NOISE AND VIBRATION IMPACT ANALYSIS

RIALTO & LINDEN INDUSTRIAL WAREHOUSE PROJECT

RIALTO, CALIFORNIA

August 2024

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August 2024

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LIST OF ABBREVIATIONS AND ACRONYMS

ADA	Americans with Disability Act
CEQA	California Environmental Quality Act
City	City of Rialto
CNEL	Community Noise Equivalent Level
County	County of San Bernardino
dB	decibel(s)
dBA	A-weighted decibel(s)
EPA	United States Environmental Protection Agency
ft	foot/feet
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FTA Manual	FTA's 2018 *Transit Noise and Vibration Impact Assessment Manual*
HVAC	heating, ventilation, and air conditioning
in/sec	inches per second
L_{dn}	day-night average noise level
L_{eq}	equivalent continuous sound level
L_{max}	maximum instantaneous sound level
Noise Element	City of Rialto General Plan Noise Element
Noise Ordinance	City of Rialto Municipal Code Noise Ordinance
PPV	peak particle velocity
project	Rialto & Linden Industrial Warehouse Project
RMS	root-mean-square
SBD Airport	San Bernardino International Airport
SPL	sound pressure level
sq ft	square foot/feet
VdB	vibration velocity decibels

INTRODUCTION

This noise and vibration impact analysis has been prepared to evaluate the potential noise and vibration impacts and reduction measures associated with the Rialto & Linden Warehouse Project (project) in Rialto, California. This report is intended to satisfy the City of Rialto (City) requirements for a project-specific noise and vibration impact analysis by examining the impacts of the project site and evaluating noise reduction measures that the project may require.

PROJECT LOCATION AND DESCRIPTION

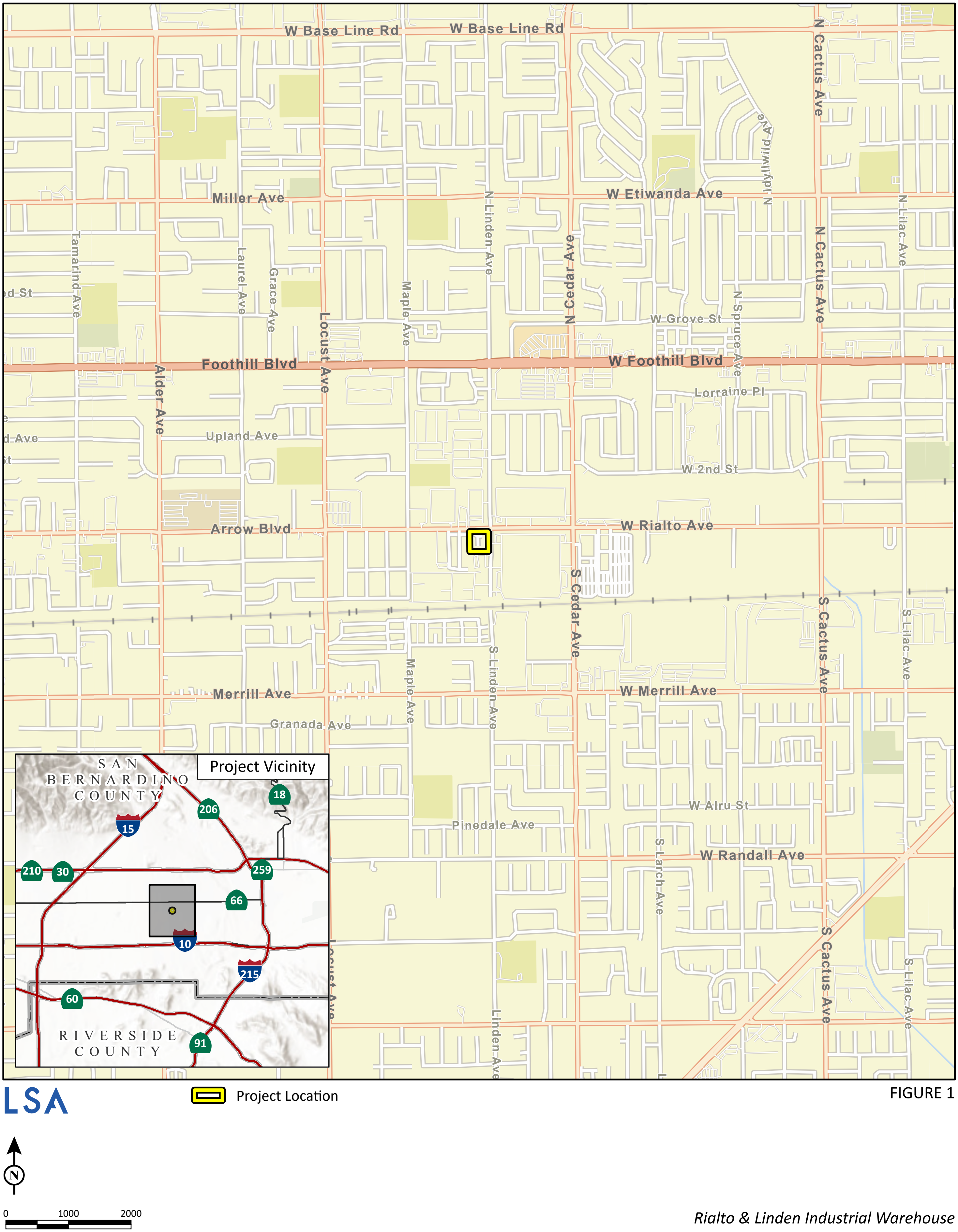
The project site is surrounded by existing residences to the north and west, mixed commercial uses to the east, and industrial uses to the south. The proposed project involves the construction of a two-story, 42,000-square-foot industrial warehouse that includes 4,000 square feet of office space and associated paving (35,602 square feet) and landscaping (17,062 square feet on-site and 3,072 square feet off-site). The first floor of the proposed building would include 38,000 square feet of industrial/warehouse space and 2,000 square feet of office space. An additional 2,000 square feet of office space would occupy the second floor of the proposed building. Thirty-six (36) parking spaces are proposed including 2 Americans with Disability Act (ADA) compliant spaces and 4 electric vehicle (EV) spaces.

EXISTING LAND USES IN THE PROJECT AREA

The project site is primarily surrounded by existing industrial and residential uses. See Figures 1 and 2, below. The areas adjacent to the project site include the following uses:

- **North:** Existing residential uses opposite West Rialto Avenue.
- **East:** Existing industrial uses.
- **South:** Existing industrial uses.
- **West:** Existing residential uses.

The nearest sensitive receptors are the existing multifamily residences adjacent to the western project boundary.



LSA

FIGURE 1

SOURCE: Esri Street Map 2024

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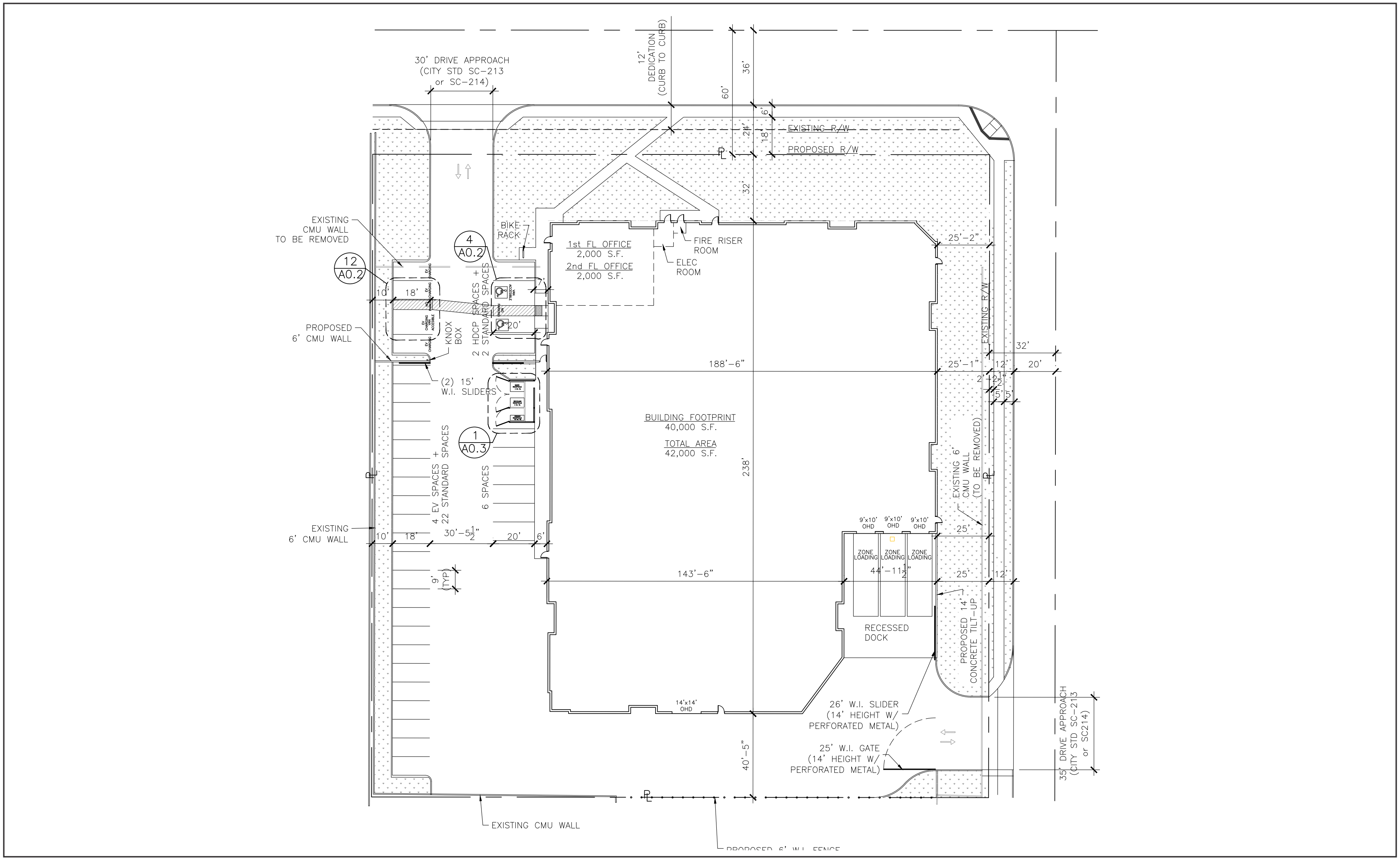
Rialto & Linden Industrial Warehouse

Project Location



LSA

FIGURE 2

SOURCE: Van Dam Engineering

Rialto & Linden Industrial Warehouse

Site Plan

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NOISE AND VIBRATION FUNDAMENTALS

CHARACTERISTICS OF SOUND

Noise is usually defined as unwanted sound. Noise consists of any sound that may produce physiological or psychological damage and/or interfere with communication, work, rest, recreation, and sleep.

To the human ear, sound has two significant characteristics: pitch and loudness. Pitch is generally an annoyance, while loudness can affect the ability to hear. Pitch is the number of complete vibrations, or cycles per second, of a sound wave, which results in the tone's range from high to low. Loudness is the strength of a sound, and it describes a noisy or quiet environment; it is measured by the amplitude of the sound wave. Loudness is determined by the intensity of the sound waves combined with the reception characteristics of the human ear. Sound intensity is the average rate of sound energy transmitted through a unit area perpendicular to the direction in which the sound waves are traveling. This characteristic of sound can be precisely measured with instruments. The analysis of a project defines the noise environment of the project area in terms of sound intensity and its effect on adjacent sensitive land uses.

MEASUREMENT OF SOUND

Sound intensity is measured with the A-weighted decibel (dBA) scale to correct for the relative frequency response of the human ear. That is, an A-weighted noise level de-emphasizes low and very high frequencies of sound, similar to the human ear's de-emphasis of these frequencies. Decibels (dB), unlike the linear scale (e.g., inches or pounds), are measured on a logarithmic scale representing points on a sharply rising curve.

For example, 10 dB is 10 times more intense than 0 dB, 20 dB is 100 times more intense than 0 dB, and 30 dB is 1,000 times more intense than 0 dB. Thirty decibels (30 dB) represents 1,000 times as much acoustic energy as 0 dB. The decibel scale increases as the square of the change, representing the sound pressure energy. A sound as soft as human breathing is about 10 times greater than 0 dB. The decibel system of measuring sound gives a rough connection between the physical intensity of sound and its perceived loudness to the human ear. A 10 dB increase in sound level is perceived by the human ear as only a doubling of the sound's loudness. Ambient sounds generally range from 30 dB (very quiet) to 100 dB (very loud).

Sound levels are generated from a source, and their decibel level decreases as the distance from that source increases. Sound levels dissipate exponentially with distance from their noise sources. For a single point source, sound levels decrease approximately 6 dB for each doubling of distance from the source. This drop-off rate is appropriate for noise generated by stationary equipment. If noise is produced by a line source (e.g., highway traffic or railroad operations), the sound decreases 3 dB for each doubling of distance in a hard site environment. Line source sound levels decrease 4.5 dB for each doubling of distance in a relatively flat environment with absorptive vegetation.

There are many ways to rate noise for various time periods, but an appropriate rating of ambient noise affecting humans also accounts for the annoying effects of sound. The equivalent continuous sound level (L_{eq}) is the total sound energy of time-varying noise over a sample period. However, the predominant rating scales for human communities in the State of California are the L_{eq} and Community Noise Equivalent Level (CNEL) or the day-night average noise level (L_{dn}) based on A-weighted decibels. CNEL is the time-weighted average noise over a 24-hour period, with a 5 dBA weighting factor applied to the hourly L_{eq} for noises occurring from 7:00 p.m. to 10:00 p.m. (defined as relaxation hours) and a 10 dBA weighting factor applied to noises occurring from 10:00 p.m. to 7:00 a.m. (defined as sleeping hours). L_{dn} is similar to the CNEL scale but without the adjustment for events occurring during the relaxation. CNEL and L_{dn} are within 1 dBA of each other and are normally interchangeable. The City uses the CNEL noise scale for long-term traffic noise impact assessment.

Other noise rating scales of importance when assessing the annoyance factor include the maximum instantaneous noise level (L_{max}), which is the highest sound level that occurs during a stated time period. The noise environments discussed in this analysis for short-term noise impacts are specified in terms of maximum levels denoted by L_{max}, which reflects peak operating conditions and addresses the annoying aspects of intermittent noise. It is often used together with another noise scale, or noise standards in terms of percentile noise levels, in noise ordinances for enforcement purposes. For example, the L_{10} noise level represents the noise level exceeded 10 percent of the time during a stated period. The L_{50} noise level represents the median noise level. Half the time the noise level exceeds this level, and half the time it is less than this level. The L_{90} noise level represents the noise level exceeded 90 percent of the time and is considered the background noise level during a monitoring period. For a relatively constant noise source, the L_{eq} and L_{50} are approximately the same.

Noise impacts can be described in three categories. The first category includes audible impacts, which are increases in noise levels noticeable to humans. Audible increases in noise levels generally refer to a change of 3 dB or greater because this level has been found to be barely perceptible in exterior environments. The second category, potentially audible, refers to a change in the noise level between 1 dB and 3 dB. This range of noise levels has been found to be noticeable only in laboratory environments. The last category includes changes in noise levels of less than 1 dB, which are inaudible to the human ear. Only audible changes in existing ambient or background noise levels are considered potentially significant.

Physiological Effects of Noise

Physical damage to human hearing begins at prolonged exposure to sound levels higher than 85 dBA. Exposure to high sound levels affects the entire system, with prolonged sound exposure in excess of 75 dBA increasing body tensions, thereby affecting blood pressure and functions of the heart and the nervous system. In comparison, extended periods of sound exposure above 90 dBA would result in permanent cell damage. When the sound level reaches 120 dBA, a tickling sensation occurs in the human ear, even with short-term exposure. This level of sound is called the threshold of feeling. As the sound reaches 140 dBA, the tickling sensation is replaced by a feeling of pain in the ear (i.e., the threshold of pain). A sound level of 160–165 dBA will result in dizziness or a loss of equilibrium. The ambient or background noise problem is widespread and generally more concentrated in urban areas than in outlying, less developed areas.

Table A lists definitions of acoustical terms, and Table B shows common sound levels and their sources.

Table A: Definitions of Acoustical Terms

Term	Definitions
Decibel, dB	A unit of sound measurement that denotes the ratio between two quantities that are proportional to power; the number of decibels is 10 times the logarithm (to the base 10) of this ratio.
Frequency, Hz	Of a function periodic in time, the number of times that the quantity repeats itself in 1 second (i.e., the number of cycles per second).
A-Weighted Sound Level, dBA	The sound level obtained by use of A-weighting. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. (All sound levels in this report are A-weighted unless reported otherwise.)
L_{01}, L_{10}, L_{50}, L_{90}	The fast A-weighted noise levels that are equaled or exceeded by a fluctuating sound level 1%, 10%, 50%, and 90% of a stated time period, respectively.
Equivalent Continuous Noise Level, L_{eq}	The level of a steady sound that, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.
Community Noise Equivalent Level, CNEL	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 5 dBA to sound levels occurring in the evening from 7:00 p.m. to 10:00 p.m. and after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The 24-hour A-weighted average sound level from midnight to midnight, obtained after the addition of 10 dBA to sound levels occurring in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted sound levels measured on a sound level meter, during a designated time interval, using fast time averaging.
Ambient Noise Level	The all-encompassing noise associated with a given environment at a specified time. Usually a composite of sound from many sources from many directions, near and far; no particular sound is dominant.
Intrusive	The noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, and tonal or informational content, as well as the prevailing ambient noise level.

Sources: *Technical Noise Supplement* (Caltrans 2013); *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
Caltrans = California Department of Transportation
FTA = Federal Transit Administration

Table B: Common Sound Levels and Their Noise Sources

Noise Source	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Evaluations
Near Jet Engine	140	Deafening	128 times as loud
Civil Defense Siren	130	Threshold of Pain	64 times as loud
Hard Rock Band	120	Threshold of Feeling	32 times as loud
Accelerating Motorcycle at a Few Feet Away	110	Very Loud	16 times as loud
Pile Driver; Noisy Urban Street/ Heavy City Traffic	100	Very Loud	8 times as loud
Ambulance Siren; Food Blender	95	Very Loud	—
Garbage Disposal	90	Very Loud	4 times as loud
Freight Cars; Living Room Music	85	Loud	—
Pneumatic Drill; Vacuum Cleaner	80	Loud	2 times as loud
Busy Restaurant	75	Moderately Loud	—
Near Freeway Auto Traffic	70	Moderately Loud	Reference level
Average Office	60	Quiet	One-half as loud
Suburban Street	55	Quiet	—
Light Traffic; Soft Radio Music in Apartment	50	Quiet	One-quarter as loud
Large Transformer	45	Quiet	—
Average Residence without Stereo Playing	40	Faint	One-eighth as loud
Soft Whisper	30	Faint	—
Rustling Leaves	20	Very Faint	—
Human Breathing	10	Very Faint	Threshold of Hearing
—	0	Very Faint	—

Source: Compiled by LSA (2023).

FUNDAMENTALS OF VIBRATION

Vibration refers to ground-borne noise and perceptible motion. Ground-borne vibration is almost exclusively a concern inside buildings and is rarely perceived as a problem outdoors, where the motion may not be discernible, but without the effects associated with the shaking of a building there is less adverse reaction. Vibration energy propagates from a source through intervening soil and rock layers to the foundations of nearby buildings. The vibration then propagates from the foundation throughout the remainder of the structure. Building vibration may be perceived by occupants as the motion of building surfaces, the rattling of items sitting on shelves or hanging on walls, or a low-frequency rumbling noise. The rumbling noise is caused by the vibration of walls, floors, and ceilings that radiate sound waves. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by 10 dB or less. This is an order of magnitude below the damage threshold for normal buildings.

Typical sources of ground-borne vibration are construction activities (e.g., blasting, pile-driving, and operating heavy-duty earthmoving equipment), steel-wheeled trains, and occasional traffic on rough roads. Problems with both ground-borne vibration and noise from these sources are usually localized to areas within approximately 100 feet (ft) from the vibration source, although there are examples of ground-borne vibration causing interference out to distances greater than 200 ft as detailed in the Federal Transit Administration's (FTA) 2018 *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual). When roadways are smooth, vibration from traffic, even heavy trucks, is rarely perceptible. It is assumed for most projects that the roadway surface will be smooth enough that ground-borne vibration from street traffic will not exceed the impact criteria; however, construction of the project could result in ground-borne vibration that may be perceptible and annoying.

Ground-borne noise is not likely to be a problem because noise arriving via the normal airborne path will usually be greater than ground-borne noise.

Ground-borne vibration has the potential to disturb people and damage buildings. Although it is very rare for train-induced ground-borne vibration to cause even cosmetic building damage, it is not uncommon for construction processes such as blasting and pile-driving to cause vibration of sufficient amplitudes to damage nearby buildings (FTA 2018). Ground-borne vibration is usually measured in terms of vibration velocity, either the root-mean-square (RMS) velocity or peak particle velocity (PPV). The RMS is best for characterizing human response to building vibration, and PPV is used to characterize the potential for damage. Decibel notation acts to compress the range of numbers required to describe vibration. Vibration velocity level in decibels is defined as

$$L_v = 20 \log_{10} [V/V_{ref}]$$

where "L_v" is the vibration velocity in decibels (VdB), "V" is the RMS velocity amplitude, and "V_{ref}" is the reference velocity amplitude, or 1×10^{-6} inches/second (in/sec) used in the United States.

REGULATORY SETTING

APPLICABLE NOISE STANDARDS

The applicable noise standards governing the project site include the criteria in the City's Noise Element of the General Plan, the City's Municipal Code, and the County of San Bernardino (County) Development Code.

City of Rialto

Noise Element of the General Plan

The City of Rialto General Plan Safety and Noise Element establishes policies to guard against the creation of any new noise and land use conflicts, and to minimize the impact of existing noise sources on the community. The Safety and Noise Element does not contain specific transportation-related noise standards; however, it does provide land use compatibility guidelines for future development and the future noise contour boundaries for major roadways in the City of Rialto.

The noise criteria identified in the City of Rialto Safety and Noise Element (Exhibit 5.5) are guidelines to evaluate the land use compatibility of transportation-related noise. The compatibility criteria, (shown on Exhibit 3-A), provide the City of Rialto with a planning tool to gauge the compatibility of land uses relative to existing and future exterior noise levels. The *Rialto Noise Guidelines for Land Use Planning* matrix indicates that light industrial land uses, such as the proposed project, are considered normally acceptable with exterior noise levels below 70 dBA CNEL, and conditionally acceptable with noise levels below 75 dBA CNEL. For conditionally acceptable land uses, new development should be undertaken only after detailed analysis of noise reduction requirements are made.

City of Rialto Municipal Code and San Bernardino County Development Code

Section 9.50.050[B] of the City of Rialto Municipal Code restricts loading/unloading and the use of dollies, carts, forklifts, or wheeled equipment that causes any unnecessary noise within 1,000 ft of a residence between the hours of 8:00 p.m. and 7:00 a.m. However, the City of Rialto Municipal Code does not identify specific operational noise level standards. Therefore, the County of San Bernardino Development Code standards are used in this noise study to assess the potential impacts at adjacent sensitive receiver locations consistent with Section 9.50.050[B] of the City of Rialto Municipal Code.

The San Bernardino County Code, Title 8 Development Code, Section 83.01.080[c] establishes the noise level standards for stationary noise sources. For residential properties, the exterior noise level shall not exceed 55 dBA L_{eq} during the daytime hours (7:00 a.m. to 10:00 p.m.) and 45 dBA L_{eq} during the nighttime hours (10:00 p.m. to 7:00 a.m.) for the whole hour and for not more than 30 minutes in any hour.

The exterior noise level standards shall apply for a cumulative period of 30 minutes in any hour. The standard plus 5 dBA cannot be exceeded for a cumulative period of more than 15 minutes in any hour, the standard plus 10 dBA for a cumulative period of more than 5 minutes in any hour, the standard plus 15 dBA for a cumulative period of more than 1 minute in any hour, or the standard plus 20 dBA for any period of time. Furthermore, Section 83.01.080[e] indicates that if the existing ambient noise level already exceeds any of the exterior noise level limit categories, then the standard shall be adjusted to reflect the ambient conditions. The County of San Bernardino operational noise level standards are shown in Table C.

Table C: Operational Noise Level Standards

Time Period	Exterior Noise Level Standards (dBA)				
	L_{50} (30 minutes)	L_{25} (15 minutes)	L_8 (5 minutes)	L_2 (1 minute)	L_{max} (Anytime)
Daytime[1]	55	60	65	70	75
Nighttime[2]	45	50	55	60	65

Source: County of San Bernardino Development Code, Title 8, Section 83.01.080.
Note: The percent noise level is the level exceeded "n" percent of the time during the measurement period. L_{50} is the noise level exceeded 50% of the time.
[1] Daytime means 7:00 a.m. to 10:00 p.m.
[2] Nighttime means 10:01 p.m. to 6:59 a.m.
dBA = A-weighted decibels
L_{max} = maximum instantaneous noise level

The percentile noise descriptors are provided to ensure that the duration of the noise source is fully considered. However, due to the relatively constant intensity of the project operational activities, the L_{50} or average L_{eq} noise level metrics best describe the operation of air conditioning units. In addition, the L_{eq} noise level metric accounts for noise fluctuations over time by averaging the louder and quieter events and giving more weight to the louder events. In addition, due to the mathematical relationship between the median (L_{50}) and the mean (L_{eq}), the L_{eq} will always be larger than or equal to the L_{50}. The more variable the noise becomes, the larger the L_{eq} becomes in comparison to the L_{50}. Therefore, this noise study conservatively relies on the average L_{eq} sound level limits to describe the project operational noise levels.

Section 9.50.050[F] of the City of Rialto Municipal Code included in Appendix 3.1 restricts the use of pile driver, steam or gasoline shovel, pneumatic hammer, steam or electric hoist or other similar devices, and Section 9.50.050[G] restricts electrically operated compressor, fan, or other similar devices between the hours of 8:00 p.m. and 7:00 a.m. In addition, Section 9.50.070 of the City of Rialto Municipal Code, states that construction activities are permitted between the hours of 7:00 a.m. to 5:30 p.m., Monday through Friday, from October 1 to April 30; 6:00 a.m. to 7:00p.m., Monday through Friday, from May 1 to September 30; and 8:00 a.m. to 5:00 p.m. on Saturdays any time of year; with no activity allowed on Sundays or State holidays. While the City establishes limits to the hours during which construction activity may take place, neither the City of Rialto or the County of San Bernardino General Plans or Municipal Codes establish numeric maximum acceptable construction source noise levels at potentially affected receivers, which would allow for a quantified determination of what California Environmental Quality Act (CEQA) constitutes as a substantial temporary or periodic noise increase. Therefore, a numerical construction threshold based on the FTA's *Transit Noise and Vibration Impact Assessment Manual* (FTA Manual) is used for analysis of daytime construction impacts, as discussed below.

Federal Transit Administration

According to the FTA, local noise ordinances are typically not very useful in evaluating construction noise. They usually relate to nuisance and hours of allowed activity, and sometimes specify limits in terms of maximum levels, but are generally not practical for assessing the impact of a construction project. Project construction noise criteria should account for the existing noise environment, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land use. Due to the lack of standardized construction noise thresholds, the FTA provides guidelines that can be considered reasonable criteria for construction noise assessment. This is shown in Table D.

Table D: Detailed Assessment Daytime Construction Noise Criteria

Land Use	Daytime 1-hour L_{eq} (dBA)
Residential	80
Commercial	85
Industrial	90

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
dBA = A-weighted decibels
FTA = Federal Transit Administration
L_{eq} = equivalent continuous sound level

APPLICABLE VIBRATION STANDARDS

County Development Code

To analyze vibration impacts, vibration-generating activities are typically evaluated against standards established under a jurisdiction's Municipal Code. Since the City of Rialto Municipal Code does not identify specific vibration level standards, the County Development Code vibration level standards are used in this analysis to assess potential impacts at nearby sensitive receiver locations.

The County Development Code, Section 83.01.090[a] states that vibration shall be no greater than or equal to 0.2 in/sec measured at or beyond the lot line. Therefore, to determine if the vibration levels are due to the operation and construction of the project, the PPV vibration level standard of 0.2 in/sec is used.

Federal Transit Administration

Vibration standards included in the FTA Manual are used in this analysis for ground-borne vibration impacts on human annoyance. The criteria for environmental impact from ground-borne vibration and noise are based on the maximum levels for a single event. Table E provides the criteria for assessing the potential for interference or annoyance from vibration levels in a building.

Table E: Interpretation of Vibration Criteria for Detailed Analysis

Land Use	Max L_v (VdB)[1]	Description of Use
Workshop	90	Vibration that is distinctly felt. Appropriate for workshops and similar areas not as sensitive to vibration.
Office	84	Vibration that can be felt. Appropriate for offices and similar areas not as sensitive to vibration.
Residential Day	78	Vibration that is barely felt. Adequate for computer equipment and low-power optical microscopes (up to 20×).
Residential Night and Operating Rooms	72	Vibration is not felt, but ground-borne noise may be audible inside quiet rooms. Suitable for medium-power microscopes (100×) and other equipment of low sensitivity.

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] As measured in 1/3-octave bands of frequency over a frequency range of 8 to 80 Hertz.
FTA = Federal Transit Administration
Max = maximum
L_V = velocity in decibels
VdB = vibration velocity decibels

OVERVIEW OF THE EXISTING NOISE ENVIRONMENT

The primary existing noise sources in the project area include vehicle traffic from West Rialto Avenue and neighborhood and industrial noises in the vicinity of the project site.

AMBIENT NOISE MEASUREMENTS

Long-Term Noise Measurements

To assess existing noise levels, LSA conducted two long-term noise measurements in the vicinity of the project site. The long-term (24-hour) noise level measurements were conducted on July 16 through July 17, 2024, using two Larson Davis Spark 706RC Dosimeters. Table F provides a summary of the measured hourly noise levels and calculated CNEL level from the long-term noise level measurements. As shown in Table F, the calculated CNEL levels reached 63.6 dBA CNEL. Hourly noise levels at surrounding uses are as low as 47.2 dBA L_{eq} during nighttime hours and 50.7 dBA L_{eq} during daytime hours. Noise measurement sheets are provided in Appendix A. Figure 3 shows the long-term monitoring locations.

Table F: Long-Term 24-Hour Ambient Noise Monitoring Results

Location		Daytime Noise Levels[1] (dBA L_{eq})	Evening Noise Levels[2] (dBA L_{eq})	Nighttime Noise Levels[3] (dBA L_{eq})	Daily Noise Levels (dBA CNEL)
LT-1	In a tree at the northwestern part of the project site, approximately 76 ft from West Rialto Avenue and 320 ft from South Linden Avenue.	57.6 – 63.8	57.8 – 59.9	53.6 – 57.7	63.6
LT-2	On a barbwire fence at the southwestern corner of the project site, approximately 325 ft from South Linden Avenue and 356 ft from West Rialto Avenue.	50.7 – 52.7	51.2 – 53.3	47.2 – 50.7	56.6

Source: Compiled by LSA (2024).
Note: Noise measurements were conducted from July 16 to July 17, 2024, starting at 2:00 p.m.
[1] Daytime Noise Levels = noise levels during the hours from 7:00 a.m. to 7:00 p.m.
[2] Evening Noise Levels = noise levels during the hours from 7:00 p.m. to 10:00 p.m.
[3] Nighttime Noise Levels = noise levels during the hours from 10:00 p.m. to 7:00 a.m.
CNEL = Community Noise Equivalent Level
dBA = A-weighted decibels
ft = foot/feet
L_{eq} = equivalent continuous sound level

EXISTING AIRCRAFT NOISE

The nearest airports to the project are Flabob Airport and San Bernardino International Airport (SBD Airport), located approximately 7.9 miles south and approximately 8.5 miles east of the project site, respectively. The project site is located well outside the SBD Airport Influence Area according to the 2017 Existing CNEL Contours and Generalized Land Uses – San Bernardino International Airport (San Bernardino County 2018). Therefore, the project would not be adversely affected by airport/airfield noise.

LSA

LEGEND

Project Site Boundary

LT-1 Long-term Noise Monitoring Location

0 80 160
FEET

SOURCE: Google Earth 2024

FIGURE 3

Rialto & Linden Industrial Warehouse

Noise Monitoring Locations

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PROJECT IMPACTS

SHORT-TERM CONSTRUCTION NOISE IMPACTS

Two types of short-term noise impacts could occur during the construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. Although there would be a relatively high single-event noise-exposure potential causing intermittent noise nuisance (passing trucks at 50 ft would generate up to 84 dBA L_{max}), the effect on longer-term ambient noise levels would be small when compared to existing daily traffic volumes on West Rialto Avenue. During the building construction phase, approximately 76 trips would occur during an average day from worker and vendor activities. Based on the *436 West Rialto Avenue Mitigated Negative Declaration (*City of Rialto 2023*)* the existing volume on Rialto Avenue adjacent to the project site is 13,350 ADT. The expected noise increase on West Rialto Avenue would be 0.02 dBA CNEL. A noise level increase of less than 1 dBA would not be perceptible to the human ear, therefore, short-term, construction-related impacts associated with worker commutes and equipment transport to the project site would be less than significant.

The second type of short-term noise impact is related to noise generated during construction, which includes site preparation, grading, building construction, paving, and architectural coating on the project site. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site and, therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table G lists typical construction equipment noise levels recommended for noise impact assessments, based on a distance of 50 ft between the equipment and a noise receptor, taken from the Federal Highway Administration's *FHWA Roadway Construction Noise Model* (FHWA 2006).

In addition to the reference maximum noise level, the usage factor provided in Table G is used to calculate the hourly noise level impact for each piece of equipment based on the following equation:

$$L_{eq}(equip) = E.L. + 10\log(U.F.) - 20\log\left(\frac{D}{50}\right)$$

where: L_{eq} *(equip)* = L_{eq} at a receiver resulting from the operation of a single piece of equipment over a specified time period.

E.L. = noise emission level of the particular piece of equipment at a reference distance of 50 ft.

U.F. = usage factor that accounts for the fraction of time that the equipment is in use over the specified period of time.

D = distance from the receiver to the piece of equipment.

Table G: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)[1]	Maximum Noise Level (L_{max}) at 50 Ft[2]
Auger Drill Rig	20	84
Backhoes	40	80
Compactor (ground)	20	80
Compressor	40	80
Cranes	16	85
Dozers	40	85
Dump Trucks	40	84
Excavators	40	85
Flat Bed Trucks	40	84
Forklift	20	85
Front-end Loaders	40	80
Graders	40	85
Impact Pile Drivers	20	95
Jackhammers	20	85
Paver	50	77
Pickup Truck	40	55
Pneumatic Tools	50	85
Pumps	50	77
Rock Drills	20	85
Rollers	20	85
Scrapers	40	85
Tractors	40	84
Trencher	50	80
Welder	40	73

Source: *FHWA Roadway Construction Noise Model User's Guide,* Table 1 (FHWA 2006).
Note: Noise levels reported in this table are rounded to the nearest whole number.
[1] Usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power.
[2] Maximum noise levels were developed based on Specification 721.560 from the Central Artery/Tunnel program to be consistent with the City of Boston's Noise Code for the "Big Dig" project.
FHWA = Federal Highway Administration
ft = foot/feet
L_{max} = maximum instantaneous sound level

Each piece of construction equipment operates as an individual point source. Using the following equation, a composite noise level can be calculated when multiple sources of noise operate simultaneously:

$$Leq\ (composite) = 10 * \log_{10}\left(\sum_{1}^{n} 10^{\frac{Ln}{10}}\right)$$

Using the equations from the methodology above, the reference information in Table G, and the construction equipment list provided, the composite noise levels of each construction phase were calculated. The project construction composite noise levels at a distance of 50 ft would range from 74 dBA L_{eq} to 86 dBA L_{eq}, with the highest noise levels occurring during the paving phase.

Once composite noise levels are calculated, reference noise levels can then be adjusted for distance using the following equation:

$$Leq\ (at\ distance\ X) = Leq\ (at\ 50\ feet) - 20 * \log_{10}\left(\frac{X}{50}\right)$$

In general, this equation shows that doubling the distance would decrease noise levels by 6 dBA while halving the distance would increase noise levels by 6 dBA.

Table H shows the nearest sensitive uses to the project site, their distance from the center of construction activities, and composite noise levels expected during construction. These noise level projections do not consider intervening topography or barriers. Construction equipment calculations are provided in Appendix B.

Table H: Potential Construction Noise Impacts at Nearest Receptor

Receptor (Location)	Composite Noise Level (dBA L_{eq}) at 50 ft[1]	Distance (ft)	Construction Noise Level Standard (dBA L_{eq})	Composite Noise Level (dBA L_{eq})
Residential (West)	86	150	80	76
Industrial (South)		160	90	76
Residential (North)		290	80	71
Industrial (East)		420	90	67

Source: Compiled by LSA (2024).
1 The composite construction noise level represents the paving phase which is expected to result in the greatest noise level as compared to other phases.
dBA L_{eq} = average A-weighted hourly noise level
ft = foot/feet

While construction noise will vary, it is expected that composite noise levels during construction would reach 76 dBA L_{eq} at the nearest residential uses to the west and at the nearest industrial uses to the south during daytime hours. These predicted noise levels would only occur when all construction equipment is operating simultaneously and, therefore, are assumed to be rather conservative in nature. While construction-related short-term noise levels have the potential to be higher than existing ambient noise levels in the project area under existing conditions, the noise impacts would no longer occur once project construction is completed.

As stated above, noise impacts associated with construction activities are regulated by the City's Noise Ordinance. The proposed project would comply with the construction hours specified in the City's Noise Ordinance, which states that construction activities are permitted between the hours of 7:00 a.m. to 5:30 p.m., Monday through Friday, from October 1 to April 30; 6:00 a.m. to 7:00p.m., Monday through Friday, from May 1 to September 30; and 8:00 a.m. to 5:00 p.m. on Saturdays any time of year; with no activity allowed on Sundays or State holidays.

As it relates to off-site uses, construction-related noise impacts would remain below the 80 dBA L_{eq} and 90 dBA L_{eq} 1-hour construction noise level criteria for daytime construction noise level criteria as established by the FTA for residential and industrial land uses, respectively; therefore, the impact would be considered less than significant.

SHORT-TERM CONSTRUCTION VIBRATION IMPACTS

This construction vibration impact analysis discusses the level of human annoyance using vibration levels in RMS (VdB) and assesses the potential for building damages using vibration levels in PPV (in/sec). This is because vibration levels calculated in RMS are best for characterizing human response to building vibration, while vibration level in PPV is best for characterizing potential for damage.

Table I shows the PPV and VdB values at 25 ft from the construction vibration source. As shown in Table I, bulldozers, and other heavy-tracked construction equipment (expected to be used for this project) generate approximately 0.089 PPV in/sec or 87 VdB of ground-borne vibration when measured at 25 ft, based on the FTA Manual. The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project construction boundary (assuming the construction equipment would be used at or near the project setback line).

Table I: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV/L_V at 25 ft	
	PPV (in/sec)	L_V (VdB)[1]
Pile Driver (Impact), Typical	0.644	104
Pile Driver (Sonic), Typical	0.170	93
Vibratory Roller	0.210	94
Hoe Ram	0.089	87
Large Bulldozer[2]	**0.089**	**87**
Caisson Drilling	0.089	87
Loaded Trucks[2]	**0.076**	**86**
Jackhammer	0.035	79
Small Bulldozer	0.003	58

Source: *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018).
[1] RMS vibration velocity in decibels (VdB) is 1 µin/sec.
[2] Equipment shown in **bold** is expected to be used on site.
µin/sec = microinches per second
ft = foot/feet
FTA = Federal Transit Administration
in/sec = inch/inches per second
L_V = velocity in decibels
PPV = peak particle velocity
RMS = root-mean-square
VdB = vibration velocity decibels

The formulae for vibration transmission are provided below and Tables J and K below provide a summary of off-site construction vibration levels.

$$L_v dB\ (D) = L_v dB\ (25\ ft) - 30\ Log\ (D/25)$$

$$PPV_{equip} = PPV_{ref} \times (25/D)^{1.5}$$

Table J: Potential Construction Vibration Annoyance Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (VdB) at 25 ft[1]	Distance (ft)[2]	Vibration Level (VdB)
Residential (West)	87	150	64
Industrial (South)		160	63
Residential (North)		290	55
Industrial (East)		420	50

Source: Compiled by LSA (2024).

[1] The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.

[2] The assessment distance is associated with the average condition, identified by the distance from the center of construction activities to surrounding uses.

ft = foot/feet

VdB = vibration velocity decibels

Table K: Potential Construction Vibration Damage Impacts at Nearest Receptor

Receptor (Location)	Reference Vibration Level (PPV) at 25 ft[1]	Distance (ft)[2]	Vibration Level (PPV)
Residential (West)	0.089	5	0.995
Industrial (South)		5	0.995
Residential (North)		130	0.008
Industrial (East)		270	0.003

Source: Compiled by LSA (2024).

[1] The reference vibration level is associated with a large bulldozer, which is expected to be representative of the heavy equipment used during construction.

[2] The assessment distance is associated with the peak condition, identified by the distance from the perimeter of construction activities to surrounding structures.

ft = foot/feet

PPV = peak particle velocity

As shown in Table E, above, the threshold at which vibration levels would result in annoyance would be 78 VdB and 84 VdB for daytime residential uses and office type uses, respectively.

Based on the information provided in Table J, vibration levels are expected to approach 64 VdB at the closest residential use to the west and 63 VdB at the closest industrial use to the south and would not exceed the annoyance thresholds.

Based on the information provided in Table K, the closest structures to external construction activities are the residences to the west and the industrial use to south, both within 10 ft of the project construction boundary. Using the reference data from Table K and the equation above, it is expected that vibration levels generated by dump trucks and other large equipment would generate ground-borne vibration levels of 0.995 PPV (in/sec) or higher at the closest structures to the project site, respectively. This vibration level would exceed the 0.2 in/sec PPV threshold considered safe for non-engineered timber and masonry buildings, which would result in a potentially significant impact. The distance from large construction equipment with a reference vibration level of 0.089 in/sec PPV at 25 ft for which the 0.2 in/sec threshold would no longer be exceeded is 15 ft. Vibration levels at all other buildings would be lower. Therefore, construction would not result in any vibration damage, and impacts would be less than significant with the incorporation of Mitigation Measure NOI-1, as detailed below.

Mitigation Measure NOI-1 **Construction Vibration Damage**. Due to the close proximity to surrounding structures, the City of Rialto (City) Director of Community Development, or designee, shall verify prior to issuance of grading permits, that the approved plans require that the construction contractor shall implement the following reduction measures during project construction activities to ensure that damage does not occur at surrounding structures:

- Identify structures that are located within 15 feet (ft) of heavy construction activities and that have the potential to be affected by ground-borne vibration. This task shall be conducted by a qualified structural engineer as approved by the City's Director of Community Development, or designee.
- Once the construction equipment list finalized, a comparison of the proposed equipment to be used and the assumed equipment vibration levels presented in Table 7-4 of the Federal Transit Administration's (FTA) *Noise and Vibration Impact Assessment Manual – FTA Report No. 0123* shall be completed. If it is determined that the proposed equipment would generate lower vibration levels than assumed, further vibration reduction would not be necessary. However, if levels would potentially exceed the FTA Damage Criteria presented in Table 7-5 of the FTA *Noise and Vibration Impact Assessment Manual – FTA Report No. 0123*, the applicant shall develop a vibration monitoring and construction contingency plan for approval by the County Director of Community Development, or designee, to identify structures where monitoring would be conducted; set up a vibration monitoring schedule; define structure-specific vibration limits; and address the need to conduct photo, elevation, and crack surveys to document before and after construction conditions. Construction contingencies would be identified for when vibration levels approached the limits.
- If a vibration monitoring and construction contingency plan is deemed necessary, monitor vibration during initial construction activities would be required. Monitoring results may indicate the need for more or less intensive measurements.
- When vibration levels approach limits, suspend construction and implement contingencies as identified in the approved

vibration monitoring and construction contingency plan to either lower vibration levels or secure the affected structures.

LONG-TERM OFF-SITE TRAFFIC NOISE IMPACTS

As a result of the implementation of the proposed project, off-site traffic volumes on surrounding roadways have the potential to increase. The proposed project trips generated were obtained from the *Rialto & Linden Industrial Warehouse Project Traffic Memorandum* (LSA 2024). The proposed project would generate 121 average daily trips. Based on the *436 West Rialto Avenue Mitigated Negative Declaration (*City of Rialto 2023*)* the existing volume on Rialto Avenue adjacent to the project site is 13,350 ADT. The expected noise increase due to project related traffic would be 0.04 dBA CNEL. A noise level increase of less than 1 dBA would not be perceptible to the human ear; therefore, the traffic noise increase in the vicinity of the project site resulting from the proposed project would be less than significant. No mitigation is required.

LONG-TERM TRAFFIC-RELATED VIBRATION IMPACTS

The proposed project would not generate vibration levels related to on-site operations. In addition, vibration levels generated from project-related traffic on the adjacent roadways are unusual for on-road vehicles because the rubber tires and suspension systems of on-road vehicles provide vibration isolation. Based on a reference vibration level of 0.076 in/sec PPV, structures greater than 20 ft from the roadways that contain project trips would experience vibration levels below the most conservative standard of 0.12 in/sec PPV, and therefore vibration levels generated from project-related traffic on the adjacent roadways would be less than significant and no mitigation is required.

LONG-TERM STATIONARY NOISE IMPACTS TO OFF-SITE RECEPTORS

Adjacent off-site land uses would be potentially exposed to stationary-source noise impacts from the proposed on-site heating, ventilation, and air conditioning (HVAC) equipment and truck deliveries and loading and unloading activities. The potential noise impacts to off-site sensitive land uses from the proposed HVAC equipment and truck delivery activities are discussed below. To provide a conservative analysis, it is assumed that operations would occur equally during all hours of the day and that the two loading docks would be active at all times. Additionally, it is assumed that within any given hour, one heavy truck would maneuver to park near or back into one of the proposed loading docks. To determine the future noise impacts from project operations to the noise sensitive uses, a 3-D noise model, SoundPLAN, was used to incorporate the site topography as well as the shielding from the proposed building on site. A graphic representation of the operational noise impacts is presented in Appendix C.

Heating, Ventilation, and Air Conditioning Equipment

The project would have various rooftop mechanical equipment including HVAC units on the proposed building. Based on the project site plan, the project is assumed to have two (2) rooftop HVAC units and assumed to operate 24 hours per day. The HVAC equipment would generate sound power levels (L_w) of up to 87 dBA L_w or 72 dBA L_{eq} at 5 ft, based on manufacturer data (Trane n.d.).

Trash Bin Emptying Activities

The project is estimated to have a trash dumpster near the southwestern corner of the proposed project site. The trash emptying activities would take place for a period less than 1 minute and would generate L_w of up to 118.6 dBA L_w or 84 dBA L_{eq} at 50 ft, based on reference information within SoundPLAN.

Truck Deliveries and Truck Loading and Unloading Activities

Noise levels generated by delivery trucks would be similar to noise readings from truck loading and unloading activities, which generate a noise level of 75 dBA L_{eq} at 20 ft based on measurements taken by LSA (*Operational Noise Impact Analysis for Richmond Wholesale Meat Distribution Center* [LSA 2016]). Shorter term noise levels that occur during the docking process taken by LSA were measured to be 76.3 dBA L_8 at 20 ft. Delivery trucks would arrive on site and maneuver their trailers so that trailers would be parked within the loading docks. During this process, noise levels are associated with the truck engine noise, air brakes, and back-up alarms while the truck is backing into the dock. These noise levels would occur for a short period of time (less than 5 minutes). After a truck enters the loading dock, the doors would be closed, and the remainder of the truck loading activities would be enclosed and therefore much less perceptible. To present a conservative assessment, it is assumed that truck arrivals and departure activities could occur at one dock for a period of less than 5 minutes and unloading activities could occur at two docks simultaneously for a period of more than 30 minutes in a given hour.

Cumulative Operations Noise Assessment

Tables L and M, below, show the combined hourly noise levels generated by HVAC equipment, trash bin emptying activities, and truck delivery activities at the closest off-site sensitive land uses. The project-related noise level impacts would range from 44.9 dBA L_{eq} to 53.3 dBA L_{eq} at the surrounding sensitive receptors. These levels would be below the City's Municipal Code daytime and nighttime noise standards.

Table L: Daytime Exterior Noise Level Impacts

Receptor	Direction	Existing Quietest Daytime Noise Level (dBA L_{eq})	Project Generated Noise Levels (dBA L_{eq})	Potential Operational Noise Impact?[1]
Residential uses (Cambria Villa Apartments)	West	50.7	53.3	No

Source: Compiled by LSA (2024).

[1] A potential operational noise impact would occur if (1) the quietest daytime ambient hour is less than 55 dBA L_{eq} and project noise impacts are greater than 55 dBA L_{eq}, or (2) the quietest daytime ambient hour is greater than 55 dBA L_{eq} and project noise impacts are 3 dBA greater than the quietest daytime ambient hour.

dBA = A-weighted decibels

L_{eq} = equivalent noise level

Table M: Nighttime Exterior Noise Level Impacts

Receptor	Direction	Existing Quietest Nighttime Noise Level (dBA L_{eq})	Project Generated Noise Levels (dBA L_{eq})	Potential Operational Noise Impact?[1]
Residential uses (Cambria Villa Apartments)	West	47.2	44.9	No

Source: Compiled by LSA (2024).

[1] A potential operational noise impact would occur if (1) the quietest nighttime ambient hour is less than 45 dBA L_{eq} and project noise impacts are greater than 45 dBA L_{eq}, or (2) the quietest nighttime ambient hour is greater than 45 dBA L_{eq} and project noise impacts are 3 dBA greater than the quietest nighttime ambient hour.

dBA = A-weighted decibels

L_{eq} = equivalent noise level

Because project noise levels would not generate a noise level that exceeds the City's noise standards or existing ambient noise levels by 3 dBA or more, the impact would be less than significant, and no noise reduction measures are required.

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Trane. n.d. *Fan Performance - Product Specifications RT-PRC023AU-EN.*

APPENDIX A

NOISE MONITORING DATA

Noise Measurement Survey – 24 HR

Project Number: 20241780
Project Name: Rialto and Linden

Test Personnel: Amber Hazelrigg
Equipment: Spark 706RC (SN: 17815)

Site Number: LT-1 Date: 7/16/24

Time: From 2 PM To 2 PM

Site Location: The monitor was hung from a tree in the northwestern side of the site. It is approximately 76 feet to West Rialto Avenue and 320 feet to South Linden Avenue.

Primary Noise Sources: The primary noise source is from West Rialto Avenue. The secondary noise source is residential.

Comments:

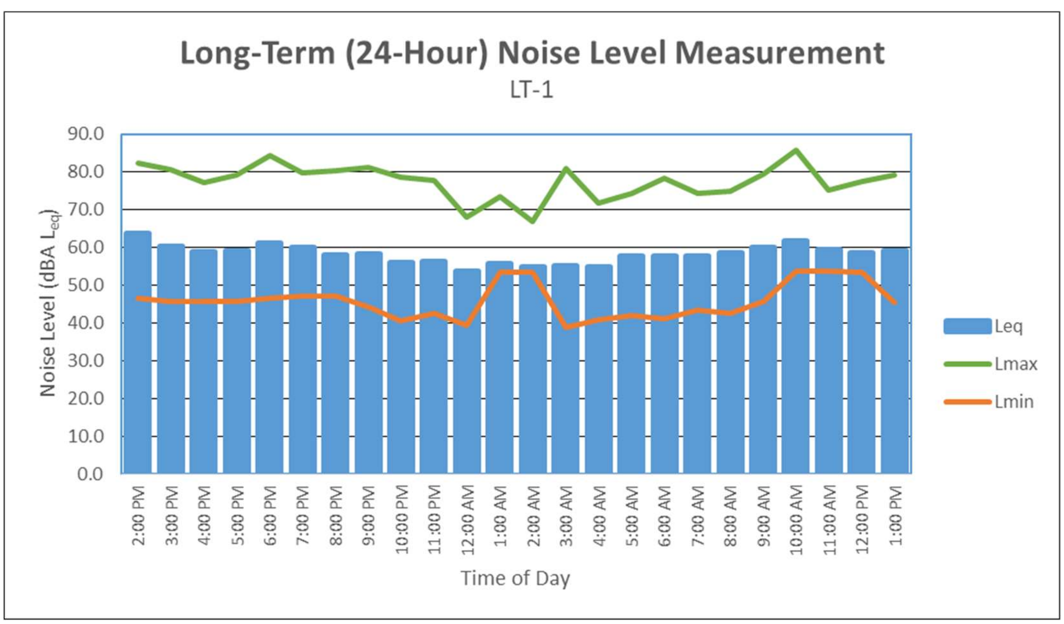
Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-1

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
2:00 PM	7/16/24	63.8	82.3	46.6
3:00 PM	7/16/24	60.1	80.5	45.8
4:00 PM	7/16/24	58.9	77.2	45.7
5:00 PM	7/16/24	59.0	79.1	45.8
6:00 PM	7/16/24	61.0	84.4	46.6
7:00 PM	7/16/24	59.9	79.8	47.2
8:00 PM	7/16/24	57.8	80.3	47.2
9:00 PM	7/16/24	58.3	81.1	44.3
10:00 PM	7/16/24	55.9	78.7	40.6
11:00 PM	7/16/24	56.3	77.7	42.6
12:00 AM	7/17/24	53.6	67.9	39.3
1:00 AM	7/17/24	55.6	73.4	53.5
2:00 AM	7/17/24	54.8	66.8	53.4
3:00 AM	7/17/24	55.0	80.9	38.8
4:00 AM	7/17/24	54.9	71.6	40.8
5:00 AM	7/17/24	57.7	74.2	41.8
6:00 AM	7/17/24	57.6	78.2	41.2
7:00 AM	7/17/24	57.6	74.4	43.4
8:00 AM	7/17/24	58.5	74.9	42.4
9:00 AM	7/17/24	60.0	79.4	45.8
10:00 AM	7/17/24	61.6	85.6	53.6
11:00 AM	7/17/24	59.4	75.1	53.6
12:00 PM	7/17/24	58.6	77.5	53.4
1:00 PM	7/17/24	59.2	79.2	45.3

Source: Compiled by LSA Associates, Inc. (2024).

dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



Noise Measurement Survey – 24 HR

Project Number: 20241780
Project Name: Rialto and Linden

Test Personnel: Amber Hazelrigg
Equipment: Spark 706RC (SN: 17814)

Site Number: LT-2 Date: 7/16/24

Time: From 2 PM To 2 PM

Site Location: The monitor was hung on a barbwire fence in the southwestern corner of the project site. It is approximately 325 feet to South Linden Avenue and 356 feet to West Rialto Ave.

Primary Noise Sources: The primary noise source is residential. The secondary noise source is from the adjacent lot/businesses.

Comments:

Photo:

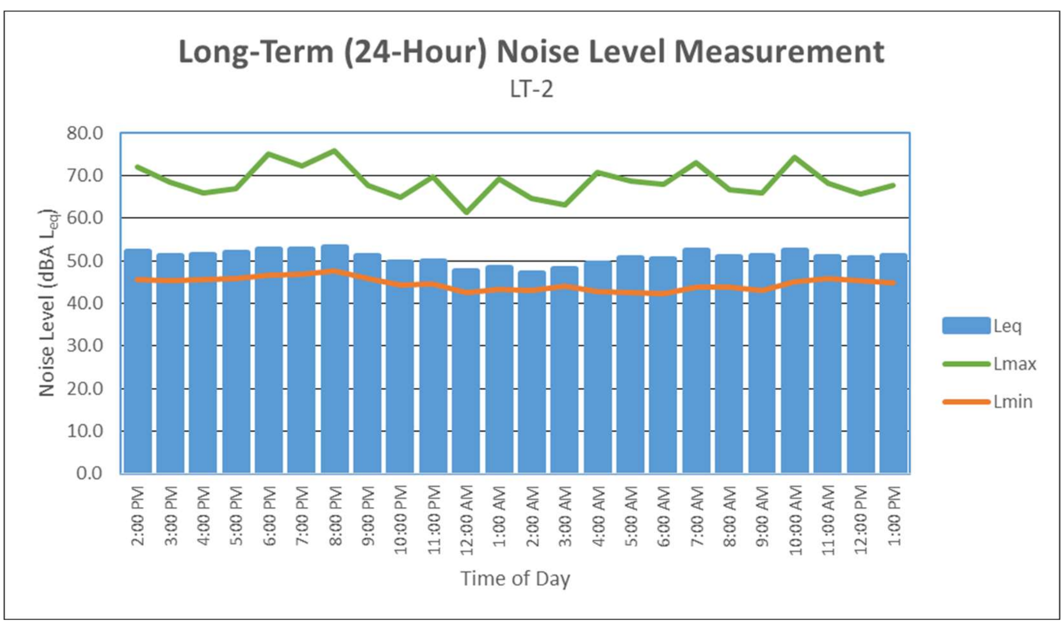
Long-Term (24-Hour) Noise Level Measurement Results at LT-2

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
2:00 PM	7/16/24	52.2	72.0	45.7
3:00 PM	7/16/24	51.3	68.5	45.4
4:00 PM	7/16/24	51.3	66.0	45.6
5:00 PM	7/16/24	51.9	66.9	45.9
6:00 PM	7/16/24	52.7	75.2	46.7
7:00 PM	7/16/24	52.8	72.3	46.8
8:00 PM	7/16/24	53.3	75.8	47.6
9:00 PM	7/16/24	51.2	67.6	45.8
10:00 PM	7/16/24	49.7	64.9	44.2
11:00 PM	7/16/24	49.9	69.8	44.5
12:00 AM	7/17/24	47.7	61.4	42.5
1:00 AM	7/17/24	48.5	69.3	43.4
2:00 AM	7/17/24	47.2	64.7	43.0
3:00 AM	7/17/24	48.2	63.0	44.1
4:00 AM	7/17/24	49.3	70.8	42.8
5:00 AM	7/17/24	50.7	68.6	42.5
6:00 AM	7/17/24	50.3	68.0	42.2
7:00 AM	7/17/24	52.4	73.1	43.7
8:00 AM	7/17/24	50.8	66.7	43.8
9:00 AM	7/17/24	51.3	65.9	43.1
10:00 AM	7/17/24	52.5	74.4	45.1
11:00 AM	7/17/24	50.9	68.3	45.8
12:00 PM	7/17/24	50.7	65.6	45.4
1:00 PM	7/17/24	51.2	67.6	44.8

Source: Compiled by LSA Associates, Inc. (2024).

dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level

L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



APPENDIX B

CONSTRUCTION NOISE LEVEL CALCULATIONS

Construction Calculations

Phase: Site Preparation

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Tractor	1	84	40	50	0.5	84	80
Grader	1	85	40	50	0.5	85	81
Scraper	1	84	40	50	0.5	84	80
					Combined at 50 feet	**89**	**85**

Phase: Grading

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Grader	1	85	40	50	0.5	85	81
Dozer	1	82	40	50	0.5	82	78
Tractor	2	84	40	50	0.5	84	83
					Combined at 50 feet	**89**	**86**
					Combined at Receptor 150 feet	**79**	**76**
					Combined at Receptor 160 feet	**79**	**76**
					Combined at Receptor 290 feet	**73**	**71**
					Combined at Receptor 420 feet	**70**	**67**

Phase:Building Construstion

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Crane	1	81	16	50	0.5	81	73
Man Lift	2	75	20	50	0.5	75	71
Tractor	1	84	40	50	0.5	84	80
Generator	1	81	50	50	0.5	81	78
Welder / Torch	3	74	40	50	0.5	74	75
					Combined at 50 feet	**87**	**84**

Phase: Paving

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Tractor	1	84	40	50	0.5	84	80
Paver	1	77	50	50	0.5	77	74
Roller	2	80	20	50	0.5	80	76
Drum Mixer	1	80	50	50	0.5	80	77
All Other Equipment > 5 HP	1	85	50	50	0.5	85	82
					Combined at 50 feet	**89**	**86**
					Combined at Receptor 150 feet	**80**	**76**
					Combined at Receptor 160 feet	**79**	**76**
					Combined at Receptor 290 feet	**74**	**70**
					Combined at Receptor 420 feet	**71**	**67**

Phase:Architectural Coating

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Compressor (air)	1	78	40	50	0.5	78	74
					Combined at 50 feet	**78**	**74**

Sources: RCNM

[1]- Percentage of time that a piece of equipment is operating at full power.

dBA – A-weighted Decibels
Lmax- Maximum Level
Leq- Equivalent Level

APPENDIX C

OPERATIONAL NOISE LEVEL CALCULATIONS

Rialto & Linden Industrial Warehouse

Project No. 20241780

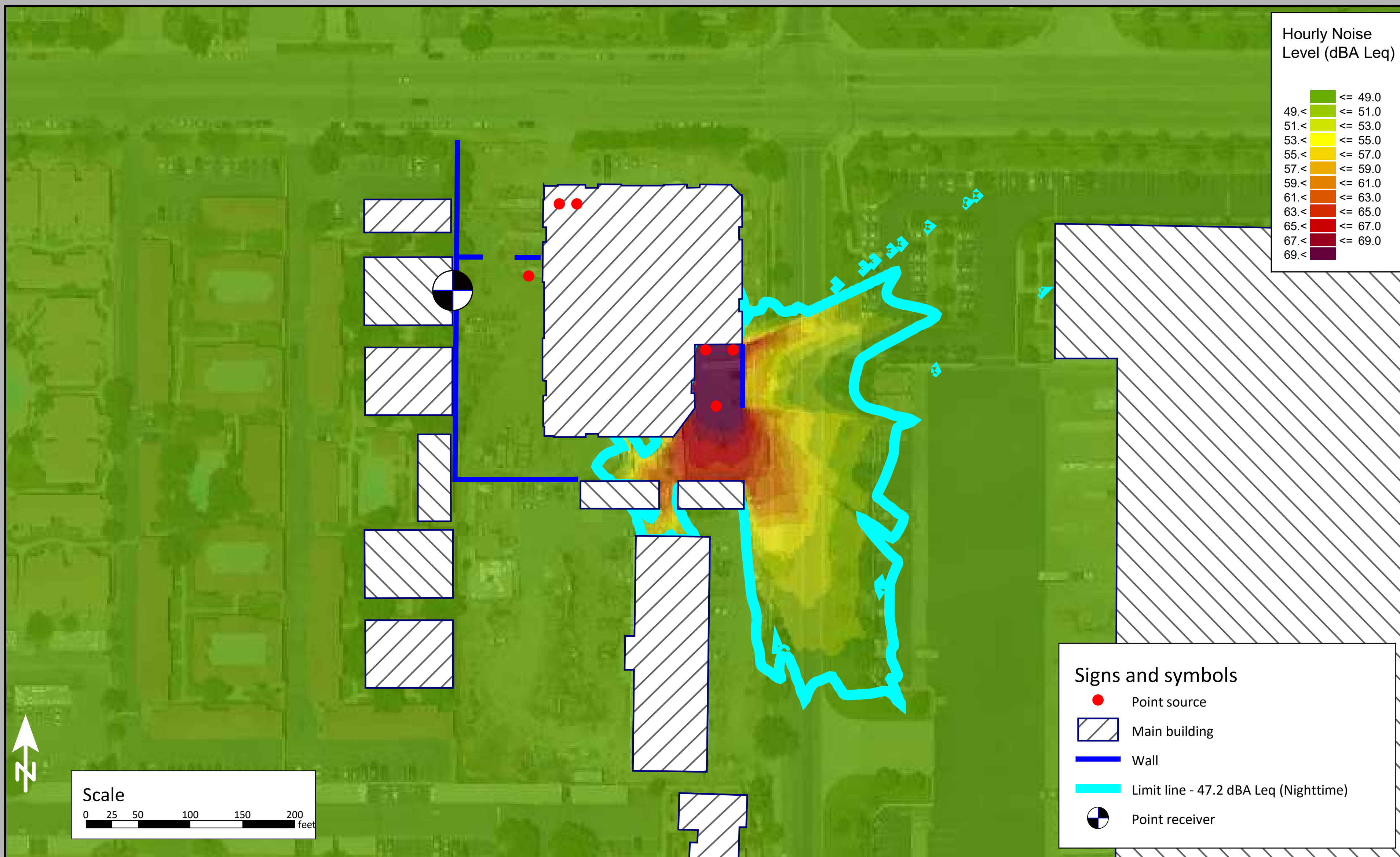
Project Operational Noise Levels - Daytime

C:\Users\MAbushanab\OneDrive - LSA Associates\Documents\Desktop\SoundPLAN\20241780 - Rialto & Linden Industrial Warehouse\Daytime.sgs - last edit 8/15/2024

Rialto & Linden Industrial Warehouse

Project No. 20241780

Project Operational Noise Levels - Nighttime



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