To:	Jenny Delumo	From:	Stantec Consulting Services Inc.
	Planning Department, City and County of San Francisco		1340 Treat Boulevard, Suite 300 Walnut Creek, CA
File:	469 Stevenson Street Project	Date:	September 27, 2019; Updated October 21, 2022

Reference: Noise Technical Memorandum for 469 Stevenson Street Project

This technical memorandum was updated on October 21, 2022 to account for additional construction equipment required to construct the proposed project at 469 Stevenson Street as identified in the 2022 Preliminary Geotechnical Report[1]. This report has also been updated to reflect revisions to the proposed project and potential foundations, accurately reflect the distance between the operation of vibration generating construction equipment and adjacent vibration-sensitive buildings and structures, and minor clarifications. Text that has been deleted from the original memorandum dated September 27, 2019 are shown in ~~strikethrough~~ and new text is shown in double underline.

INTRODUCTION

Noise Technical Memo Purpose

The purpose of this Noise Technical Memorandum (Memo) is to support the 469 Stevenson Street Project (proposed project) Initial Study. This Memo provides analyses of potential project-related noise exposure and generation during construction and operations. This Memo has been prepared to analyze the potential construction-related noise and vibration generated from the proposed project and estimate the potential operational noise conditions located at the project site. This Memo will be used as a supplementary analysis to the initial study and recirculated draft EIR.

Specifically, the purpose of this Memo is to assess the existing ambient noise conditions at the nearest sensitive receptors and within the proposed project area. This Memo includes an evaluation of the proposed noise-generating uses that could affect noise-sensitive receptors.

Project Description and Location

The project site is a through lot located at 469 Stevenson Street in the South of Market (SoMa) neighborhood of San Francisco (Assessor's Block 3704, Lot 45). The project site is located mid-block between Stevenson Street, Sixth Street, Jessie Street, and Fifth Street. The project site is approximately 28,790 square feet (0.66-acre) and currently developed as a surface parking lot with 176 parking spaces. The proposed project would demolish the existing surface parking lot and construct a new 27-story mixed-use building approximately 274 feet tall (with 16~~10~~ additional feet for the penthouse and elevator overrun that would be used to access the roof deck ~~rooftop mechanical equipment~~) with three below grade parking levels. The proposed project would total approximately 535,000~~543,000~~ gross square feet (gsf) consisting of 495~~462~~ residential units, approximately 4,000~~3,900~~ square feet of commercial retail use on the ground floor, and approximately 30,000~~25,059~~ square feet of private and common open space. The 495~~462~~ residential units would be

[1] Langan Engineering and Environmental Services, Inc. 2022. Preliminary Geotechnical Study 496 Stevenson Street, June 30, 2022.

available for rent and include a mix of 192 studios, 149~~358~~ one-bedroom, 96~~54~~ two-bedroom, 50~~42~~ three-bedroom, and 8 five-bedroom units. The proposed project would use the State Density Bonus program and provide affordable housing units onsite. The below grade parking would provide 176~~171~~ parking spaces and 200~~191~~ *Class 1* bicycle spaces. In addition, 27~~23~~ *Class 2* bicycle spaces are proposed along the frontages of Stevenson and Jessie Streets.

The mechanical equipment for the project is anticipated to be located throughout the building, including several pieces of equipment on the roof. The actual mechanical equipment planned for the building is not yet known, however, typical residential and commercial building construction would commonly involve air handling units or make up air units, condensing units, and exhaust fans.

One (1) emergency generator is planned for the proposed project to provide backup energy for the building's mechanical equipment. The generator is planned to be located within a room on the ground floor in the southwest portion of the property. The exact discharge, intake, and exhaust pipe path for the generator are not yet known, but for the purpose of this analysis, they are assumed to be directly on the Sixth Street property plane to simulate a worst-case condition. The generator was assumed to be tested during weekday, daytime hours.

~~The proposed project is anticipated to be constructed on a mat foundation and no pile driving or piers are proposed or required.~~ The project sponsor proposes to use a mat foundation for construction of the proposed building. The results of the 2022 preliminary geotechnical analysis indicate a mat foundation is feasible for the support of the proposed structure. If the final geotechnical report finds a mat foundation is not feasible then deep foundations that extend to bedrock would be required to support the proposed structure. This deep foundation could be constructed using large-diameter, drilled cast-in-place piers, also known as drilled shafts. If drilled shafts are required, that foundation system would result in noise and vibration effects that are similar to that associated with a mat foundation. In either case, no pile driving is proposed or required. Construction of the proposed project is anticipated to begin in ~~2020~~2023 and be completed by ~~2023~~2026, requiring approximately 36 months of construction. Construction activities would include site preparation / demolition, excavation and shoring, foundation and below grade construction, building construction, exterior finishing, and sitework / paving work. Construction would generally occur between the hours of 7:00 a.m. and 8:00 p.m. up to seven days a week. Nighttime construction activities would take place for a maximum of five (5) nights total and would include the following activities

1. Erection and dismantling of the tower crane;
2. Miscellaneous utility work
3. Fire alarm testing; and
4. Concrete pour for the mat slab foundation

Noise Fundamentals and Terminology

Noise is generally defined as unwanted sound that annoys or disturbs people and potentially causes an adverse psychological or physiological effect on human health. Some land uses are more tolerant of noise than others. For example, schools, hospitals, churches, hotels, and residences are considered noise sensitive receptors because they are more sensitive to noise intrusion than are commercial or industrial activities. Ambient noise levels can also affect the perceived desirability or livability of a development. Because noise is an environmental pollutant that can interfere with human activities, evaluation of noise is necessary when considering the environmental impacts of a proposed project.

Sound is mechanical energy transmitted by pressure waves over a medium such as air or water. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level is the most common descriptor used to characterize the loudness of an ambient (existing) sound level. Although the decibel (dB) scale, a logarithmic scale, is used to quantify sound intensity, it does not accurately describe how sound intensity is perceived by human hearing. The perceived loudness of sound is dependent upon many factors, including sound pressure level and frequency content. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called A-weighting, written as dB(A) and referred to as A-weighted decibels. There is a strong correlation between A-weighted sound levels and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. Table 1 defines sound measurements and other terminology used in this Memo, and Table 2 summarizes typical A-weighted sound levels for different noise sources.

With respect to how humans perceive and react to changes in noise levels, a 1dB(A) increase is imperceptible, a 3 dB(A) increase is barely perceptible, a 6 dB(A) increase is clearly noticeable, and a 10 dB(A) increase is subjectively perceived as approximately twice as loud (Egan 2007). These subjective reactions to changes in noise levels were developed on the basis of test subjects' reactions to changes in the levels of steady-state pure tones or broad-band noise and to changes in levels of a given noise source. These statistical indicators are thought to be most applicable to noise levels in the range of 50 to 70 dBA, as this is the usual range of voice and interior noise levels.

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (Leq), the minimum and maximum sound levels (Lmin and Lmax), percentile-exceeded sound levels (such as L10, L20), the day-night sound level (Ldn), and the community noise equivalent level (CNEL). Ldn and CNEL values typically differ by less than 1 dB. As a matter of practice, Ldn and CNEL values are considered to be equivalent and are treated as such in this assessment.

For a point source such as a stationary compressor or construction equipment, sound attenuates based on geometry at rate of 6 dB per doubling of distance. For a line source such as free flowing traffic on a freeway, sound attenuates at a rate of 3 dB per doubling of distance (Federal Highway Administration 2011). Atmospheric conditions including wind, temperature gradients, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound that travels over an acoustically absorptive surface, such as grass, attenuates at a greater rate than sound that travels over a hard surface, such as pavement. The increased attenuation is typically in the range of 1–2 dB per doubling of distance. Barriers such as buildings and topography that block the line of sight between a source and receptor also increase the attenuation of sound over distance.

Table 1: Definition of Sound Measurement

Sound Measurements	Definition
Decibel (dB)	A measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
A-Weighted Decibel (dB(A))	An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
C-Weighted Decibel (dB(C))	The sound pressure level in decibels as measured using the C- weighting filter network. The C-weighting is very close to an unweighted or flat response. C-weighting is only used in special cases when low-frequency noise is of particular importance. A comparison of measured A- and C-weighted level gives an indication of low frequency content.
Maximum Sound Level (Lmax)	The maximum sound level measured during the measurement period.
Minimum Sound Level (Lmin)	The minimum sound level measured during the measurement period.
Equivalent Sound Level (Leq)	The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy.
Percentile-Exceeded Sound Level (Lxx)	The sound level exceeded xx % of a specific time period. L10 is the sound level exceeded 10% of the time. L90 is the sound level exceeded 90% of the time. L90 is often considered to be representative of the background noise level in a given area.
Day-Night Level (Ldn)	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.
Community Noise Equivalent Level (CNEL)	The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.
Peak Particle Velocity (Peak Velocity or PPV)	A measurement of ground vibration defined as the maximum speed (measured in inches per second) at which a particle in the ground is moving relative to its inactive state. PPV is usually expressed in inches/second.
Frequency: Hertz (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure.

Source: Federal Highway Administration 2006a

Table 2: Typical A-Weighted Sound Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	-110	Rock band
Jet flyover at 1,000 Feet		
	-100-	
Gas lawnmower at 3 Feet		
	-90-	
Diesel truck at 50 Feet at 50 MPH		Food blender at 3 Feet
Noisy urban area, daytime	-80-	Garbage Disposal at 3 Feet
Gas lawnmower, 100 Feet		
Commercial area	-70-	Vacuum Cleaner at 10 Feet
Heavy traffic at 300 Feet		Normal Speech at 3 Feet
	-60-	
Quiet urban daytime		Large business office
	-50-	Dishwasher in next room
Quiet urban nighttime		
Quiet suburban nighttime	-40-	Theater, large conference room (Background)
Quiet rural nighttime	-30-	
		Library
	-20-	Bedroom at night, concert hall (Background)
	-10-	Broadcast/recording studio
	-0-	

Decibel Addition

Because decibels are logarithmic units, sound pressure levels cannot be added or subtracted through ordinary arithmetic. On the dB scale, a doubling of sound energy corresponds to a 3-dB increase. In other words, when two identical sources are each producing sound of the same loudness, their combined sound level at a given distance would be 3 dB higher than one source under the same conditions. For example, if one source produces a sound pressure level of 70 dB(A), two identical sources would not produce 140 dB(A)—rather, they would combine to produce 73 dB(A). The cumulative sound level of any number of sources can be determined using decibel addition.

Vibration

Operation of heavy construction equipment, particularly pile driving and other impact devices such as pavement breakers, create seismic waves that radiate along the surface of the earth and downward into the earth. These surface waves can be felt as ground vibration. Vibration from operation of this equipment can result in effects ranging from annoyance of people to damage of structures. Varying geology and distance will result in different vibration levels containing different frequencies and displacements. In all cases, vibration amplitudes will decrease with increasing distance.

Perceptible groundborne vibration is generally limited to areas within a few hundred feet of construction activities. As seismic waves travel outward from a vibration source, they excite the particles of rock and soil through which they pass and cause them to oscillate. The actual distance that these particles move is usually only a few ten-thousandths to a few thousandths of an inch. The rate or velocity (in inches per second) at which these particles move is the commonly accepted descriptor of the vibration amplitude, referred to as the peak particle velocity (PPV). Table 3 summarizes typical vibration levels generated by construction equipment (Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual, September 2018).

Table 3: Vibration Source Levels for Construction Equipment

Equipment	Reference PPV at 25 Feet	Estimated PPV at 50 Feet
Large bulldozer	0.089	0.031
Caisson drilling	0.089	0.031
Hoe Ram	0.089	0.031
Jackhammer	0.035	0.012
Loaded trucks	0.076	0.027
Small bulldozer	0.003	0.001

Source: Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual, September 2018

Vibration amplitude attenuates over distance and is a complex function of how energy is imparted into the ground and the soil conditions through which the vibration is traveling. The following equation can be used to estimate the vibration level at a given distance for typical soil conditions (Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual, September 2018). PPVref is the reference PPV from Table 3.

$$PPV = PPVref \times (25/Distance)^{1.5}$$

Table 4 summarizes the guidelines for vibration annoyance potential criteria suggested by Caltrans (California Department of Transportation 2004). Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous and frequent intermittent sources are sources that continue for an extended period of time and include activities such as impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Table 4: Guideline Vibration Annoyance Potential Criteria

Human Response	Maximum PPV (in/sec)	
	Transient Sources	Continuous and Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.10
Severe	2.0	0.4

Source: California Department of Transportation 2004.

Table 5 summarizes the guidelines for building damage potential from vibration suggested by Caltrans (California Department of Transportation 2004).

Table 5: Guideline Vibration Damage Potential Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structure	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5
Source: California Department of Transportation 2004.		

REGULATORY SETTING

California Building Code

Part 2, Title 24 of the California Code of Regulations California Noise Insulation Standards establishes minimum noise insulation standards to protect persons within new hotels, motels, dormitories, long-term care facilities, apartment houses, and dwellings other than single-family residences. Under Section 1207.11 "Exterior Sound Transmission Control", interior noise levels attributable to exterior noise sources cannot exceed 45 Ldn in any habitable room. Where such residences are located in an environment where exterior noise is 60 Ldn or greater, an acoustical analysis is required to ensure interior levels do not exceed the 45 Ldn interior standard. If the interior allowable noise levels are met by requiring that windows be kept closed, the design for the building must also specify a ventilation or air conditioning system to provide a habitable interior environment.

Paragraph 1207.4 "Allowable Interior Noise Levels" states "Interior noise levels attributable to exterior sources shall not exceed 45 dB in any habitable room. The noise metric shall be either the day-night average sound level (Ldn) or the community noise equivalent level (CNEL), consistent with the noise element on the local general plan."

California Green Building Standards (CALGREEN)

The 2016 California Green Building Standards Code (CalGreen), Section 5.507 "Environmental Comfort", states the following:

5.507.4.1 Exterior noise transmission. Wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall meet a composite STC[2] rating of at least 50 or a

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[2] STC or Sound Transmission Class Rating is a one-number rating that describes how well a building partition or element attenuates airborne sound. STC ratings focus mainly on the mid-to-high frequency range associated with speech.

composite OITC[3] rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 in the following locations:

1. Within the 65 CNEL noise contour of an airport

Exceptions:

1. Ldn or CNEL for military airports shall be determined by the facility Air Installation Compatible Land Use Zone (AICUZ) plan.
2. Ldn or CNEL for other airports and heliports for which a land use plan that has not been developed shall be determined by the local general plan noise element.
3. Within the 65 CNEL or Ldn noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway notice source as determined by the Noise Element of the General Plan.

5.507.4.1.1 Noise exposure where noise contours are not readily available. Buildings exposed to a noise level of 65 dB Leq-1-hr during any hour of operation shall have building, addition or alteration exterior wall and roof-ceiling assemblies exposed to the noise source meeting a composite STC rating of at least 45 (or OITC 35), with exterior windows of a minimum STC of 40 (or OITC 30).

5.507.4.2 Performance method. For buildings located as defined in Section 5.507.4.1 or 5.507.4.1.1, wall and roof-ceiling assemblies exposed to the noise source making up the building or addition envelope or altered envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level (Leq -1Hr) of 50 dBA in occupied areas during any hours of operations

5.507.4.2.1 Site features. Exterior features such as sound walls or earth berms may be utilized as appropriate to the building, addition or alteration project to mitigate sound migration to the interior.

5.507.4.2.2 Documentation of compliance. An acoustical analysis documenting complying interior sound levels shall be prepared by personnel approved by the architect or engineer of record.

5.507.4.3 Interior sound transmission. Wall and floor-ceiling assemblies separating tenant spaces and tenant spaces and public places shall have an STC of at least 40.

The proposed project’s interiors will be required to comply with the California Building Code and California Green Building Standards. The San Francisco Building Department would review the building plans for the proposed project to determine compliance with these standards.

San Francisco General Plan

The Environmental Protection Element within the San Francisco General Plan addresses those environmental issues that affect the residents of San Francisco, including noise concerns. Objective 11 of the Environmental Protection Element is directed toward achieving an environment in which noise levels will not interfere with the health and welfare of people in their everyday activities. Policy 11.1 identifies land use compatibility noise standards for noise-sensitive land uses affected by transportation and non-transportation noise sources. As

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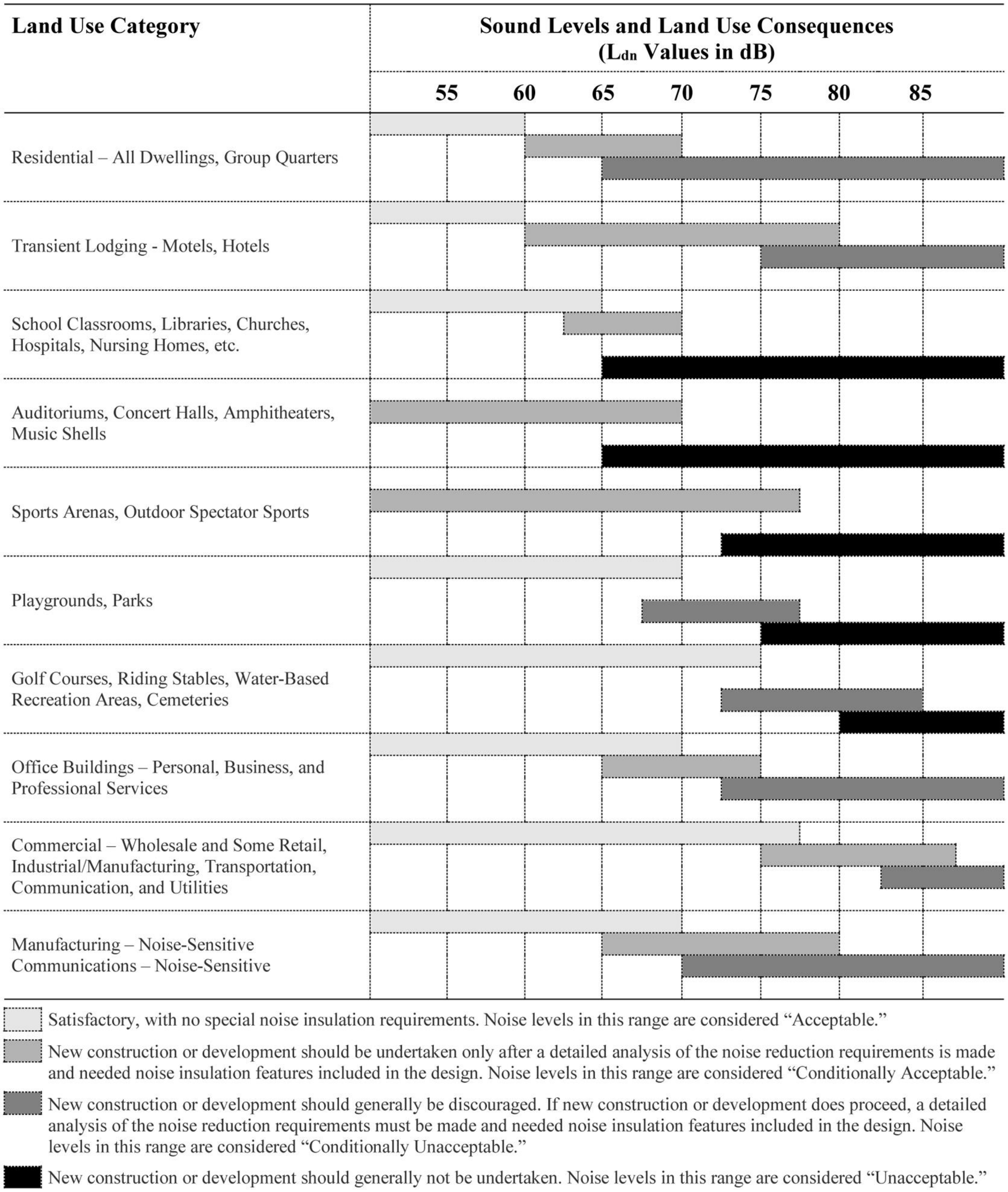
[3] OITC or Outside-Inside Transmission Class Ratings are also a one-number rating that described how well an exterior façade element, such as walls and windows, attenuate airborne noise. OITC ratings place more focus on the lower frequency ranges most associated with transportation noise sources.

shown in Figure 1, for residential buildings that are affected by transportation noise sources, the “normally acceptable” exterior noise level is 50-60 dB(A) Ldn. Exterior noise levels up to 70 dB(A) Ldn are considered “conditionally acceptable” and should be undertaken only after a detailed analysis of the noise reduction requirements are made. Exterior noise levels between 65 dB(A) and 90 dB(A) Ldn are considered “normally unacceptable.” New construction with exterior noise levels in this range would require a detailed analysis of the noise reduction requirements and noise insulation features to be incorporated in the project to maintain “normally acceptable” interior noise levels. These policies and objectives of the general plan are implemented by individual projects through required building code requirements (see above discussion).

Figure 1: San Francisco Land Use Compatibility Chart for Community Noise



San Francisco Police Code

Article 29 “Regulation of Noise” of the San Francisco Police Code states the following:

Section 2909 “Noise Limits”

“(a) Residential Property Noise Limits.

(1) No person shall produce or allow to be produced by any machine, or device, music or entertainment or any combination of same, on residential property over which the person has ownership or control, a noise level more than five dBA above the ambient at any point outside of the property plane.

(2) No person shall produce or allow to be produced by any machine, or device, music or entertainment or any combination of same, on multi-unit residential property over which the person has ownership or control, a noise level more than five dBA above the local ambient three feet from any wall, floor, or ceiling inside any dwelling unit on the same property, when the windows and doors of the dwelling unit are closed, except within the dwelling unit in which the noise source or sources may be located.

(b) Commercial and Industrial Property Noise Limits. No person shall produce or allow to be produced by any machine, or device, music or entertainment or any combination of same, on commercial or industrial property over which the person has ownership or control, a noise level more than eight dBA above the local ambient at any point outside of the property plane. With respect to noise generated from a licensed Place of Entertainment, licensed Limited Live Performance Locale, or other location subject to regulation by the Entertainment Commission or its Director, in addition to the above dBA criteria a secondary low frequency dBC criteria shall apply to the definition above. No noise or music associated with a licensed Place of Entertainment, licensed Limited Live Performance Locale, or other location subject to regulation by the Entertainment Commission or its Director, shall exceed the low frequency ambient noise level defined in Section 2901(f) by more than 8 dBC.

(d) Fixed Residential Interior Noise Limits. In order to prevent sleep disturbance, protect public health and prevent the acoustical environment from progressive deterioration due to the increasing use and influence of mechanical equipment, no fixed noise source may cause the noise level measured inside any sleeping or living room in any dwelling unit located on residential property to exceed 45 dBA between the hours of 10:00 p.m. to 7:00 a.m. or 55 dBA between the hours of 7:00 a.m. to 10:00p.m. with windows open except where building ventilation is achieved through mechanical systems that allow windows to remain closed.”

Section 2901 “Definitions”

“(d) “Emergency Work” means work made necessary to restore property to a safe condition following a public calamity or work required to protect persons or property from an imminent exposure to danger or work by private or public utilities when restoring utility service. This term shall not include testing of emergency equipment.”

Section 2907 “Construction Equipment”

“(a) Except as provided for in Subsections (b), (c), and (d) hereof, it shall be unlawful for any person to operate any powered construction equipment if the operation of such equipment emits noise at a level in excess of 80 dBA when measured at a distance of 100 feet from such equipment, or an equivalent sound level at some other convenient distance.

(b) The provisions of Subsections (a) of this Section shall not be applicable to impact tools and equipment, provided that such impact tools and equipment shall have intake and exhaust mufflers recommended by the manufacturers thereof and approved by the Director of Public Works or the Director of Building Inspection as best accomplishing maximum noise attenuation, and that pavement breakers and jackhammers shall also be equipped with acoustically attenuating shields or shrouds recommended by the manufacturers thereof and approved by the Director of Public Works or the Director of Building Inspection as best accomplishing maximum noise attenuation.

(c) The provisions of Subsection (a) of this Section shall not be applicable to construction equipment used in connection with emergency work."

Section 2908 "Construction Work at Night"

"It shall be unlawful for any person, between the hours of 8:00 p.m. of any day and 7:00 a.m. of the following day to erect, construct, demolish, excavate for, alter or repair any building or structure if the noise level created thereby is in excess of the ambient noise level by 5 dBA at the nearest property plane, unless a special permit therefor has been applied for and granted by the Director of Public Works or the Director of Building Inspection. In granting such special permit the Director of Public Works or the Director of Building Inspection shall consider: if construction noise in the vicinity of the proposed work site would be less objectionable at night than during daytime because of different population levels or different neighboring activities if obstruction and interference with traffic, particularly on streets of major importance, would be less objectionable at night than during daytime; if the kind of work to be performed emits noises at such a low level as to not cause significant disturbance in the vicinity of the work site, if the neighborhood of the proposed work site is primarily residential in character wherein sleep could be disturbed: if great economic hardship would occur if the work were spread over a longer times if the work will abate or prevent hazard to life or property; and if the proposed night work is in the general public interest. The Director of Public Works or the Director of Building Inspection shall prescribe such conditions, working times, types of construction equipment to be used, and permissible noise emissions, as required in the public interest.

The provisions of this Section shall not be applicable to emergency work."

Places of Entertainment

Noise Regulations relating to Residential Uses Near Places of Entertainment (Ordinance 70-15, effective June 19, 2015) states residential structures to be located where the day-night average sound level (Ldn) or community noise equivalent level (CNEL) exceeds 60 decibels shall require an acoustical analysis with the application of a building permit showing that the proposed design would limit exterior noise to 45 decibels in any habitable room. Furthermore, the regulations require the San Francisco Planning Department and planning commission to consider the compatibility of uses when approving residential uses adjacent to or near existing permitted places of entertainment and take all reasonably available means through the city's design review and approval processes to ensure that the design of new residential development projects take into account the needs and interests of both the places of entertainment and the future residents of the new development.

The proposed project would be located within 300 feet of two (2) places of entertainment, OMG Bar and Nightclub (directly adjacent to the project site to the southwest) and Mezzanine (215 feet northeast of the project site). In addition, The Warfield is 334 feet northwest of the project site and the SHN Golden Gate Theater is 454 feet northwest of the project site.

The ambient noise level measured at the Jessie Street edge of the site during the early morning hours is an average of 71.4 dB(C). According to Section 2090 "Noise Limits", Paragraph (b) "Commercial and Industrial Property Noise Limits" in the San Francisco Police Code, the loudest noise level the establishments would be able to generate at the project site is 79.4 dB(C). The project exterior façade would be designed taking into account the noise levels generated by the neighboring places of entertainment as verified by the Project Sponsor via e-mail on July 26, 2019.

EXISTING NOISE ENVIRONMENT

Existing Ambient Noise Levels

The existing noise environment in a project area is characterized by the area's general level of development due to the high correlation between the level of development and ambient noise levels. Areas which are not urbanized are relatively quiet, while areas which are more urbanized are noisier as a result of roadway traffic, industrial activities, and other human activities.

The City of San Francisco is exposed to several sources of noise, including traffic on the local roadways, such as Market Street, Sixth Street, and Fifth Street. Traffic noise depends primarily on traffic speed (tire noise increases with speed), proportion of medium and large truck traffic (trucks generate engine, exhaust, and wind noise, in addition to tire noise), and number of speed control devices, such as traffic lights (accelerating and decelerating vehicles and trucks can generate more noise).

Changes in traffic volumes can also have an impact on overall traffic noise levels. For example, it takes 25 percent more traffic volume to produce an increase of only 1 dB(A) in the ambient noise level. For roads already heavy with traffic volume, an increase in traffic numbers could even reduce noise because the heavier volumes could slow down the average speed of the vehicles. A doubling of traffic volume generally results in a 3 dB(A) increase in noise levels.

The main source of noise at the 469 Stevenson Street site is the steam generation plant on the adjacent Clearway Energy property. The noise from the steam generation plant is a constant, tonal noise produced from the mechanical equipment outside the building and the operation of the facility. Other sources of noise at the site include traffic on Sixth Street, very sparse traffic on Stevenson and Jessie streets, sidewalk activity, parking lot activity, aircraft fly overs, activity from businesses (back-up beepers, etc.), and noise from distant construction sites. The traffic in the area is comprised of vehicles, medium and large trucks, motorcycles, MUNI buses and streetcars, construction vehicles, and emergency vehicles. The project site is well-shielded from traffic noise along Market and Fifth Streets.

Photo 1: Microphone on Roof of 989 Market Building

A noise survey was conducted between Thursday, March 14, 2019 and Sunday, March 17, 2019 to establish the existing baseline condition for the project. The survey involved securing a calibrated Larson Davis LxT sound level meter to the roof of the adjacent building at 989 Market Street, about 95 feet above the ground. The microphone was extended approximately two feet out from the building and directly faced Stevenson Street (within the red circle in Photo 1). The unattended meter collected data continuously between Tuesday and Sunday for a minimum of 24-hours.

One (1) additional spot measurement was taken during the same time period to extrapolate the 24-hour noise level to a different elevation to gain an understanding of sound across the full project site. The spot measurement was taken at the edge of the existing parking lot facing Jessie Street using a fully calibrated Larson Davis 831 sound level meter. The microphone was about 5 feet 6 inches above the sidewalk for the measurement. The results of the ambient noise measurements are shown in Table

7 below. Average 15-minute sound pressure levels measured at the 24-hour measurement location are shown in Appendix 1 attached to this Memo.

Table 7: Ambient Noise Level Measurement Results

Location	Ldn, dB(A)[4]	Maximum One-Hour Leq, dB(A)[5]	Maximum 15-Min Daytime Leq, dB(A)	Minimum 15-Min Daytime Leq, dB(A)	Minimum 15-Min Nighttime Leq, dB(A)[6]
Stevenson Street – Rooftop	67.0 – 70.5 dB(A)	68.8 dB(A)	68.4 dB(A)	59.1 dB(A)	57.5 dB(A)
Jessie Street – Ground Level	64.5 – 68.0 dB(A)	66.3 dB(A)	65.9 dB(A)	56.6 dB(A)	55.0 dB(A)

The dates of the noise survey included the Hello Dolly show at the SHN Golden Gate Theater (March 16 and March 17, 2019), The Nils Frahm concert (March 15, 2019) and the Graveyard and Uncle Acid & The Deadbeats concert (March 16, 2019) at the Warfield, The Dirtybird Quarterly event at Mezzanine (March 15, 2019), and typical weekend activity at OMG Bar & Nightclub. Ambient noise levels measured during the early morning hours, or during the anticipated operational hours of the noise-generating entertainment uses, ranged between 70.2-73.4 dB(C). Ambient noise levels exceed the “satisfactory" category on the Land Use Compatibility Chart for Community noise.

Noise-Sensitive Receptors

Noise-sensitive receptors around the project site include The Wilson apartments at 973 Market Street, the Hampton Inn San Francisco Downtown at the corner of Mint Street and Mission Street, and various hotels and residential buildings near the corner of Sixth Street and Stevenson Street, including the Desmond Hotel at 42 Sixth Street, the Seneca Hotel at 34 Sixth Street, the Haveli Hotel at 37 Sixth Street, the Whitaker Hotel at 45 Sixth Street, the Hillsdale at 51 Sixth Street, the Oak Tree Hotel at 45 Sixth Street, the Winsor Hotel at 20 Sixth Street, and various residential spaces above 87-99 Sixth Street. The noise-sensitive receptors within 300 feet of the 469 Stevenson project site are shown in Appendix 2 attached to this memo.

Vibration-Sensitive Receptors

Historic buildings are more susceptible to vibration as compared with buildings with modern construction. Historic buildings adjacent to the project site include The Haveli Hotel at 35-37 Sixth Street (Date of Construction – 1908), The Whitaker Hotel at 39-41 Sixth Street (Date of Construction – 1906), The Oak Tree Hotel at 43-45 Sixth Street (Date of Construction – 1907), and The Hillsdale Hotel at 47-51 Sixth Street (Date of Construction – 1912). These structures are adjacent to the project site’s western property line. 65-83 Sixth Street (Date of Construction – 1913), 986 Mission Street/481 Jessie Street (Date of Construction – 1922), ~~980~~982-984 Mission Street/479 Jessie Street (Date of Construction – 1924), 972-976 Mission Street (Date of Construction – 1925), 968 Mission Street (Date of Construction – 1930), 471 Jessie Street (Date of Construction – 1912), and 956-960 Mission Street (Date of Construction – 1910) are also historic buildings, and are located across the street from the project’s Jessie Street frontage. 995 Market Street/1 Sixth Street (Date of Original Construction – 1908), 979-989 Market Street (Date of Construction – 1907), 973 Market Street (Date of Construction – 1904) are historic buildings and are located across the street from the project’s Stevenson Street frontage. Additionally, the three-story building and two smokestacks located at 460 Jessie

[4] The day-night noise level, Ldn, is relevant for noise interior to the residential units.
[5] The maximum one-hour equivalent noise level, Leq, is referenced for CalGreen.
[6] The minimum 15-minute nighttime equivalent noise level is used for the fixed-source mechanical noise property plane noise analysis.

Street are located at the adjacent Clearway Energy thermal power station to the east of the project site and are historical resources as contributors to the California Register-eligible PG&E City Beautiful Substations Discontinuous Thematic Historic District. All vibration-sensitive buildings within 300 feet of the project site are also shown in Appendix 2 attached to this Memo and distinguished from noise-sensitive receptors as shown in the legend.

Existing Noise-Generating Uses

This neighborhood of the City contains several entertainment facilities which are in operation for weekly scheduled events or for special events. Noise generated by the operation of the facilities will be part of the ambient noise environment experienced by the subject project. Noise-generating uses around the project include places used for scheduled events, such as The Warfield (982 Market Street), Piano Fight (144 Taylor Street), Pandora Karaoke & Bar (50 Mason Street), OMG Bar and Nightclub (43 Sixth Street), Mezzanine (444 Jessie Street), Exit Stage Left (156 Eddy Street), and the SHN Golden Gate Theater (1 Taylor Street), and spaces used for special events, such as Club Six (60 Sixth Street), and the SF Mint (88 Fifth Street).

METHODOLOGY

In accordance with the requirements of the California Environmental Quality Act (CEQA), the noise analysis evaluates the project's noise sources to determine the impact of the proposed project on the existing ambient noise environment. This analysis does not analyze the impact of the existing ambient noise environment on the proposed project's residents. However, as discussed in the regulatory setting above, existing regulations are in place to ensure adequate interior noise levels are achieved for a proposed project.

Results from the long-term site measurements were used to provide baseline noise conditions at nearby sensitive receptors and within the project site vicinity. For the purpose of this analysis, potential sensitive receptors were determined by reviewing current aerial photography and by walking the project site.

Operational Noise

Project-generated traffic should not increase existing noise levels by 5 dBA Ldn if existing or existing plus project-generated noise levels are within the City's "Satisfactory" category per the general plan's land use compatibility chart for community noise (Figure 1 above). If existing or resulting with project noise levels are above the "Satisfactory" category, project-generated traffic noise should not result in an increase of 3 dBA Ldn. Anticipated noise increases from future project-related traffic were estimated using predicted vehicle traffic generated from the 469 Stevenson project as detailed in the traffic analysis prepared by Fehr & Peers.

In addition, the proposed project would require one diesel emergency backup generator and a generator to operate a fire pump, required by the building code to ensure life safety requirements are met. Given their limited operation, noise from these generators are analyzed qualitatively for their potential to increase ambient noise levels.

Noise from the proposed project's mechanical and HVAC systems would operate regularly and are therefore analyzed for compliance with article 2909(a) and (d) of the noise ordinance (refer to regulatory discussion above).

The proposed project would not include sources of vibration during operations. Therefore, no operational vibration assessment is required.

Construction Noise

The San Francisco Police Code does not specify quantitative noise limits for impact equipment or combined noise impacts from the simultaneous operation of multiple pieces of construction equipment. Therefore, the quantitative evaluation of daytime construction noise effects is based on criteria in the Federal Transit Administration (FTA) guidelines for residential land uses which is 90 dBA Leq.[7]

The planning department also evaluates whether construction noise would result in an increase of 10 dBA over existing noise levels ("Ambient + 10 dBA") at sensitive receptors, which generally represents a perceived doubling of loudness. The quantitative analysis typically evaluates the noise levels from the simultaneous operation of multiple pieces of construction equipment to provide a worst-case assessment of potential noise during construction. Although a more refined analysis evaluating the noise levels from all equipment associated with a construction phase is also acceptable. The quantitative criteria above are only part of the evaluation of construction noise. The evaluation also considers the duration and intensity of any quantitative noise exceedance. In addition, nighttime construction noise is assessed to determine whether sleep disturbance would occur (if construction noise would exceed 45 dBA at residential interiors for prolonged periods of time). The nighttime construction noise analysis also considers the frequency and duration of nighttime construction activities.

The Federal Highway Administration Roadway Construction Noise Model (RCNM) was used to determine noise generated from construction activities. The RCNM is used as the Federal Highway Administration's national standard for predicting noise generated from construction activities. The RCNM analysis includes the calculation of noise levels (Lmax and Leq) at incremental distances for a variety of construction equipment. The spreadsheet inputs include acoustical use factors, Lmax values, and Leq values at various distances depending on the ambient noise measurement location. Construction noise levels were calculated for each phase of construction based on the equipment list provided by the project sponsor. Given the limited extent and duration of nighttime construction activities, the potential for nighttime construction noise to result in sleep disturbance is analyzed qualitatively.

Construction Vibration

Vibration from construction equipment is analyzed at the surrounding buildings and compared to the applicable Caltrans building damage criteria to determine whether construction activities would generate vibration at levels that could result in building damage. Given the limited extent and duration of nighttime construction activities, the potential for vibration effects to result in sleep disturbance are analyzed qualitatively.

ENVIRONMENTAL ANALYSIS

Traffic Noise Levels

To describe future noise levels due to traffic added from the proposed project, peak hour traffic counts (with and without the project) listed in the traffic study by Fehr & Peers were used to determine the percent increase of traffic on the roads adjacent to the project site and near adjacent sensitive receptors.

Table 8 shows the existing peak hour traffic count and the estimated traffic levels under existing plus project conditions on nearby roadways. The last columns in the table show the overall percentage change and the estimated difference in peak hour noise level. Calculations to support the table are contained in Appendix 3 attached to this memo.

[7] Federal Transit Administration (FTA), 2018, Transit Noise and Vibration Impact Assessment, DTA-VA- 90-1003-06, Chapter 12, September 2018, U.S. Department of Transportation. http://www.fta.dot.gov/12347_2233.html.

Table 8: Traffic Peak Hour Counts and Estimated Noise Increase

Roadway	Existing Peak Hour Traffic Counts	Estimated Peak Hour Traffic with Project	Percentage Change	Estimated dB(A) Change
Market Street	580	580	0%	0 dB(A)
Sixth Street	1,844	1,859	1%	0.04 dB(A)
Stevenson Street	108	152	41%	1.6 dB(A)
Fifth Street	1,402	1,4230	2%	0.08 dB(A)

The proposed project is expected to minimally increase traffic volumes along Market Street, Sixth Street, and Fifth Street. There would essentially be no perceptible change in traffic noise expected along these streets. Peak traffic volumes are expected to increase approximately 41 percent along Stevenson Street between Fifth and Sixth Streets with implementation of the proposed project. Traffic increases of 41 percent only raise noise levels approximately 1.6 dB(A), which is imperceptible.

Project Fixed-Source Noise

HVAC and Mechanical Systems Exterior Noise

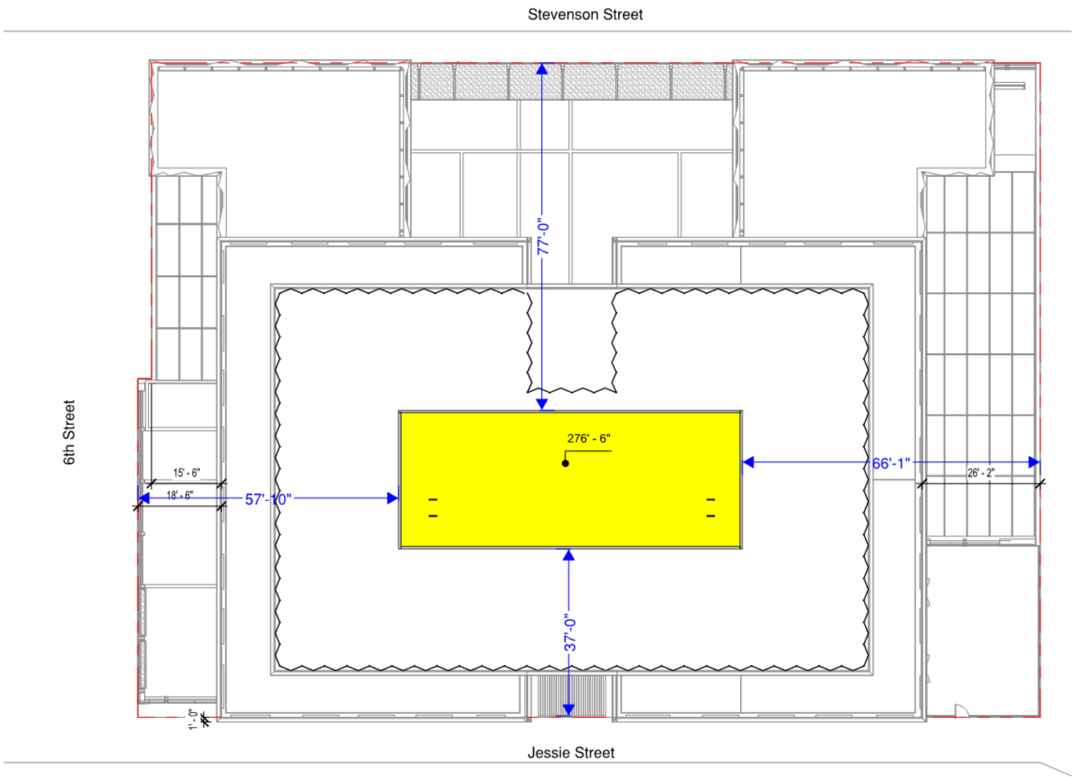
Per San Francisco Police Code section 2909(a) residential properties may not produce a noise level more than 5 dB(A) above the ambient noise level at any point outside of the property plane. Typical residential and commercial building construction would involve new rooftop mechanical equipment, such as air handling units, condensing units, make-up air units, and exhaust fans. This equipment would generate noise that would radiate to neighboring properties.

Noise from HVAC equipment can vary greatly, depending on the size of the equipment and the type of equipment used. The project sponsor has verified that water-source heat pumps are planned for the residential units and the main pieces of mechanical equipment would be located on the roof[8]. While the project sponsor has not selected the exact mechanical equipment to be installed on the project site, the following assumptions were used in the exterior analysis of the mechanical equipment based on HVAC equipment similar to standard package units installed on buildings similar to the proposed project:

- A standard HVAC unit would produce sound pressure levels in the range of 70 to 75 dBA at 50 feet.[1].[9]
- The mechanical equipment was assumed to be centrally located in the mechanical area indicated on the roof as shown in the yellow-highlighted area below in Figure 2:

[8] August 19, 2019 e-mail from Victoria Lehman, Build
[9] Hoover and Keith, Noise Control for Buildings, Manufacturing Plants, Equipment, and Products, 2000, Houston, TX.

Figure 2: Assumed Location of Rooftop Mechanical Equipment



- The mechanical area is visually blocked from the surrounding buildings by a 9 foot, 3-inch tall screen. Even though there is a screen, effects of the screen were not considered in the analysis to meet the requirements of the San Francisco Police Code section 2909(a) because this code requirement is a "property plane" requirement. This means the noise level requirements listed in the code must be met at an infinite vertical plane as defined by the subject project's property line. Therefore, this analysis is conducted just above the screen during nighttime hours to simulate a worst-case scenario.

Using the sound pressure levels and the analysis assumptions listed above, the results of the noise levels from exterior mechanical systems at the property plane are as follows:

Table 9: Calculated Rooftop Mechanical Equipment Noise Levels at the Project Property Planes

Property Plane	Nighttime Ambient Noise Level	2909(a) Noise Limit (Ambient + 5 dB(A))	Distance between Mechanical Area and Property Plane	Estimated Noise Level at Property Plane	Exceeds 2909(a) Noise Limit?
Stevenson Street	57.5 dB(A)	62.5 dB(A)	77'-0"	74.2 dB(A)	Yes
Jessie Street	55.0 dB(A)	60.0 dB(A)	37'-0"	80.5 dB(A)	Yes
Western property plane (near Sixth Street)	55.0 dB(A)	60.0 dB(A)	57'-10"	76.7 dB(A)	Yes
Eastern property plane (near Fifth Street)	57.5 dB(A)	62.5 dB(A)	66'-1"	75.0 dB(A)	Yes

The supporting calculations for the property plane noise analysis are attached to this memo in Appendix 4.

A minimum of 20.5 dB(A) noise reduction is required from the rooftop equipment to achieve the requirements of the San Francisco Police Code Section 2909(a) during nighttime hours. The project sponsor shall implement the following mitigation measures to reduce noise levels from the source equipment and achieve compliance with the police code:

- Enclose as much of the proposed project's rooftop equipment as possible within a mechanical room with small louvered openings to the exterior. The mechanical room and louvered openings can be treated with acoustic absorption and sound attenuators to reduce noise at the property planes.
- If the equipment remains open to the roof, select rooftop equipment with a maximum sound pressure level of 54.4 dB(A) at 50 feet' from the equipment.
- Attach sound attenuators to the outside air and exhaust air openings/fans of the rooftop equipment to minimize environmental noise.

During the design phase, once the project sponsor has selected the specific HVAC and mechanical equipment for the proposed project, a qualified acoustical consultant shall conduct a property plane noise analysis. The property plane analysis report shall evaluate whether the proposed HVAC and mechanical equipment complies with the noise limits in the San Francisco Police Code. The report shall be submitted to the San Francisco Planning Department for review and approval prior to issuance of a building permit or building permit addendum that would permit the HVAC and mechanical equipment.

<u>HVAC and Mechanical Systems Interior Noise</u>

Per San Francisco Police Code section 2909(d), fixed noise sources cannot intrude into a sleeping or living room in any dwelling unit located on residential property to produce interior noise levels that exceed 45 dB(A) between the hours of 10:00 PM to 7:00 AM or 55 dB(A) between the hours of 7:00 AM to 10:00 PM. The tallest closest noise-sensitive receptors to the 496 Stevenson Project are at 47-Sixth Street (approximately 20 feet from the project site) with a building height of 85'-0" and 973 Market Street (approximately 22 feet from the project site) with a building height of 101'-0". These residential buildings are the tallest buildings located directly adjacent to the Project site and therefore, the residential units in these buildings will be the closest to the rooftop mechanical equipment on the 469 Stevenson Street building.

Noise from the projected project's rooftop equipment to these residential properties was calculated to verify compliance with section 2909(d) of the San Francisco Police Code. All analysis assumptions listed above under HVAC and Mechanical Systems Exterior Noise also apply for the interior noise analysis, except the screen. Because the section 2909(d) analysis is a point calculation to the closest residential units and not a property plane analysis, the effects of the 9 foot 3-inch tall screen shielding the rooftop mechanical equipment was included in the analysis of interior noise for the mechanical systems. The interior noise analysis also accounts for a 15 dB(A) reduction in noise from the building façade. This is a typical noise reduction factor that assumes windows are open. The results of the interior noise analysis are shown in Table 10 below. The supporting calculations for the interior residential noise analysis are included at the end of this memo in Appendix 4.

Table 10: Calculated Rooftop Mechanical Equipment Noise Levels at the Nearest Residential Receptors

Receptor Location	Estimated Rooftop Equipment Noise Level at Residence	Façade Noise Reduction[10]	Calculated Interior Noise Level	Criterion	Exceeds Criterion?
47 Sixth Street	41.5 dB(A)	15 dB(A)	26.5 dB(A)	45 dB(A)	No
973 Market Street	42.7 dB(A)	15 dB(A)	27.7 dB(A)	45 dB(A)	No

Emergency Generators

One emergency generator is planned for the proposed project. The generator is planned to be located within the main electrical room on the ground floor in the southwest portion of the property. The exact discharge, intake, and exhaust pipe paths for the generator are not yet known. The generator would be tested regularly, typically once per month. However, the generator will require a permit to operate from the Bay Area Air Quality Management District, which typically permits emergency generators to operate for testing purposes up to 50 hours per year. The generator would typically be tested during the weekday, daytime hours. Given the generator would be located in an enclosed room and operate at most 1 hour per week during daytime hours, noise from the generator is not anticipated to substantially increase daytime ambient noise levels.

Short-Term Construction Noise

Daytime Construction Noise

Construction activities associated with the proposed project would include site preparation and demolition, excavation and shoring, foundation and below grade work, building construction, exterior finishing, and sitework/paving. Each construction stage has its own mix of equipment and, consequently, its own noise characteristics. These various construction operations would change the character of the noise generated at the project site and, therefore, the ambient noise level as construction progresses. The loudest phases of construction include excavation and shoring and building construction phases, as the noisiest construction equipment is earthmoving and grading equipment and concrete/industrial saws. Table 11 lists types of construction equipment that may be used throughout construction and the maximum and average noise level as measured at 20 feet from the operating equipment. The 20-foot distance is more conservative than the methodology from the FTA which would assume the equipment operates at the center, or 85 feet, from the sensitive receptors along 6th Street. ~~represents the approximate distance between the project property line and the closest noise-sensitive receptors at 35 Sixth Street, 39-41 Sixth Street, 43-45 Sixth Street, and 47 Sixth Street, which are hotels and residential over retail. The 20-foot distance represents a worst-case~~

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[10] Facade noise reduction is typically 15 dBA with windows open. See http://researchrepository.napier.ac.uk/2040/1/TWFrepNANR_116.pdf

~~assessment of noise impacts on nearby receptors because it assumes the equipment operates at the property line closest to the sensitive receptor.~~ The project site is approximately 170 feet wide along its Jessie and Stevenson Street frontages and therefore equipment will often be operating at distances greater than 20-feet from the closest sensitive receptors.

Table 11: Summary of Construction Equipment Noise Levels at the Nearest Noise-Sensitive Receptor

Equipment	Distance ~~to~~ Between Equipment and Nearest Noise-Sensitive Receptor	Sound Level at Nearest Noise-Sensitive Receptor		
		Lmax, dB(A)	Acoustical Use Factor (%)	Leq, dB(A)
Backhoe	20 feet	85.5	40	81.5
Crane	20 feet	88.5	16	80.6
Concrete Mixer Truck	20 feet	86.8	40	82.8
Concrete Saw	20 feet	97.5	20	90.5
Compressor (air)[1]	20 feet	85.6	40	81.6
Excavator	20 feet	88.7	40	84.7
Front End Loader[2]	20 feet	87.1	40	83.1
Flat Bed Truck	20 feet	82.2	40	78.2
Grader	20 feet	93.0	40	89.0
Hoe Ram	20 feet	98.2	20	91.2
Jackhammer	20 feet	96.8	20	89.9
Paver	20 feet	85.2	50	82.2
Welder / Torch	20 feet	82.0	40	78.0
Tractor[3]	20 feet	92.0	40	88.0
Man Lift[4]	20 feet	82.7	20	75.7
Drill Rig	20 feet	87.1	20	80.1
Dump Truck	20 feet	84.4	40	80.4
Pumps	20 feet	88.9	50	85.9

Source: Stantec 2019, Federal Highway Administration Roadway Construction Noise Model Version 1.1, 2008

Notes:
1. Used to approximate noise from a pressure washer for this project.
2. Used to approximate noise from the skid steer loader for this project.
3. Used to approximate noise from the forklift and rough-terrain forklift for this project.
4. Used to approximate noise from the aerial lift and scissor lift for this project.

Construction of the entire project would be conducted in sequential phases and each phase would use different pieces of construction equipment. The noise-producing equipment for each construction phase as defined by the Project Sponsor are shown in Table 12.

Table 12: Construction Phases and Equipment

Construction Phase	Equipment
Site Preparation / Demolition	Dump Truck (2) Excavator (1)
Excavation and Shoring	Bore / Drill Rigs (1) Dumper / Tenders (1) Excavators (1) Skid Steer Loaders (1) Tractors / Loaders / Backhoes (1) Aerial Lifts (1) Hoe Ram (1) Jackhammer (1) Dump Truck (2)
Foundation and Below Grade Construction	Concrete Pump (1) Manlift (1) Dump Truck (1)
Building Construction	Aerial Lifts (1) Cranes (1) Forklift (1) Rough Terrain Forklifts (1) Electric-Powered Welders (1) Concrete / Industrial Saws (2) Dump Truck (1) Manlift (1) Scissor Lift (3) Welders (1)
Exterior Finishing	Air Compressors (1) Forklift (1) Manlift (1) Welders (1)
Sitework / Paving	Cement and Mortar Mixers (1) Pavers (1) Paving Equipment (1) Pressure Washer (1)

A worst-case condition for construction activity would assume all noise-generating equipment for each construction phase were operating at the same time and at the same distance away from the closest noise-sensitive receptor. Using this assumption, the RCNM program calculated the following combined Leq and Lmax noise levels from each phase and stage of construction as shown in Table 13.

Table 13: Calculated Noise Level from Each Construction Phase

Construction Stage	Distance to Nearest Noise-Sensitive Receptor	Sound Level at Nearest Noise-Sensitive Receptor	
		Lmax, dB(A)	Leq, dB(A)
Site Preparation / Demolition	20 feet	91.1 dB(A)	87.1 dB(A)
Excavation and Shoring	20 feet	~~95.0~~ 101.6 dB(A)	~~90.5~~ 95.3 dB(A)
Foundation and Below Grade Construction	20 feet	91.2 dB(A)	85.0 dB(A)
Building Construction	20 feet	102.2 dB(A)	96.1 dB(A)
Exterior Finishing	20 feet	93.6 dB(A)	89.4 dB(A)
Sitework / Paving	20 feet	91.8 dB(A)	88.2 dB(A)

The construction noise modeling output results are attached to this memo in Appendix 5.

Construction noise during the Excavation and Shoring Phase and the Building Construction Phase are expected to exceed the FTA 90 dB(A) Leq guideline at the closest noise-sensitive receptors. The excavation and shoring phase is expected to take approximately two months to complete. Building construction is expected to take a total of about 29 months to complete. The loudest part of the building construction phase is anticipated to be during the beginning of the phase when the concrete/industrial saws would be used. The Building Construction phase, the Exterior Finishing Phase, and the Sitework/Paving Phase will all run concurrently.

Because the ambient daytime noise level in the project vicinity is approximately 70 dBA, noise levels from all phases of construction are expected to be 10 dB(A) above the ambient noise level at the closest sensitive receptors. As discussed previously, a 10 dBA increase in noise level is perceived as a doubling of loudness.

The entire construction process is expected to take approximately 36 months to complete. Therefore, noise sensitive receptors would be potentially exposed to noise levels 10 dBA above the ambient for the entire duration of construction. However, noise levels would fluctuate throughout the day depending upon the specific equipment being used at any one time. While the construction activity will extend over 36 months, the use of the most noise producing equipment, such as bulldozers, graders, and concrete/industrial saws would be limited to the excavation/shoring phase and the first part of the building construction phases.

Nighttime Construction Noise

Most construction would occur during daytime hours, but some nighttime construction would occur. During the total 36-month construction phase, nighttime construction work may be required on up to five (5) nights and would include the following activities:

1. Erection and dismantling of the tower crane;
2. Miscellaneous utility work
3. Fire alarm testing; and
4. Concrete pour for the mat slab foundation

This required nighttime work would occur at different times throughout the 36-month construction period and not for 5 sequential nights. Therefore, given the duration of nighttime work it is not expected to result in sleep disturbance for a substantial period of time.

Construction Noise Control Measures

The following measures would reduce construction noise at nearby sensitive receptors.

Construction Noise Control Plan

The project sponsor shall develop site-specific noise attenuation measures under the supervision of a qualified acoustical consultant. At the end of the design phase of this project and prior to commencing construction, the project sponsor shall submit a noise attenuation plan to the San Francisco Planning Department and Department of Building Inspection to ensure maximum feasible noise attenuation will be achieved. The noise attenuation plan shall reduce construction noise to the degree feasible with a goal of reducing construction noise levels at adjacent noise sensitive receptors (residential, hotel, hospital, convalescent home, school, and church uses) so that noise levels do not exceed 90 dBA and 10 dBA above ambient daytime noise levels. The project sponsor shall include noise attenuation measures in specifications provided to the general contractor and any sub-contractors. Noise attenuation measures shall, at minimum, include the following:

- Require the general contractor to ensure that equipment and trucks used for project construction utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically attenuating shields or shrouds), wherever feasible.
- Require the general contractor to perform all work in a manner that minimizes noise to the extent feasible; use equipment with effective mufflers; undertake the noisiest activities during times of least disturbance to surrounding residents and occupants, as feasible.
- Require the general contractor to use impact tools (e.g., jack hammers, pavement breakers, and rock drills) that are hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. Where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used, along with external noise jackets on the tools, which could reduce noise levels by as much as 10 dBA.
- Require the general contractor to erect temporary plywood noise barriers (at least 0.5-inch-thick) around stationary noise sources and/or the construction site, particularly where a noise source or the site adjoins noise-sensitive uses. The barriers shall be high enough to block the line of sight from the dominant construction noise source to the closest noise-sensitive receptors. Depending on factors such as barrier height, barrier extent, and distance between the barrier and the noise-producing equipment or activity, such barriers may reduce construction noise by 3–15 dBA at the locations of nearby noise-sensitive receptors.
- Require the general contractor to use noise control blankets on a building structure as the building is erected to reduce noise emission from the site.
- Require the general contractor to line or cover hoppers, storage bins, and chutes with sound-deadening material (e.g., apply wood or rubber liners to metal bin impact surfaces).
- Unless safety provisions require otherwise, require the general contractor to adjust audible backup alarms downward in sound level while still maintaining an adequate signal-to-noise ratio for alarm

effectiveness. Consider signal persons, strobe lights, or alternative safety equipment and/or processes as allowed to reduce reliance on high-amplitude sonic alarms/beeps.

- Require the general contractor to place stationary noise sources, such as generators and air compressors, on the east side of the project site, as far away from nearby noise-sensitive receptors as possible. To further reduce noise, the contractor shall locate stationary equipment in pit areas or excavated areas, if feasible.
- Require the general contractor to place non-noise-producing mobile equipment, such as trailers, in the direct sound pathways between suspected major noise-producing sources and noise-sensitive receptors.
- Under the supervision of a qualified acoustical consultant, the project sponsor shall monitor the effectiveness of noise attenuation measures by taking noise measurements before any construction or ground disturbing activity and regularly during each phase of construction.
- Prior to the issuance of a building permit, along with the submission of construction documents, the project sponsor shall submit to the planning department and building department a list of measures that shall be implemented and that shall respond to and track complaints pertaining to construction noise. These measures shall include:

  (1) posted signs on-site pertaining to permitted construction days and hours;

  (2) a procedure and phone numbers for notifying the building department and the San Francisco Police Department (during regular construction hours and off-hours). This telephone number shall be maintained until the proposed project has been considered commissioned and is ready for occupancy. If the telephone is not staffed 24 hours per day, the contractor shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended;

  (3) a sign posted on site describing noise complaint procedures and a complaint hotline number that shall be answered at all times during construction;

  (4) designation of an on-site construction complaint and enforcement manager for the project who shall document, investigate, evaluate, and attempt to resolve all project-related noise complaints; and

  (5) notification of neighboring residents and non-residential building managers within 300 feet of the project construction area at least 30 days in advance of extreme noise generating activities (defined as activities generating anticipated noise levels of 90 dBA or greater, about the estimated duration of the activity.

Construction Vibration

During construction of the proposed project, equipment may be used directly adjacent to the nearest vibration sensitive receptors along Sixth Street. The project site is approximately 170 feet wide along its Jessie and Stevenson Street frontages and therefore equipment will often be operating at distances greater than directly adjacent to the closest sensitive receptors. Older and historic buildings can be damaged by excessive vibration associated with construction activities.

Sleep Disturbance from Vibration

As discussed above, nighttime construction work would be limited to five (5) total nights over the entire 36-month construction period. It is not anticipated that nighttime construction work would require vibration generating equipment. Therefore, construction activities are not expected to result in vibration during nighttime hours that would be perceptible and thereby result in sleep disturbance.

Building Damage Assessment

The properties nearest to the project site that are most susceptible to vibration are as follows:

- 35-37 Sixth Street, 39-41 Sixth Street, 43-45 Sixth Street, and 47-55 Sixth Street – Directly adjacent to the Project site. All of these buildings are historic resources according to the San Francisco Planning Department South of Market Historic Resource Survey Map[11] and the associated Primary Records[12]. These buildings are constructed of masonry or concrete clad in textured stucco and capped by a flat roof. Therefore, these buildings are assumed to be under the “Historic and Some Old Buildings” category as defined by Caltrans.

- 979-989 Market Street – Approximately ~~22’~~ 27’ from the Project site. This is a ~~non-~~historic building originally constructed in 1907. Based on observation and electronic visual references, this building is assumed to fall within the Caltrans building damage category of “Historic and Some Old” buildings.

- 973 Market Street – Approximately ~~22’~~ 27’ from the Project Site. ~~Non-~~A historic building~~, but~~ originally constructed in 1904. Based on observation and electronic visual references, this building is assumed to fall within the Caltrans building damage category of “Historic and Some Old Buildings”.

- Clearway Energy Thermal Power Station – Main Building and Smokestack Approximately 40’ from the Project Site. However, a portion of the main building extends toward the project site. For this reason, the analysis assumes the main building is directly adjacent to the project site. This site is a contributor to the California Register-eligible PG&E City Beautiful Substations Discontinuous Thematic Historic District. Based on observation and electronic visual references, the smokestack is assumed to be constructed with concrete and masonry with no plaster and would likely fall within the Caltrans building damage category of “Historic and Some Old” buildings.

- 481, 479, 477 Jessie Street – Approximately ~~40’~~ 38’ from Project Site. ~~Non h~~Historic buildings~~, but~~ originally constructed in 1922. Based on observation and electronic visual references, ~~these~~ this building~~s are~~ is assumed to fall within the Caltrans building damage category of “Historic and Some Old” buildings.

- 65-83 Sixth Street – Approximately ~~52’~~ 40’ from Project Site. ~~Non h~~Historic building~~, but~~ originally constructed in 1913. Based on observation and electronic visual references, ~~these~~this building~~s are~~ is assumed to fall within the Caltrans building damage category of “Historic and Some Old” buildings.

- 972-976 Mission – Approximately ~~42’~~ 38’ from Project Site. ~~Non h~~Historic building~~, but~~ originally constructed in 1925. Based on observation and electronic visual references, this building is assumed to fall within the Caltrans building damage category of “Historic and Some Old” buildings.

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[11] (https://sfplanning.org/resource/south-market-historic-resource-survey-map)
[12] https://sfgov.org/sfplanningarchive/ftp/files/GIS/SouthSoMa/Docs/3704%20051.pdf

- 968 Mission Street – Approximately ~~42'~~ 38' from Project Site. ~~Non h~~Historic building~~, but~~ originally constructed in 1930. Based on observation and electronic visual references, this building is assumed to fall within the Caltrans building damage category of "Historic and Some Old" buildings.

- 471 Jessie Street – Approximately ~~42'~~ 38' from Project Site. ~~Non h~~Historic building~~, but~~ originally constructed in 1912. Based on observation and electronic visual references, this building is assumed to fall within the Caltrans building damage category of "Historic and Some Old" buildings.

- 956-960 Mission Street – Approximately 51' from Project Site. ~~Non h~~Historic building~~, but~~ originally constructed in 1910. Based on observation and electronic visual references, this building is assumed to fall within the Caltrans building damage category of "Historic and Some Old" buildings.

- 995 Market / 1 Sixth Street – Approximately 38' from Project Site. ~~Non h~~Historic building~~, but~~ originally constructed in 1908. Based on observation and electronic visual references, this building is assumed to fall within the Caltrans building damage category of "Historic and Some Old" buildings.

Table 14 estimates the vibration levels at various distances from ~~the nearest receptors to the project site generated by~~ construction equipment that is expected to produce groundborne vibration. As stated previously in this memo, vibration levels are determined using the following formula, PPV = PPVref x $(25/\text{Distance})^{1.5}$, where PPVref is as listed in Table 3.

Table 14: Vibration Source Levels for Construction Equipment

Equipment	Estimated PPV at 1 Foot (Directly Adjacent to Property)	Estimated PPV at 5 Feet	Estimated PPV at 10 Feet	Estimated PPV at 25 Feet	Estimated PPV at 40 Feet
Large Bulldozer[1]	11.125	0.995	0.352	0.089	0.044
Caisson Drilling[2]	11.125	0.995	0.352	0.089	0.044
Hoe Ram	11.125	0.995	0.352	0.089	0.044
Jackhammer	4.375	0.391	0.138	0.035	0.017
Loaded Trucks	9.500	0.850	0.300	0.076	0.038
Small Bulldozer	0.375	0.034	0.012	0.003	0.002

Source: Federal Transit Administration 2018
Notes:
1. Used to approximate vibration from a large tractor, backhoe, and loader for this project
2. Used to approximate vibration from a drill rig for this project.

Table 15 shows the expected vibration levels at the neighboring buildings from construction activity related to the estimated Caltrans Construction Vibration Damage Criteria:

Table 15: Expected Construction Vibration Levels at Closest Properties Related to Caltrans Criteria

Vibration-Sensitive Buildings	Caltrans Building Damage Criteria	Distance between Vibration Sensitive Building and Project Site	Calculated Maximum PPV at Property	Exceeds Criteria?
35-37 Sixth Street	0.25	~~20 feet~~ 1 foot (Directly Adjacent)	~~0.124~~ 11.125	~~No~~ Yes
39-41 Sixth Street	0.25	~~20 feet~~ 1 foot (Directly Adjacent)	~~0.124~~ 11.125	~~No~~ Yes
43-45 Sixth Street	0.25	~~20 feet~~ 1 foot (Directly Adjacent)	~~0.124~~ 11.125	~~No~~ Yes
47-~~51~~55 Sixth Street	0.25	~~20 feet~~ 1 foot (Directly Adjacent)	~~0.124~~ 11.125	~~No~~ Yes
~~53-55 Sixth Street~~	~~0.25~~	~~20 feet~~	~~0.124~~	~~No~~
65-83 Sixth Street	0.25	~~52~~ 40 feet	~~0.03~~ 0.04	No
Clearway Energy Thermal Power Station Main Building and Smoke Stack	0.25	Main Building - 1 foot (Directly Adjacent)/ Smoke Stack - 40 feet	11.125/ 0.04	Yes/ No
986 Mission Street / 481 Jessie Street	0.25	~~42~~ 38 feet	~~0.04~~ 0.05	No
972-976 Mission Street	0.25	~~42~~ 38 feet	~~0.04~~ 0.05	No
968 Mission Street	0.25	~~42~~ 38 feet	~~0.04~~ 0.05	No
471 Jessie Street	0.25	~~42~~ 38 feet	~~0.04~~ 0.05	No
956-960 Mission Street	0.25	51 feet	0.03	No
995 Market Street / 1 Sixth Street	0.25	38 feet	0.05	No
979-989 Market Street	0.25	~~22~~ 27 feet	~~0.11~~ 0.08	No
973 Market Street	0.25	~~22~~ 27 feet	~~0.11~~ 0.08	No
~~Clearway Energy Thermal Power Station~~	~~0.25~~	~~40 Feet~~	~~0.04~~	~~No~~
~~481 Jessie Street~~	~~0.25~~	~~42 feet~~	~~0.04~~	~~No~~
479 Jessie Street/ 982-984 Mission Street	0.25	~~42~~ 38 feet	~~0.04~~ 0.05	No
~~477 Jessie Street~~	~~0.25~~	~~42feet~~	~~0.04~~	~~No~~

As shown in Table 15, construction activities and equipment as proposed by the project sponsor ~~would not~~ may generate vibration levels that exceed the building damage criteria and could result in damage to the buildings adjacent to the project site, including 35-37 Sixth Street, 39-41 Sixth Street, 43-45 Sixth Street, 47-55 Sixth Street, and the Main Building at the Clearway Energy Thermal Power Station. The following standard construction best practices would reduce construction-related vibration to the neighboring properties:

Construction Vibration Standard Construction Best Practices

Prior to issuance of any demolition or building permit, the project sponsor shall submit a project-specific Pre-construction Survey and Vibration Management and Monitoring Plan to the Environmental Review Officer (ERO) or the ERO's designee for approval. The plan shall identify all feasible means to avoid damage to potentially affected buildings which includes all building and structures at 35-37 Sixth Street, 39-41 Sixth Street, 43-45 Sixth Street, 47- 55 Sixth Street, and the Main Building at the Clearway Energy Thermal Power Station. The project sponsor shall ensure the following requirements of the Pre-Construction Survey and Vibration Management and Monitoring Plan are included in contract specifications, as necessary.

Pre-construction Survey. Prior to the start of any ground-disturbing activity, the project sponsor shall engage a consultant to undertake a pre-construction survey of potentially affected structures at 35-37 Sixth Street, 39-41 Sixth Street, 43-45 Sixth Street, 47-55 Sixth Street, and the Main Building at the Clearway Energy Thermal Power Station. The project sponsor shall engage a qualified historic preservation professional and a structural engineer or other professional with similar qualifications to undertake a pre-construction survey of potentially affected historic buildings. The pre-construction survey shall include descriptions and photographs of all identified historic buildings at 35-37 Sixth Street, 39-41 Sixth Street, 43-45 Sixth Street, 47-55 Sixth Street and the Main Building at the Clearway Energy Thermal Power Station, including all facades, roofs, and details of the character-defining features that could be damaged during construction, and shall document existing damage, such as cracks and loose or damaged features (as allowed by property owners). The report shall also include pre-construction drawings that record the pre-construction condition of the buildings and identify cracks and other features to be monitored during construction. The qualified historic preservation professional shall be the lead author of the pre-construction survey. The pre-construction survey shall be submitted to the ERO for review and approval prior to the start of vibration-generating construction activity.

Vibration Management and Monitoring Plan. The project sponsor shall undertake a monitoring plan to avoid or reduce project-related construction vibration damage to all identified historic buildings at 35-37 Sixth Street, 39-41 Sixth Street, 43-45 Sixth Street, 47-55 Sixth Street, and the Main Building at the Clearway Energy Thermal Power Station and to ensure that any such damage is documented and repaired consistent with the secretary of the interior's standards. Prior to issuance of any demolition or building permit, the project sponsor shall submit the Plan to the ERO for review and approval.

The Vibration Management and Monitoring Plan shall include, at a minimum, the following components, as applicable:

- *Maximum Vibration Level*. Based on the anticipated construction and condition of the affected buildings and/or structures on adjacent properties, a qualified acoustical/vibration consultant in coordination with a structural engineer (or professional with similar qualifications) and a qualified historic preservation professional, shall establish a maximum vibration level that shall not be exceeded at each building/structure on adjacent properties, based on existing conditions, character-defining features, soil conditions, and anticipated construction practices (common standards are a peak particle velocity [PPV] of 0.25 inch per second for historic and some old buildings).

- *Vibration-Generating Equipment*. The plan shall identify all vibration-generating equipment to be used during construction (including, but not limited to site preparation, clearing, demolition, excavation, shoring, foundation installation, and building construction).

- *Alternative Construction Equipment and Techniques*. The plan shall identify potential alternative equipment and techniques that could be implemented if construction vibration levels are observed in excess of the established standard (e.g., smaller, lighter equipment could be used in some cases).

- *Construction Best Practices*. The plan shall incorporate construction best practices that outline all feasible means to protect and avoid damage to adjacent historical resources, including, but not necessarily limited to: identifying buffer distances to be maintained based on vibration levels and site constraints between the operation of vibration-generating construction equipment and the potentially affected building and/or structure to avoid damage to the extent possible; staging of equipment and materials and circulation plans that are incorporated into construction documents to minimize impacts to adjacent historical resources; and the installation of physical protection at the boundary of the project site where historical resources are directly adjacent.

- *Vibration Monitoring*. The plan shall identify the method and equipment for vibration monitoring to ensure that construction vibration levels do not exceed the established standards identified in the plan.

    - Should construction vibration levels be observed in excess of the standards established in the plan, the contractor(s) shall halt construction and put alternative construction techniques identified in the plan into practice, to the extent feasible.

    - The qualified historic preservation professional and structural engineer shall inspect each affected building and/or structure (as allowed by property owners) in the event the construction activities exceed the vibration levels identified in the plan.

    - The structural engineer and historic preservation professional shall submit monthly reports to the ERO during vibration-inducing activity periods that identify and summarize any vibration level exceedances and describe the actions taken to reduce vibration.

    - If vibration has damaged nearby buildings and/or structures, the historic preservation consultant shall immediately notify the ERO and prepare a damage report documenting the features of the building and/or structure that has been damaged.

    - Following incorporation of the alternative construction techniques and/or planning department review of the damage report, vibration monitoring shall recommence to ensure that vibration levels at each affected building and/or structure on adjacent properties are not exceeded.

- *Periodic Inspections*. The plan shall identify the intervals and parties responsible for periodic inspections. The qualified historic preservation professional and structural engineer shall conduct regular periodic inspections of each affected building and/or structure on adjacent properties (as allowed by property owners) during vibration-generating construction activity on the project site. The plan will specify how often inspections shall occur.

- *Repair Damage*. The plan shall also identify provisions to be followed should damage to any building and/or structure occur due to construction-related vibration. The building(s) and/or structure(s) shall be remediated to their pre-construction condition (as allowed by property owners) at the conclusion of vibration-generating activity on the site consistent with the Secretary of the Interior's Standards in consultation with the qualified historic preservation professional and planning department preservation staff.

Vibration Monitoring Results Report. After construction is complete the project sponsor shall submit to the ERO a final report from the qualified historic preservation professional and structural engineer. The report shall include, at a minimum, collected monitoring records, building and/or structure condition summaries, descriptions of all instances of vibration level exceedance, identification of damage incurred due to vibration, and corrective actions taken to restore damaged buildings and structures. The ERO shall review and approve the Vibration Monitoring Results Report.

Cumulative Noise

There are currently 17 cumulative projects in proximity to the proposed project. One of these projects are transportation network projects (Better Market Street Project) and the rest are development projects. Thirteen of these cumulative projects are within 0.25 mile (1,320 feet) of the 469 Stevenson project site such that their construction and operational noise would have the potential to combine with the project's construction and operational noise at the nearest sensitive receptor locations. These projects include the following:

- 1025 Howard Street (Howard and Sixth Streets)
- 1055 Market Street (Between Sixth and Seventh Streets)
- 1082 Howard Street (Between Sixth and Seventh Streets)
- 1088 Howard Street (Howard and Seventh Streets)
- 1125 Market Street (Between Seventh and Eighth Streets)
- 457-475 Minna Street (Between Fifth and Sixth Streets)
- 481-483 Tehama Street (Tehama and Sixth Streets)
- 527 Stevenson Street (Stevenson and Sixth Streets)
- 57 Taylor Street (Taylor and Market Streets)
- 921 Howard Street (Between Fifth and Sixth Streets)
- 984 Folsom Street (Folsom and Sixth Streets)
- 996 Mission Street (Between Fifth and Sixth Streets)
- Better Market Street (Market Street, between Octavia Boulevard to Steuart Street)

Construction Noise

Of these projects, the closest to the 469 Stevenson Street Project are the, the 996 Mission Street project, the Better Market Street project, and the 527 Stevenson Street project, being about, 145 feet, 246 feet, and 425 feet away from the project site, respectively. All other project sites are separated from the proposed project by an extended distance. All cumulative projects would have multiple existing buildings between them and the 469 Stevenson Street project site that would provide shielding of their construction to limit the noise which combines with the project construction noise, if they were to be constructed simultaneously. Also, construction at all the cumulative project sites would be subject to the same noise regulations as the proposed project, such as limiting construction hours and equipment noise levels. In addition, the noisiest phases of demolition, construction, excavation, and foundation installation, would be relatively brief and less likely to overlap than the less noisy phases of construction, such as interior work. However, given the large number of cumulative projects nearby and the potential for numerous projects to be under construction simultaneously as the proposed project, cumulative construction noise could be substantial by both increasing the intensity of noise levels in the area and the duration that sensitive receptors experience construction noise. The noise control measures identified above are recommended and would reduce the contribution of construction noise generated by the proposed project.

Construction Vibration

Vibration effects are highly localized, and vibration attenuates rapidly from the source. Therefore, vibration impacts attributable to construction activities generally would be limited to buildings and structures adjacent to the project site. ~~Since the proposed project would not result in vibration-related damage to adjacent structures during construction activities,~~ Because vibration effects are localized and attenuate rapidly with distance from the source, vibration-generating equipment from the proposed project would likely not combine with that of even the closest cumulative projects (~~996 Mission Street,~~ Better Market Street~~,~~ and ~~Sixth Street~~ ~~Improvement~~ Fifth Street Improvement projects) to result in cumulative vibration effects that would damage nearby buildings, including the historic district contributors that abut the project site.

Operational Noise

With respects to operational noise, the proposed project would include new fixed noise sources that would produce operational noise on the project site. Similar new fixed noise sources would produce noise for the cumulative development projects within a 0.25-mile radius of the project site, such as the 996 Mission Street and 527 Stevenson Street projects. This could result in a permanent increase in ambient noise above existing levels. However, noise from the proposed project's mechanical equipment and mechanical equipment from the cumulative projects would be localized, would attenuate with added distance, and would be required to comply with the noise regulations of the San Francisco Police Code. Therefore, the proposed project and cumulative projects would be unlikely to combine to increase ambient noise levels in the area.

Cumulative development projects would also result in operational noise from project-generated vehicular traffic. To estimate future cumulative noise levels due to traffic, peak hour cumulative plus project traffic estimates were used to determine the percent increase of traffic on the roads adjacent to the project site. Due to expected changes in traffic patterns and vehicle restrictions from the Better Market Street Project along Market Street and the Sixth Street Pedestrian Safety Project, the 469 Stevenson Street project plus cumulative projects would actually reduce future peak hour traffic volumes and associated traffic noise along Market Street and Sixth Street. Table 16 shows the existing and cumulative future peak hour traffic volume on the local roadway network. The last columns in the table show the overall percent change and the estimated difference in peak hour noise level.

Table 16: Cumulative Peak HourTraffic Volumes and Estimated Noise Increase

Roadway	Existing Peak Hour Traffic Count	Cumulative Peak Hour Traffic Volumes with Project	Percent Change	Estimated dB(A) Change
Market Street	580	400	-31%	-1.2 dB(A)
Sixth Street	1,844	1,561	-15%	-0.6 dB(A)
Stevenson Street	108	244	126%	Less than 1 dB(A)
Fifth Street	1,402	2,448	75%	3 dB(A)

Peak traffic is expected to increase approximately 125 percent along Stevenson Street between Fifth Street and Sixth Street with the cumulative projects plus the proposed project. Even though the traffic on Stevenson Street is expected to increase by 125 percent, the overall peak hour traffic number is still very low. Cumulative plus project peak hour traffic volumes on Stevenson Street are only expected to be 244 cars. Traffic volumes this low is not expected to generate a great deal of noise and ambient noise levels at the site would still be dominated by the existing noise sources. The estimated change in ambient noise levels along Stevenson Street is estimated to be below 1 dB(A).

Cumulative plus project peak traffic volumes along Fifth Street between Stevenson Street and Market Street are expected to increase by 75 percent. Traffic increases of 75 percent only increase noise levels approximately 3 dB(A). The project would contribute 28 vehicle trips to Fifth Street under cumulative conditions, which represents a minor proportion of the overall cumulative traffic volume on that segment of Fifth Street.

CONCLUSION

Noise generation associated with the proposed project is typically attributed to the project construction activities. These include site grading, construction of the building and apparatuses, and the increase traffic related to facility use. Operational noise generation can be attributed to the slight increase in traffic volumes from residents as well as from typical commercial and residential fixed mechanical equipment.

Based on the FHWA RCNM, the proposed project can generate high levels of construction noise which are temporary and would not result in long-term noise increases from construction. While the noise levels presented are a “worst-case” scenario and may at times be audible over traffic-related noise levels surrounding the area, these high levels are not expected to be continuous. Moreover, the highest noise levels would occur only during the hours allowed by the San Francisco Police Code and should be reduced by the application of measures to control construction noise at the project site. Noise control techniques should be implemented to ensure that noise generated from temporary construction activities would not be substantial at nearby sensitive receptors.

Stantec Consulting Services Inc.

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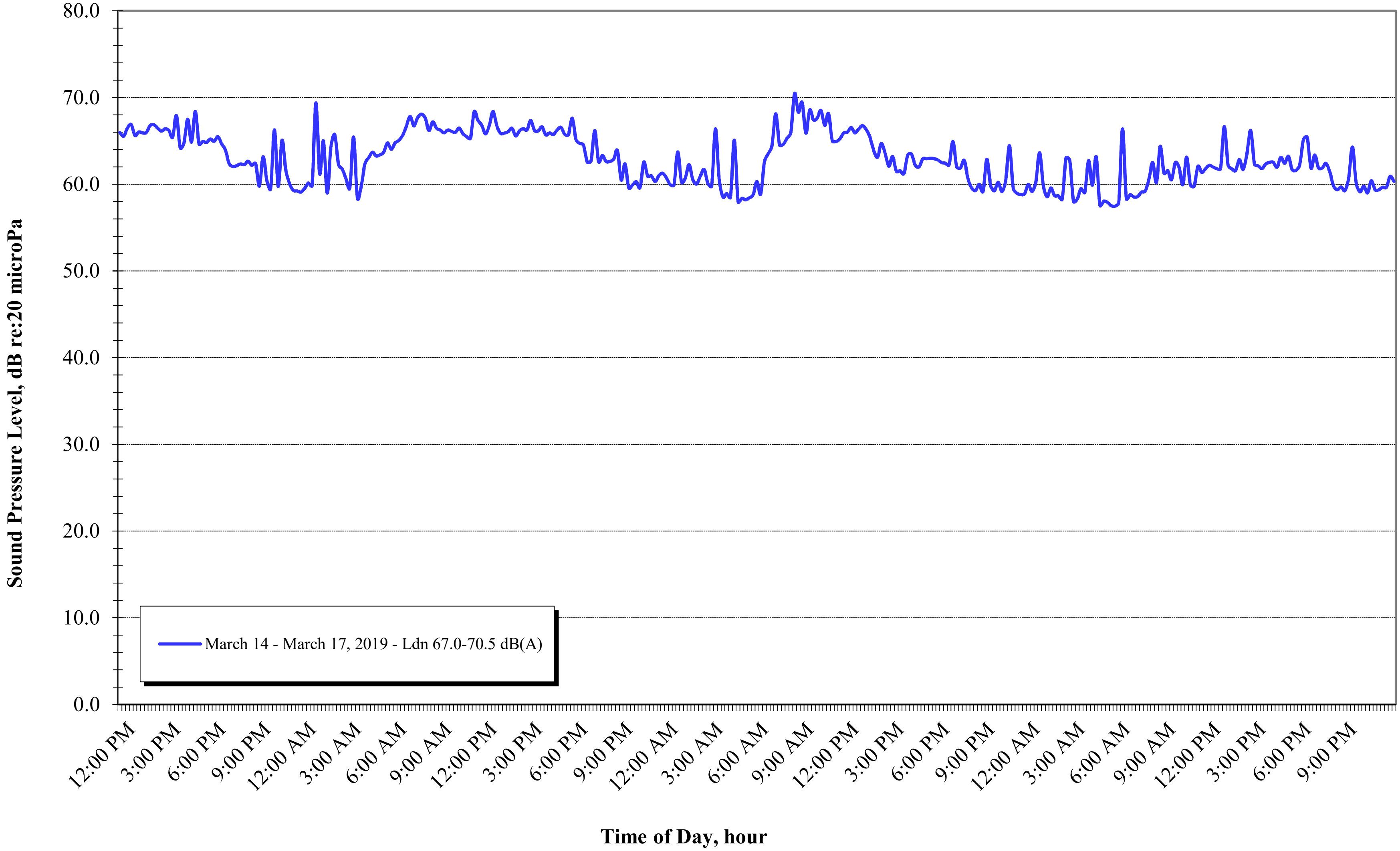
APPENDIX 1: Measured Hourly Ambient Noise Levels at Project Site

469 Stevenson Street - San Francisco, CA

15-Minute Noise Levels (Leq) at Long Term Measurement Location

Ambient Noise Levels - Thursday, March 14 - Sunday, March 17, 2019



APPENDIX 2: Noise and Vibration-Sensitive Receivers Within 300-ft of Project Site

\\Us1304-f02\workgroup\1857\active\185704245\03_data\gis\mxd\fig_20_noise_receptors.mxd Revised: 2019-09-30 By: kaejohnson

1. The Wilson Apartments at 973 Market Street
2. Hampton Inn San Francisco Downtown
3. Desmond Hotel
4. Seneca Hotel
5. Haveli Hotel
6. The Whitaker Hotel
7. The Hillside Hotel
8. Oak Tree Hotel
9. Winsor Hotel
10. Residential Above 87-89 Sixth Street
11. 460 Jessie Street
12. 65-83 Sixth Street
13. 986 Mission Street/481 Jessie Street
14. 980-984 Mission Street/479 Jessie Street
15. 972- 976 Mission Street
16. 968 Mission Street
17. 471 Jessie Street
18. 956-960 Mission Street
19. 955 Market Street/ 1 Sixth Street
20. 979-989 Market Street

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

469 Stevenson Street Project

Case No. 2017-014833ENV.

Noise- and Vibration-Sensitive Receptors within 300 feet of Project Site

APPENDIX 3: Peak Hour Traffic Count Noise Calculation Results

469 Stevenson
Traffic Counts
27-Sep-19

Market between 5th and 6th

PM Peak without Project	PM Peak with Project	Estimated dB Increase
580	580	
580	580	
	0%	0

6th between Stevenson and Market

PM Peak without Project	PM Peak with Project	Estimated dB Increase
1844	1859	
1844	1859	
	1%	0.0

Stevenson Street between 6th and 5th

PM Peak without Project	PM Peak with Project	Estimated dB Increase
108	152	
108	152	
	41%	1.6

5th Street between Stevenson and Market

PM Peak without Project	PM Peak with Project	Estimated dB Increase
1402	1430	
1402	1430	
	2%	0.08

1180 Main Street
Cumulative Traffic Counts
27-Sep-19

Market between 5th and 6th

PM Peak without Project	Cumulative PM Peak with Project	Estimated dB Increase
580	400	
580	400	
	-31%	-1.24

6th between Stevenson and Market

PM Peak without Project	Cumulative PM Peak with Project	Estimated dB Increase
1844	1561	
1844	1561	
	-15%	-0.6

Stevenson Street between 6th and 5th

PM Peak without Project	Cumulative PM Peak with Project	Estimated dB Increase
108	244	
108	244	
	126%	5.04

5th Street between Stevenson and Market

PM Peak without Project	Cumulative PM Peak with Project	Estimated dB Increase
1402	2448	
1402	2448	
	75%	3

APPENDIX 4: Property Plane and Interior Residential Calculation Results

Project Name:	469 Stevenson	**Tag:**	Rooftop Mechanical	**Created by:**	TJF	**Date:**	7/26/2019
Proj. Num:	185704245	**Area Served:**	--			**Revised:**	
Phase:	--	**Run:**	Estimated Exterior Noise to 6th Street Property Plane			**Revised:**	
Mech Set Date:	--	**Notes:**	Property Plane is 57'-10" From Equipment Area			**Revised:**	
			Noise levels used in analysis are 75 dB(A) Lp at 50 ft from the equipment.				

Tag	Side	Type	Size	CFM	SP	MANF	Side	dBA	63	125	250	500	1000	2000	4000	8000
Estimated Rooftop Eq.	--	--	--	--	--	--	Outside	75	79	72	71	72	70	68	63	54

Barrier Attenuation, POINT SOURCE - HARRIS (Acoustical Measurements and Noise Control, p. 3.19)
Does not include distance attenuation

$A_{bar} = 10*\log(3+10NK)-A_{ground}$

Elevation of Source	272.4	**Path-Length (DIRECT), r_d**	57.8
Source-to-Barrier	27.4	**Path-Length (BARRIER), r_b**	57.8
Top of Barrier	273.3	**Path-Length Difference, r_b - r_d = d_{diff}**	0.0 (NO OBSTRUCTION)
Barrier-to-Receiver	30.4		
Elevation of Receiver	274.5		

Hz	63	125	250	500	1000	2000	4000	8000
Wave, λ	17.89	9.02	4.51	2.25	1.13	0.56	0.28	0.14
Fresnel No. — **$(2/\lambda)(d_{diff}) = N$**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ground Atten. — **A_{ground}**	0	0	0	0	0	0	0	0
>>	0	0	0	0	0	0	0	0

Distance, POINT SOURCE
Lp1-Lp2 (in far field & free field)

Q2	R1(ft)	R2(ft)	
2	50'	58'	Lp1-Lp2 = -10*LOG(Q)+20*LOG(R2/R1)

	63	125	250	500	1000	2000	4000	8000
>>	-2	-2	-2	-2	-2	-2	-2	-2

1. Predicted Lp:		dBA	76.7	81	74	73	74	72	70	65	56
2. Design Criteria:	dB(A) 60.0									

Project Name:	469 Stevenson	**Tag:**	Rooftop Mechanical	**Created by:**	TJF	**Date:**	7/26/2019
Proj. Num:	185704245	**Area Served:**	--			**Revised:**	
Phase:	--	**Run:**	Estimated Exterior Noise to 5th Street Property Plane			**Revised:**	
Mech Set Date:	--	**Notes:**	Property Plane is 66'-1" From Equipment Area			**Revised:**	
			Noise levels used in analysis are 75 dB(A) Lp at 50 ft from the equipment.				

Tag	Side	Type	Size	CFM	SP	MANF	Side	dBA	63	125	250	500	1000	2000	4000	8000
Estimated Rooftop Eq.		--	--	--	--	--	Outside	75	79	72	71	72	70	68	63	54

Barrier Attenuation, POINT SOURCE - HARRIS (Acoustical Measurements and Noise Control, p. 3.19)

Does not include distance attenuation

$A_{bar} = 10*\log(3+10NK)-A_{ground}$

Elevation of Source	272.4	**Path-Length (DIRECT), r_d**	66.1
Source-to-Barrier	28.0	**Path-Length (BARRIER), r_b**	66.1
Top of Barrier	273.3	**Path-Length Difference, $r_b - r_d = d_{diff}$**	0.0 (NO OBSTRUCTION)
Barrier-to-Receiver	38.1		
Elevation of Receiver	274.5		

Hz	63	125	250	500	1000	2000	4000	8000
Wave, λ	17.89	9.02	4.51	2.25	1.13	0.56	0.28	0.14
Fresnel No. $(2/\lambda)(d_{diff}) = N$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ground Atten. A_{ground}	0	0	0	0	0	0	0	0

\>> 0 0 0 0 0 0 0 0

Distance, POINT SOURCE

Lp1-Lp2 (in far field & free field)

Q2	R1(ft)	R2(ft)	Lp1-Lp2 = -10*LOG(Q)+20*LOG(R2/R1)
2	50'	66'	

\>> -1 -1 -1 -1 -1 -1 -1 -1

1. Predicted Lp:		dBA	**75.5**	80	73	72	73	71	69	64	55
2. Design Criteria:	dB(A) 62.5									

Project Name:	469 Stevenson	**Tag:**	Rooftop Mechanical	**Created by:** TJF	**Date:**	7/26/2019
Proj. Num:	185704245	**Area Served:**	--		**Revised:**	
Phase:	--	**Run:**	Estimated Exterior Noise to Stevenson Street Property Plane		**Revised:**	
Mech Set Date:	--	**Notes:**	Property Plane is 77'-0" From Equipment Area		**Revised:**	
			Noise levels used in analysis are 75 dB(A) Lp at 50 ft from the equipment.			

Tag	Side	Type	Size	CFM	SP	MANF	Side	dBA	63	125	250	500	1000	2000	4000	8000
Estimated Rooftop Eq.	--	--	--	--	--	--	Outside	75	79	72	71	72	70	68	63	54

Barrier Attenuation, POINT SOURCE - HARRIS (Acoustical Measurements and Noise Control, p. 3.19)

Does not include distance attenuation

$A_{bar} = 10*\log(3+10NK)-A_{ground}$

Elevation of Source	272.4	**Path-Length (DIRECT), r_d**	77.0
Source-to-Barrier	27.0	**Path-Length (BARRIER), r_b**	77.0
Top of Barrier	273.3	**Path-Length Difference, $r_b - r_d = d_{diff}$**	0.0 (NO OBSTRUCTION)
Barrier-to-Receiver	50.0		
Elevation of Receiver	275.0		

Hz	63	125	250	500	1000	2000	4000	8000
Wave, λ	17.89	9.02	4.51	2.25	1.13	0.56	0.28	0.14
Fresnel No. $(2/\lambda)(d_{diff}) = N$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ground Atten. A_{ground}	0	0	0	0	0	0	0	0

	63	125	250	500	1000	2000	4000	8000
>>	0	0	0	0	0	0	0	0

Distance, POINT SOURCE

Lp1-Lp2 (in far field & free field)

Q2	R1(ft)	R2(ft)	Lp1-Lp2 = -10*LOG(Q)+20*LOG(R2/R1)
2	50'	77'	

	63	125	250	500	1000	2000	4000	8000
>>	1	1	1	1	1	1	1	1

			dBA	63	125	250	500	1000	2000	4000	8000
1. Predicted Lp:			74.2	78	71	70	71	69	67	62	53
2. Design Criteria:	dB(A)	62.5									

Project Name:	469 Stevenson	**Tag:**	Rooftop Mechanical	**Created by:**	TJF	**Date:**	7/26/2019
Proj. Num:	185704245	**Area Served:**	--			**Revised:**	
Phase:	--	**Run:**	Estimated Exterior Noise to Jessie Street Property Plane			**Revised:**	
Mech Set Date:	--	**Notes:**	Property Plane is 37'-0" From Equipment Area			**Revised:**	
			Noise levels used in analysis are 75 dB(A) Lp at 50 ft from the equipment.				

Tag	Side	Type	Size	CFM	SP	MANF	Side	dBA	63	125	250	500	1000	2000	4000	8000
Estimated Rooftop Eq.		--	--	--	--	--	Outside	75	79	72	71	72	70	68	63	54

Barrier Attenuation, POINT SOURCE - HARRIS (Acoustical Measurements and Noise Control, p. 3.19)

Does not include distance attenuation

$A_{bar} = 10*\log(3+10NK)-A_{ground}$

Elevation of Source	272.4	**Path-Length (DIRECT), r_d**	37.0
Source-to-Barrier	27.0	**Path-Length (BARRIER), r_b**	37.0
Top of Barrier	273.3	**Path-Length Difference, $r_b - r_d = d_{diff}$**	0.0 (NO OBSTRUCTION)
Barrier-to-Receiver	10.0		
Elevation of Receiver	274.0		

Hz	63	125	250	500	1000	2000	4000	8000
Wave, λ	17.89	9.02	4.51	2.25	1.13	0.56	0.28	0.14
Fresnel No. $(2/\lambda)(d_{diff}) = N$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ground Atten. A_{ground}	0	0	0	0	0	0	0	0

	63	125	250	500	1000	2000	4000	8000
>>	0	0	0	0	0	0	0	0

Distance, POINT SOURCE

Lp1-Lp2 (in far field & free field)

Q2	R1(ft)	R2(ft)	
2	50'	37'	Lp1-Lp2 = -10*LOG(Q)+20*LOG(R2/R1)

	63	125	250	500	1000	2000	4000	8000
>>	-6	-6	-6	-6	-6	-6	-6	-6

		dBA	63	125	250	500	1000	2000	4000	8000
1. Predicted Lp:		80.5	85	78	77	78	76	74	69	60
2. Design Criteria:	dB(A) 60.0									

Project Name:	469 Stevenson	**Tag:**	Rooftop Mechanical	**Created by:**	TJF	**Date:**	7/26/2019
Proj. Num:	185704245	**Area Served:**	--			**Revised:**	
Phase:	--	**Run:**	Estimated Exterior Noise to 47 6th Street Residential			**Revised:**	
Mech Set Date:	--	**Notes:**	Property Plane is 57'-10" From Equipment Area			**Revised:**	
			Noise levels used in analysis are 75 dB(A) Lp at 50 ft from the equipment.				
			Equipment is at 272.4' elevation, Receiver is at 85' elevation.				

Tag	Side	Type	Size	CFM	SP	MANF	Side	dBA	63	125	250	500	1000	2000	4000	8000
Estimated Rooftop Eq.		--	--	--	--	--	Outside	75	79	72	71	72	70	68	63	54

Barrier Attenuation, POINT SOURCE - HARRIS (Acoustical Measurements and Noise Control, p. 3.19)

Does not include distance attenuation

$A_{bar} = 10*\log(3+10NK)-A_{ground}$

Elevation of Source	272.4	**Path-Length (DIRECT), r_d**	196.1
Source-to-Barrier	27.4	**Path-Length (BARRIER), r_b**	218.1
Top of Barrier	273.3	**Path-Length Difference, $r_b - r_d = d_{diff}$**	22.0
Barrier-to-Receiver	30.4		
Elevation of Receiver	85.0		

Hz	63	125	250	500	1000	2000	4000	8000
Wave, λ	17.89	9.02	4.51	2.25	1.13	0.56	0.28	0.14
Fresnel No. $(2/\lambda)(d_{diff}) = N$	2.46	4.88	9.76	19.51	39.03	78.05	156.10	312.20
Ground Atten. A_{ground}	0	0	0	0	0	0	0	0

	63	125	250	500	1000	2000	4000	8000
>>	14	17	20	23	26	29	32	35

Distance, POINT SOURCE

Lp1-Lp2 (in far field & free field)

Q2	R1(ft)	R2(ft)	Lp1-Lp2 = -10*LOG(Q)+20*LOG(R2/R1)
2	50'	196'	

	63	125	250	500	1000	2000	4000	8000
>>	9	9	9	9	9	9	9	9

		dBA	63	125	250	500	1000	2000	4000	8000
1. Predicted Lp:		41.5	56	46	42	40	35	30	22	10
2. Design Criteria:	dB(A) 45.0									

Project Name:	469 Stevenson	**Tag:**	Rooftop Mechanical	**Created by:**	TJF	**Date:**	7/26/2019
Proj. Num:	185704245	**Area Served:**	--			**Revised:**	
Phase:	--	**Run:**	Estimated Exterior Noise to 973 Market Residential			**Revised:**	
Mech Set Date:	--	**Notes:**	Property Plane is 77'-0" From Equipment Area			**Revised:**	
			Noise levels used in analysis are 75 dB(A) Lp at 50 ft from the equipment.				
			Equipment is at 272.4' elevation, Receiver is at 101' elevation.				

Tag	Side	Type	Size	CFM	SP	MANF	Side	dBA	63	125	250	500	1000	2000	4000	8000
Estimated Rooftop Eq.	--		--	--	--	--	Outside	75	79	72	71	72	70	68	63	54

Barrier Attenuation, POINT SOURCE - HARRIS (Acoustical Measurements and Noise Control, p. 3.19)
Does not include distance attenuation

$A_{bar} = 10*\log(3+10NK)-A_{ground}$

Elevation of Source	272.4	**Path-Length (DIRECT), r_d**	192.2
Source-to-Barrier	27.0	**Path-Length (BARRIER), r_b**	209.4
Top of Barrier	273.3	**Path-Length Difference, $r_b - r_d = d_{diff}$**	17.2
Barrier-to-Receiver	60.0		
Elevation of Receiver	101.0		

Hz	63	125	250	500	1000	2000	4000	8000
Wave, λ	17.89	9.02	4.51	2.25	1.13	0.56	0.28	0.14
Fresnel No. $(2/\lambda)(d_{diff}) = N$	1.92	3.82	7.63	15.26	30.52	61.04	122.08	244.16
Ground Atten. A_{ground}	0	0	0	0	0	0	0	0

	63	125	250	500	1000	2000	4000	8000
>>	13	16	19	22	25	28	31	34

Distance, POINT SOURCE
Lp1-Lp2 (in far field & free field)

Q2	R1(ft)	R2(ft)	Lp1-Lp2 = -10*LOG(Q)+20*LOG(R2/R1)
2	50'	192'	

	63	125	250	500	1000	2000	4000	8000
>>	9	9	9	9	9	9	9	9

1. Predicted Lp:			dBA	42.7	57	47	43	41	36	31	23	11
2. Design Criteria:	dB(A)	45									

APPENDIX 5: Roadway Construction Noise Model Output Results

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/19/2019
Case Description: 469 Stevenson Construction Noise - Site Preparation / Demolition

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
43 6th Street	Residential	66.2	61.7	62.2

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dump Truck	No	40		76.5	20	0
Dump Truck	No	40		76.5	20	0
Excavator	No	40		80.7	20	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Dump Truck		84.4	80.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck		84.4	80.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator		88.7	84.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	91.1	87.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/26/2022
Case Description: 469 Stevenson Construction Noise - Excavation and Shoring

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
43 6th Street	Residential	66.2	61.7	62.2

Equipment

Description		Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Drill Rig Truck		No	20		79.1	20	0
Dump Truck		No	40		76.5	20	0
Excavator		No	40		80.7	20	0
Front End Loader	(Steer Skid Loader)	No	40		79.1	20	0
Backhoe		No	40		77.6	20	0
Man Lift	(Aerial Lift)	No	20		74.7	20	0
Dump Truck		No	40		76.5	20	0
Dump Truck		No	40		76.5	20	0
Jackhammer		Yes	20		88.9	20	0
Mounted Impact Hammer (hoe ram)		Yes	20		90.3	20	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Drill Rig Truck		87.1	80.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck		84.4	80.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator		88.7	84.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	(Steer Skid Loader)	87.1	83.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Backhoe		85.5	81.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	(Aerial Lift)	82.7	75.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck		84.4	80.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck		84.4	80.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Jackhammer		96.8	89.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mounted Impact Hammer (hoe ram)		98.2	91.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	**101.6**	**95.3**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/19/2019
Case Description: 469 Stevenson Construction Noise - Foundation and Below Grade Construction

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
43 6th Street	Residential	66.2	61.7	62.2

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Pump Truck	No	20		81.4	20	0
Man Lift	No	20		74.7	20	0
Dump Truck	No	40		76.5	20	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Pump Truck		89.4	82.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift		82.7	75.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck		84.4	80.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	91.2	85	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/19/2019
Case Description: 469 Stevenson Construction Noise - Building Constructior

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
43 6th Street	Residential	66.2	61.7	62.2

Description		Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Man Lift	(Aerial Lift)	No	20		74.7	20	0
Crane		No	16		80.6	20	0
Tractor	(Forklift)	No	40	84		20	0
Tractor	(Rough Terrain Forklift)	No	40	84		20	0
Welder / Torch		No	40		74	20	0
Concrete Saw		No	20		89.6	20	0
Concrete Saw		No	20		89.6	20	0
Dump Truck		No	40		76.5	20	0
Man Lift		No	20		74.7	20	0
Man Lift	(Scissor Lift)	No	20		74.7	20	0
Man Lift	(Scissor Lift)	No	20		74.7	20	0
Man Lift	(Scissor Lift)	No	20		74.7	20	0
Welder / Torch		No	40		74	20	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Man Lift	(Aerial Lift)	82.7	75.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane		88.5	80.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	(Forklift)	92	88	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	(Rough Terrain Forklift)	92	88	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch		82	78	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw		97.5	90.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw		97.5	90.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck		84.4	80.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift		82.7	75.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	(Scissor Lift)	82.7	75.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	(Scissor Lift)	82.7	75.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	(Scissor Lift)	82.7	75.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch		82	78	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	102.2	96.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/19/2019
Case Description: 469 Stevenson Construction Noise - Exterior Finishing

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
43 6th Street	Residential	66.2	61.7	62.2

Description		Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)		No	40		77.7	20	0
Tractor	(Forklift)	No	40	84		20	0
Man Lift		No	20		74.7	20	0
Welder / Torch		No	40		74	20	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)		85.6	81.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	(Forklift)	92	88	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift		82.7	75.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch		82	78	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	93.6	89.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 8/19/2019
Case Description: 469 Stevenson Construction Noise - Sitework / Paving

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
43 6th Street	Residential	66.2	61.7	62.2

Description		Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck		No	40		78.8	20	0
Paver		No	50		77.2	20	0
Paver	(Paving Equipment)	No	50		77.2	20	0
Compressor (air)	(Pressure Washer)	No	40		77.7	20	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck		86.8	82.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver		85.2	82.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver	(Paving Equipment)	85.2	82.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Compressor (air)	(Pressure Washer)	85.6	81.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	91.8	88.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A