I-15/Jurupa Valley Storage

Noise Impact Study

City of Jurupa Valley, CA

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1.0 Introduction

1.1 Purpose of Analysis and Study Objectives

This noise assessment was prepared to evaluate the potential noise impacts for the project study area and to recommend noise mitigation measures, if necessary, to minimize the potential noise impacts. The assessment was conducted and compared to the noise standards set forth by the Federal, State, and Local agencies. Consistent with the City's Noise Guidelines, the project must demonstrate compliance to the applicable noise criterion as outlined within the City's Noise Element and Municipal Code.

The following is provided in this report:

- A description of the study area and the proposed project
- Information regarding the fundamentals of noise
- A description of the local noise guidelines and standards
- An evaluation of the existing ambient noise environment
- An analysis of stationary noise impacts from the project site to adjacent land uses
- Construction noise and vibration evaluation

1.2 Site Location and Study Area

The project site is located at APN's 152-020-010, 152-060-007, 152-060-009, and 152-060-006, situated along the I-15 freeway in the City of Jurupa Valley, California, as shown in Exhibit A. The project is currently zoned W-1 Watercourse, Watershed, and Conservation Areas with proposed zoning of C-1/C-P General Commercial and W-1 Watercourse, Watershed and Conservation Areas. Land uses surrounding the site include residential to the north, and open space to the east and south, with residential to the west across the I-15 freeway.

1.3 Proposed Project Description

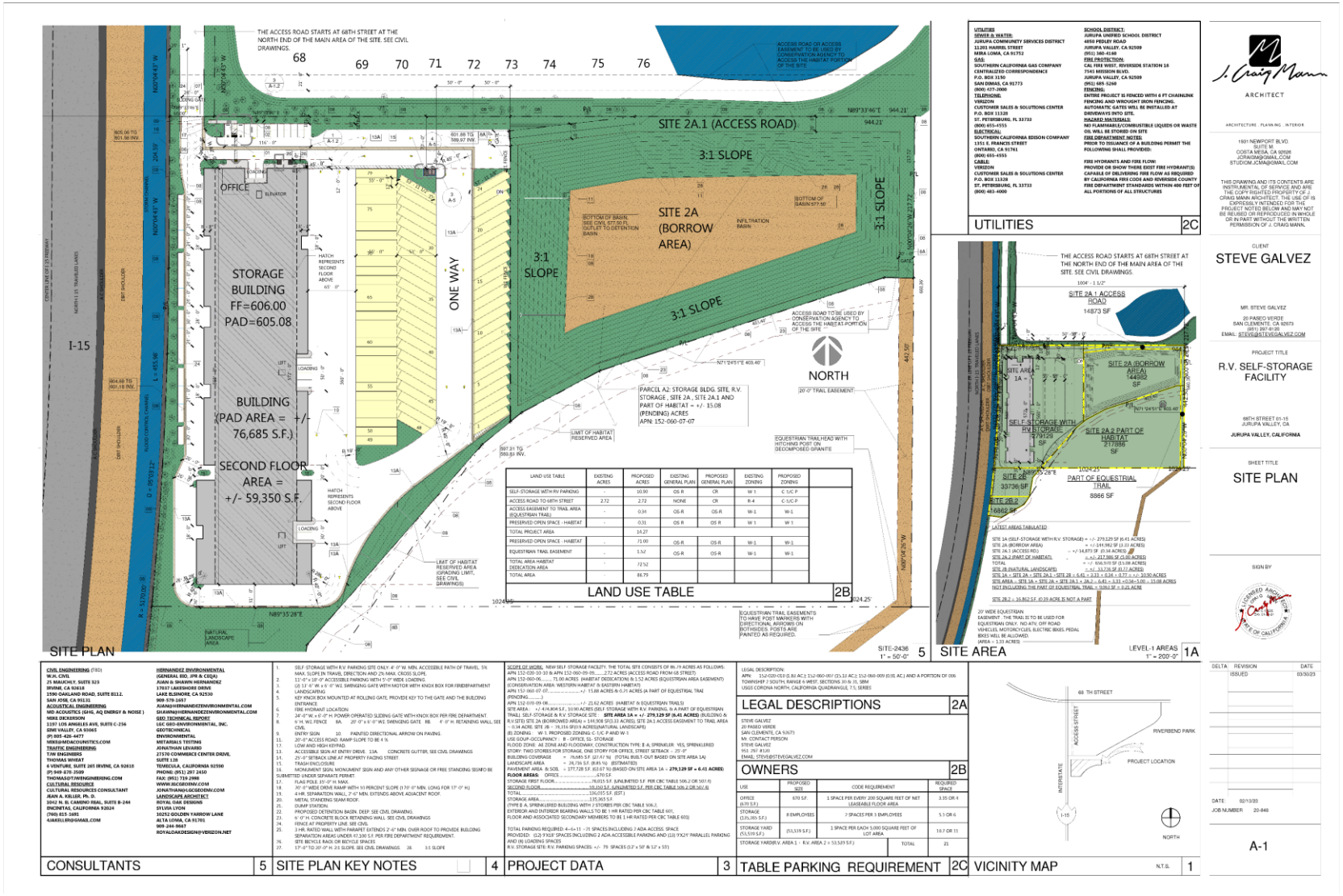
The Project proposes to develop a two-story storage facility of which 670 square feet will be office space, 76,015 square feet for the first floor and 59,350 sf will be the second floor. The project will include a total of 21 parking and RV storage spaces. Exhibit B demonstrates the site plan for the project.

Exhibit A

Location Map

Exhibit B

Site Plan



2.0 Fundamentals of Noise

This section of the report provides basic information about noise and presents some of the terms used in the report.

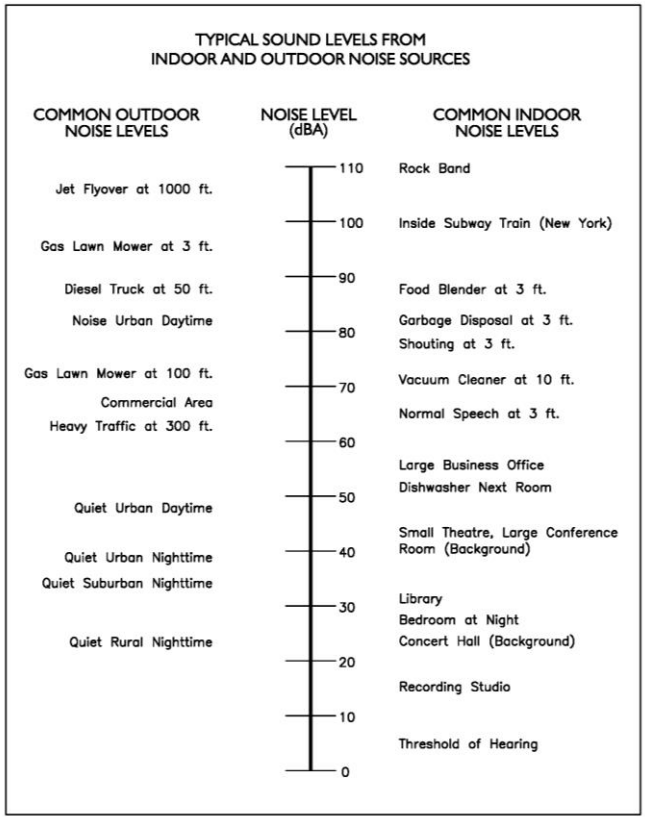
2.1 Sound, Noise and Acoustics

Sound is a disturbance created by a moving or vibrating source and is capable of being detected by the hearing organs. Sound may be thought of as mechanical energy of a moving object transmitted by pressure waves through a medium to a human ear. For traffic or stationary noise, the medium of concern is air. *Noise* is defined as sound that is loud, unpleasant, unexpected, or unwanted.

2.2 Frequency and Hertz

A continuous sound is described by its *frequency* (pitch) and its *amplitude* (loudness). Frequency relates to the number of pressure oscillations per second. Low-frequency sounds are low in pitch (bass sounding) and high-frequency sounds are high in pitch (squeak). These oscillations per second (cycles) are commonly referred to as Hertz (Hz). The human ear can hear from the bass pitch starting out at 20 Hz all the way to the high pitch of 20,000 Hz.

Exhibit C: Typical A-Weighted Noise Levels



2.3 Sound Pressure Levels and Decibels

The *amplitude* of a sound determines its loudness. The loudness of sound increases or decreases as the amplitude increases or decreases. Sound pressure amplitude is measured in units of micro-Newton per square inch meter ($\mu N/m^2$), also called micro-Pascal (µPa). One µPa is approximately one hundred billionths (0.00000000001) of normal atmospheric pressure. Sound pressure level (SPL or L_p) is used to describe in logarithmic units the ratio of actual sound pressures to a reference pressure squared. These units are called decibels, abbreviated dB. Exhibit C illustrates references sound levels for different noise sources.

2.4 Addition of Decibels

Because decibels are on a logarithmic scale, sound pressure levels cannot be added or subtracted by simple plus or minus addition. When two sounds or equal SPL are combined, they will produce an SPL 3 dB greater than the original single SPL. In other words, sound energy must be doubled to produce a 3 dB increase. If two sounds differ by approximately 10 dB, the higher sound level is the predominant sound.

2.5 Human Response to Changes in Noise Levels

In general, the healthy human ear is most sensitive to sounds between 1,000 Hz and 5,000 Hz, and it perceives a sound within that range as being more intense than a sound with a higher or lower frequency with the same magnitude. For purposes of this report as well as with most environmental documents, the A-scale weighting is typically reported in terms of A-weighted decibel (dBA), a scale designed to account for the frequency-dependent sensitivity of the ear. Typically, the human ear can barely perceive a change in noise level of 3 dB. A change in 5 dB is readily perceptible, and a change in 10 dB is perceived as being twice or half as loud. As previously discussed, a doubling of sound energy results in a 3 dB increase in sound, which means that a doubling of sound energy (e.g. doubling the volume of traffic on a highway) would result in a barely perceptible change in sound level.

2.6 Noise Descriptors

Noise in our daily environment fluctuates over time. Some noise levels occur in regular patterns, others are random. Some noise levels are constant while others are sporadic. Noise descriptors were created to describe the different time-varying noise levels.

A-Weighted Sound Level: The sound pressure level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighting filter de-emphasizes the very low and very high-frequency components of the sound in a manner similar to the response of the human ear. A numerical method of rating human judgment of loudness.

Ambient Noise Level: The composite of noise from all sources, near and far. In this context, the ambient noise level constitutes the normal or existing level of environmental noise at a given location.

Community Noise Equivalent Level (CNEL): The average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five (5) decibels to sound levels in the evening from 7:00 to 10:00 PM and after addition of ten (10) decibels to sound levels in the night before 7:00 AM and after 10:00 PM.

Decibel (dB): A unit for measuring the amplitude of a sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micro-pascals.

dB(A): A-weighted sound level (see definition above).

Equivalent Sound Level (LEQ): The sound level corresponding to a steady noise level over a given sample period with the same amount of acoustic energy as the actual time-varying noise level. The energy average noise level during the sample period.

Habitable Room: Any room meeting the requirements of the Uniform Building Code, or other applicable regulations, which is intended to be used for sleeping, living, cooking or dining purposes, excluding such enclosed spaces as closets, pantries, bath or toilet rooms, service rooms, connecting corridors, laundries, unfinished attics, foyers, storage spaces, cellars, utility rooms and similar spaces.

L(n): The A-weighted sound level exceeded during a certain percentage of the sample time. For example, L10 in the sound level exceeded 10 percent of the sample time. Similarly L50, L90, and L99, etc.

Noise: *A*ny unwanted sound or sound which is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying. The State Noise Control Act defines noise as "...excessive undesirable sound...".

Outdoor Living Area: Outdoor spaces that are associated with residential land uses typically used for passive recreational activities or other noise-sensitive uses. Such spaces include patio areas, barbecue areas, jacuzzi areas, etc. associated with residential uses; outdoor patient recovery or resting areas associated with hospitals, convalescent hospitals, or rest homes; outdoor areas associated with places of worship which have a significant role in services or other noise-sensitive activities; and outdoor school facilities routinely used for educational purposes which may be adversely impacted by noise. Outdoor areas usually not included in this definition are: front yard areas, driveways, greenbelts, maintenance areas and storage areas associated with residential land uses; exterior areas at hospitals that are not used for patient activities; outdoor areas associated with places of worship and principally used for short-term social gatherings; and, outdoor areas associated with school facilities that are not typically associated with educational uses prone to adverse noise impacts (for example, school play yard areas).

Percent Noise Levels: See L(n).

Sound Level (Noise Level): The weighted sound pressure level obtained by use of a sound level meter having a standard frequency filter for attenuating part of the sound spectrum.

Sound Level Meter: An instrument, including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement and determination of noise and sound levels.

Single Event Noise Exposure Level (SENEL): The dB(A) level which, if it lasted for one second, would produce the same A-weighted sound energy as the actual event.

2.7 Traffic Noise Prediction

Noise levels associated with traffic depends on a variety of factors: (1) volume of traffic, (2) speed of traffic, (3) auto, medium truck (2–3 axle) and heavy truck percentage (4 axle and greater), and sound propagation. The greater the volume of traffic, higher speeds and truck percentages equate to a louder volume in noise. A doubling of the Average Daily Traffic (ADT) along a roadway will increase noise levels by approximately 3 dB; reasons for this are discussed in the sections above.

2.8 Sound Propagation

As sound propagates from a source it spreads geometrically. Sound from a small, localized source (i.e., a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates at a rate of 6 dB per doubling of distance. The movement of vehicles down a roadway makes the source of the sound appear to propagate from a line (i.e., line source) rather than a point source. This line source results in the noise propagating from a roadway in a cylindrical spreading versus a spherical spreading that results from a point source. The sound level attenuates for a line source at a rate of 3 dB per doubling of distance.

As noise propagates from the source, it is affected by the ground and atmosphere. Noise models use hard site (reflective surfaces) and soft site (absorptive surfaces) to help calculate predicted noise levels. Hard site conditions assume no excessive ground absorption between the noise source and the

receiver. Soft site conditions such as grass, soft dirt or landscaping attenuate noise at a rate of 1.5 dB per doubling of distance. When added to the geometric spreading, the excess ground attenuation results in an overall noise attenuation of 4.5 dB per doubling of distance for a line source and 7.5 dB per doubling of distance for a point source.

Research has demonstrated that atmospheric conditions can have a significant effect on noise levels when noise receivers are located 200 feet from a noise source. Wind, temperature, air humidity, and turbulence can further impact have far sound can travel.

3.0 Ground-Borne Vibration Fundamentals

3.1 Vibration Descriptors

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels, damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

Several different methods are used to quantify vibration amplitude.

PPV – Known as the peak particle velocity (PPV) which is the maximum instantaneous peak in vibration velocity, typically given in inches per second.

RMS – Known as root mean squared (RMS) can be used to denote vibration amplitude

VdB – A commonly used abbreviation to describe the vibration level (VdB) for a vibration source.

3.2 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Outdoor sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration. To counter the effects of ground-borne vibration, the Federal Transit Administration (FTA) has published guidance relative to vibration impacts. According to the FTA, fragile buildings can be exposed to ground-borne vibration levels of 0.3 inches per second without experiencing structural damage.

3.3 Vibration Propagation

There are three main types of vibration propagation: surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground's surface. These waves carry most of their energy along an expanding circular wavefront, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wavefront. The particle motion in these waves is longitudinal (i.e., in a "push-pull" fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wavefront. However, unlike P-waves, the particle motion is transverse, or side-to-side and perpendicular to the direction of propagation.

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

4.0 Regulatory Setting

The proposed project is located in the City of Jurupa Valley, California and noise regulations are addressed through the efforts of various federal, state and local government agencies. The agencies responsible for regulating noise are discussed below.

4.1 Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

- Publicize noise emission standards for interstate commerce
- Assist state and local abatement efforts
- Promote noise education and research

The Federal Office of Noise Abatement and Control (ONAC) originally was tasked with implementing the Noise Control Act. However, it was eventually eliminated leaving other federal agencies and committees to develop noise policies and programs. Some examples of these agencies are as follows: The Department of Transportation (DOT) assumed a significant role in noise control through its various agencies. The Federal Aviation Agency (FAA) is responsible for regulating noise from aircraft and airports. The Federal Highway Administration (FHWA) is responsible for regulating noise from the interstate highway system. The Occupational Safety and Health Administration (OSHA) is responsible for the prohibition of excessive noise exposure to workers. The Housing and Urban Development (HUD) is responsible for establishing noise regulations as it relates to exterior/interior noise levels for new HUD-assisted housing developments near high noise areas.

The federal government advocates that local jurisdictions use their land use regulatory authority to arrange new development in such a way that “noise sensitive” uses are either prohibited from being constructed adjacent to a highway or, or alternatively that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

Since the federal government has preempted the setting of standards for noise levels that can be emitted by the transportation source, the City is restricted to regulating the noise generated by the transportation system through nuisance abatement ordinances and land use planning.

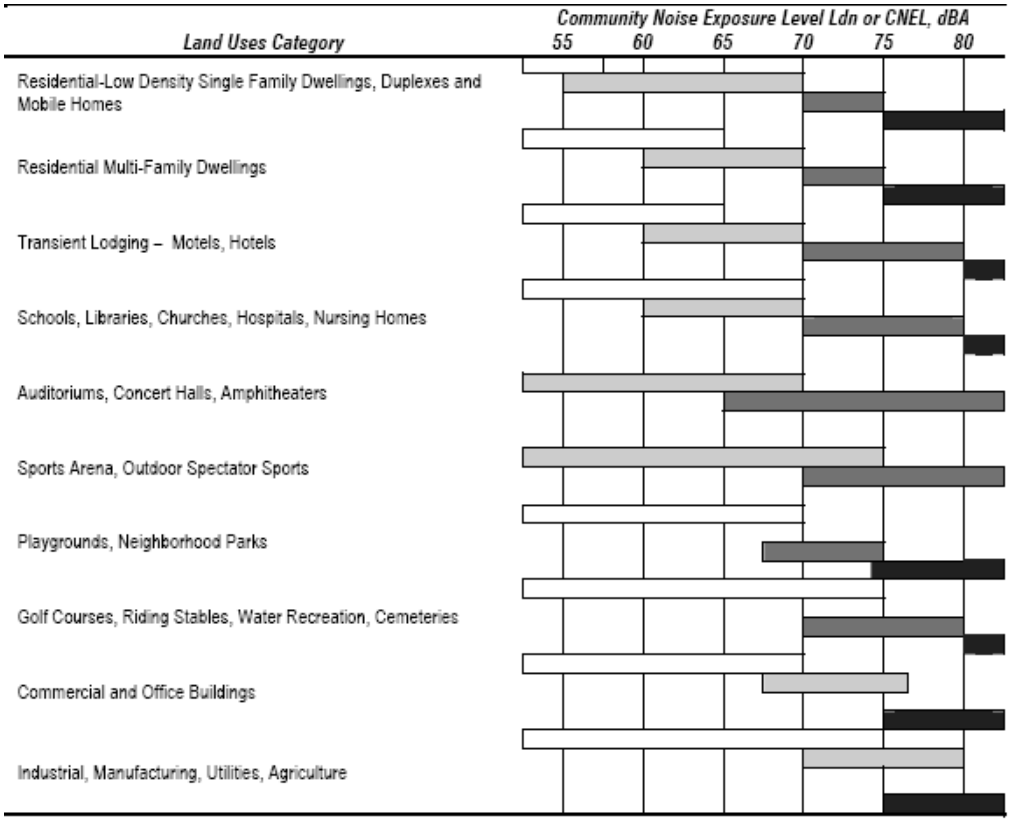
4.2 State Regulations

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model is the “Land Use Compatibility for Community Noise Environments Matrix.” The matrix allows the local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise.

The State of California has established noise insulation standards as outlined in Title 24 and the Uniform Building Code (UBC) which in some cases requires acoustical analyses to outline exterior noise levels and to ensure interior noise levels do not exceed the interior threshold. The State mandates that the legislative body of each county and city adopt a noise element as part of its comprehensive general

plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable as illustrated in Exhibit D.

Exhibit D: Land Use Compatibility Guidelines



4.3 City of Jurupa Valley Noise Regulations

The City of Jurupa Valley outlines their noise regulations and standards within the Municipal Code and the Noise Element of the City of Jurupa Valley General Plan.

City of Jurupa Valley – Noise Ordinance

Chapter 11.05 from the City's municipal code outlines the noise ordinance. MD's provided excerpts of the ordinance that relates to this project.

Sec. 11.05.020. - Exemptions.

Sound emanating from the following sources is exempt from the provisions of this chapter:

(1) Facilities owned and operated by or for a governmental agency.
(2) Capital Improvement projects of a government agency.
(3) The maintenance or repair of public properties.
(4) Public safety personnel in the course of executing their official duties, including, but not limited to, sworn peace officers, emergency personnel and public utility personnel. This exemption includes, without limitation, sound emanating from all equipment used by such personnel, whether stationary or mobile.
(5) Public or private schools and school-sponsored activities.
(6) Agricultural operations on land designed "agriculture" in the Jurupa Valley General Plan, or land zoned A-1 (light agriculture), or A-D (agriculture-dairy), provided such operations are carried out in a manner consistent with accepted industry standards. This exemption includes, without limitation, sound emanating from all equipment used during such operations, whether stationary or mobile.
(7) Wind energy conversion systems (WECS), provided such systems comply with the WECS noise provisions of Jurupa Valley Municipal Code or Title 9.
(8) Private construction projects located one-quarter (¼) of a mile or more from an inhabited dwelling;
(9) Private construction projects located within one-quarter (¼) of a mile from an inhabited dwelling, provided that:
(a) Construction does not occur between the hours of six (6:00) p.m. and six (6:00) a.m. during the months of June through September; and
(b) Construction does not occur between the hours of six (6:00) p.m. and seven (7:00) a.m. during the months of October through May;
(11) Motor vehicles, other than off-highway vehicles. This exemption does not include sound emanating from motor vehicle sound systems;
(12) Heating and air conditioning equipment;
(13) Safety, warning and alarm devices, including, but not limited to, house and car alarms, and other warning devices that are designed to protect the public health, safety, and welfare; or
(14) The discharge of firearms consistent with all state laws

Section 11.05.040 – General Sound Level Standards

No person shall create any sound, or allow the creation of any sound, on any property that causes the exterior sound level on any other occupied property to exceed the sound level standards set forth in Table 1 of this section or that violates the special sound source standards set forth in Section 11.05.060.

Table 1: Allowable Exterior Noise Level

Sound Level Standards (dBA Leq)		
General Plan Land Use Designation	**Maximum Decibel Level**	
	7 a.m. - 10 p.m.	**10 p.m. - 7 a.m.**
Light density residential (LDR)	55	45
Medium density residential (MDR)		
High density residential (HDR)		
Retail commercial (CR)	65	55
Light Industrial	75	55
Business Park (BP)	65	45

(Ord. No. 2012-01, § 1(11.10.040), 2-16-2012)

Sec. 11.05.060. - Special sound sources standards.
The general sound level standards set forth in Section 11.05.040 apply to sound emanating from all sources, including the following special sound sources, and the person creating, or allowing the creation of, the sound is subject to the requirements of that section. The following special sound sources are also subject to the following additional standards, the failure to comply with which constitute separate violations of this chapter:

(2) Power tools and equipment. No person shall operate any power tools or equipment between the hours of ten (10:00) p.m. and eight (8:00) a.m. such that the power tools or equipment are audible to the human ear inside an inhabited dwelling other than a dwelling in which the power tools or equipment may be located. No person shall operate any power tools or equipment at any other time such that the power tools or equipment are audible to the human ear at a distance greater than one hundred (100) feet from the power tools or equipment. Sound level measurements may be used but are not required to establish a violation of this subsection.

Sec. 11.05.070. - Exceptions.
Exceptions may be requested from the standards set forth in Section 11.05.040 or 11.05.060 and may be characterized as construction-related or continuous events exceptions.

(1) Application and processing.

(a) Construction-related exceptions. An application for a construction-related exception shall be made to and considered by the Building Official of the city on forms provided by the Building and Safety Division and shall be accompanied by the appropriate filing fee. No public hearing is required.

(b) Continuous events exceptions. An application for a continuous events exception shall be made to the Planning Director on forms provided by the Planning Department and shall be accompanied by the appropriate filing fee. Upon receipt of an application for a continuous events exception, the Planning Director shall set the matter for public hearing before the Planning Commission, notice of which shall be given as provided in Section 9.240.250 of this Code. Notwithstanding the above, an application for a continuous events exception that is associated with an application for a land use permit shall be processed concurrently with the land use permit in the same manner that the land use permit is required to be processed.

(2) Requirements for approval. The appropriate decision-making body or officer shall not approve an exception application unless the applicant demonstrates that the activities described in the application would not be detrimental to the health, safety or general welfare of the community. In determining whether activities are detrimental to the health, safety or general welfare of the community, the appropriate decision-making body or officer shall consider such factors as the proposed duration of the activities and their location in relation to sensitive receptors. If an exception application is approved, reasonable conditions may be imposed to minimize the public detriment, including, but not limited to, restrictions on sound level, sound duration and operating hours.

(3) Appeals. The Building Official's decision on an application for a construction-related exception is considered final. After making a decision on an application for a continuous events exception, the appropriate decision-making body or officer shall mail notice of the decision to the applicant. Within ten (10) calendar days after the mailing of such notice, the applicant or an interested person may appeal the decision to the City Council pursuant to the provisions of Section 2.05.060.

City of Jurupa Valley – Noise Element

Goals, Policies, and Implementation Measures

Policies, goals and implementation program measures from the Noise Element that would mitigate potential impacts on noise include the following.

NE 3.1 Noise Analysis. Require that a noise analysis be conducted by an acoustical specialist for all proposed development projects that have the potential to generate significant noise near a noise-sensitive land use, or on or near land designated for noise-sensitive land uses, and ensure that recommended mitigation measures are implemented.

NE 3.3 Noise Buffers. Require major stationary noise generating sources to install noise buffering or reduction mechanisms within their facilities to reduce noise generation levels to the lowest level practical as a condition of the approval or renewal of project entitlements.

NE 3.4 Construction Equipment. Require that all construction equipment utilize noise reduction features (i.e., mufflers and engine shrouds) that are at least as effective as those originally installed by the equipment's manufacturer.

NE 3.5 Construction Noise. Limit commercial construction activities adjacent to or within 200 feet of residential uses to weekdays, between 7:00 a.m. and 6:00 p.m., and limit high-noise-generating construction activities (e.g., Page 7-20 Jurupa Valley General Plan Update, 2017 grading, demolition, pile driving) near sensitive receptors to weekdays between 9:00 a.m. and 3:00 p.m.

NE 3.7 Automobile-Oriented Uses. Require that parking structures, terminals, drive-through restaurants, automobile sales and repair, fueling stations, minimarts, car washes, and similar automobile-oriented uses be sited and designed to minimize potential noise impacts on adjacent land uses.

5.0 Study Method and Procedure

The following section describes the noise modeling procedures and assumptions used for this assessment.

5.1 Noise Measurement Procedure and Criteria

Noise measurements are taken to determine the existing noise levels. A noise receiver or receptor is any location in the noise analysis in which noise might produce an impact. The following criteria are used to select measurement locations and receptors:

- Locations expected to receive the highest noise impacts, such as the first row of houses
- Locations that are acoustically representative and equivalent of the area of concern
- Human land usage
- Sites clear of major obstruction and contamination

MD conducted the sound level measurements in accordance to City's noise ordinance, the Federal Highway Transportation (FHWA) and Caltrans (TeNS) technical noise specifications. All measurement equipment meets American National Standards Institute (ANSI) specifications for sound level meters (S1.4-1983 identified in Chapter 19.68.020.AA). The following gives a brief description of the Caltrans Technical Noise Supplement procedures for sound level measurements:

- Microphones for sound level meters were placed 5-feet above the ground for all measurements
- Sound level meters were calibrated (Larson Davis CAL 200) before and after each measurement
- Following the calibration of equipment, a windscreen was placed over the microphone
- Frequency weighting was set on "A" and slow response
- Results of the long-term noise measurements were recorded on field data sheets
- During any short-term noise measurements, any noise contaminations such as barking dogs, local traffic, lawn mowers, or aircraft fly-overs were noted
- Temperature and sky conditions were observed and documented

5.2 Noise Measurement Locations

Noise monitoring locations were selected based on the project site's boundary. One (1) Long-term 24 hour noise measurement was conducted at the site's property line and is illustrated in Exhibit E. Appendix A includes photos, field sheet, and measured noise data.

5.3 Stationary Noise Modeling

SoundPLAN (SP) acoustical modeling software was utilized to model future worst-case stationary noise impacts to the adjacent land uses. SP is capable of evaluating multiple stationary noise source impacts at various receiver locations. SP's software utilizes algorithms (based on the inverse square law and reference equipment noise level data) to calculate noise level projections. The software allows the user to input specific noise sources, spectral content, sound barriers, building placement, topography, and sensitive receptor locations.

The future worst-case noise level projections were modeled using referenced sound level data for the various stationary on-site sources (parking spaces and loading docks). The model assumes that the

building facility has four (4) rooftop HVAC units, and approximately 21 parking spaces, and 79 RV parking spaces.

Rooftop HVAC units were modeled as point sources with a reference noise level per manufacturer cut sheets. The model does not include parapets, which are anticipated and will further reduce the noise levels.

Parking was modeled as 1 car movement per parking space per hour.

The SP model assumes that all noise sources are operating simultaneously (worst-case scenario) when in actuality the noise will be intermittent and lower in noise level.

Finally, the model is able to evaluate the noise attenuating effects of any existing or proposed property line walls. Input and output calculations are provided in Appendix C.

Table 2: Reference Sound Level Measurements for SoundPLAN Model

Source	Source Type	Reference Level (dBA)	Descriptor
Rooftop HVAC Unit	Point Source	79-83	Sound Power
Parking	Area (SP Parking Tool)	-	1 movement per hr

5.4 FHWA Roadway Construction Noise Model

The construction noise analysis utilizes the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RNCM), together with several key construction parameters. Key inputs include distance to the sensitive receiver, equipment usage, % usage factor, and baseline parameters for the project site.

The project was analyzed based on the different construction phases. Construction noise is expected to be loudest during the grading, concrete and building phases of construction. The construction noise calculation output worksheet is located in Appendix D. The following assumptions relevant to short-term construction noise impacts were used:

- It is estimated that construction will occur over a 12-month time period. Construction noise is expected to be the loudest during the grading, concrete, and building phases.

Exhibit E

Measurement Locations

6.0 Existing Noise Environment

One (1) twenty-four-hour ambient noise measurement was conducted at the project site. Noise measurements were taken to determine the existing ambient noise levels. Noise data indicates that traffic along I-15 Freeway is the primary sources of noise impacting the site and the surrounding area. Therefore, this assessment will utilize the ambient noise data as a basis and compare levels to said data.

6.1 Long-Term Noise Measurement Results

The results of the Long-term noise data are presented in Table 3.

Table 3: Long-Term Noise Measurement Data[1]

Date	Time	1-Hour dB(A)							
		L_{EQ}	L_{MAX}	L_{MIN}	L_2	L_8	L_{25}	L_{50}	L_{90}
4/21/2023	12AM-1AM	55.0	67.7	50.5	66.4	63.2	60.9	58.9	55.9
4/21/2023	1AM-2AM	52.6	65.3	50.6	66.5	63.3	61.0	59.0	56.0
4/21/2023	2AM-3AM	51.4	64.1	50.8	66.7	63.5	61.2	59.2	56.2
4/21/2023	3AM-4AM	49.6	62.3	52.0	67.9	64.7	62.4	60.4	57.4
4/21/2023	4AM-5AM	50.6	63.3	53.6	69.5	66.3	64.0	62.0	59.0
4/21/2023	5AM-6AM	54.4	67.1	53.2	69.1	65.9	63.6	61.6	58.6
4/21/2023	6AM-7AM	60.8	73.5	51.5	67.4	64.2	61.9	59.9	56.9
4/21/2023	7AM-8AM	63.1	75.8	50.1	66.0	62.8	60.5	58.5	55.5
4/21/2023	8AM-9AM	61.2	73.9	49.0	64.9	61.7	59.4	57.4	54.4
4/21/2023	9AM-10AM	60.2	72.9	48.3	64.2	61.0	58.7	56.7	53.7
4/21/2023	10AM-11AM	60.1	72.8	47.3	63.2	60.0	57.7	55.7	52.7
4/21/2023	11AM-12PM	60.3	73.0	46.7	62.6	59.4	57.1	55.1	52.1
4/21/2023	12PM-1PM	60.4	73.1	45.1	61.0	57.8	55.5	53.5	50.5
4/21/2023	1PM-2PM	60.5	73.2	42.7	58.6	55.4	53.1	51.1	48.1
4/21/2023	2PM-3PM	60.7	73.4	41.5	57.4	54.2	51.9	49.9	46.9
4/21/2023	3PM-4PM	61.9	74.6	39.7	55.6	52.4	50.1	48.1	45.1
4/21/2023	4PM-5PM	63.5	76.2	40.7	56.6	53.4	51.1	49.1	46.1
4/21/2023	5PM-6PM	63.1	75.8	44.5	60.4	57.2	54.9	52.9	49.9
4/21/2023	6PM-7PM	61.4	74.1	50.9	66.8	63.6	61.3	59.3	56.3
4/21/2023	7PM-8PM	60.0	72.7	53.2	69.1	65.9	63.6	61.6	58.6
4/21/2023	8PM-9PM	58.9	71.6	51.3	67.2	64.0	61.7	59.7	56.7
4/21/2023	9PM-10PM	58.2	70.9	50.3	66.2	63.0	60.7	58.7	55.7
4/21/2023	10PM-11PM	57.2	69.9	50.2	66.1	62.9	60.6	58.6	55.6
4/21/2023	11PM-12AM	56.6	69.3	50.4	66.3	63.1	60.8	58.8	55.8
CNEL		63.8							

Notes:

1. Long-term noise monitoring location (LT1) is illustrated in Exhibit E.

Noise data indicates the ambient noise level ranges between 49.6 dBA Leq to 63.5 dBA Leq depending on location. Additional field notes and photographs are provided in Appendix A. The quietest ambient noise measurement measured 49.6 dBA Leq. The study will compare the project noise levels to the quietest ambient noise level as a worst case scenario.

7.0 Future Noise Environment Impacts and Mitigation

This assessment analyzes future noise impacts as a result of the project. The analysis details the estimated exterior noise levels. Stationary noise impacts are analyzed from the on-site noise sources such as trucks loading and unloading.

7.1 Future Exterior Noise

The following outlines the exterior noise levels associated with the proposed project.

7.1.1 Noise Impacts to Off-Site Receptors Due to Stationary Sources

Adjacent uses that may be affected by project operational noise include residential to the north. The worst-case stationary noise was modeled using SoundPLAN acoustical modeling software. Worst-case assumes that all project activities are always operational when in reality the noise will be intermittent and cycle on/off depending on usage. Project operations are anticipated to occur 24 hours a day. The light density residential stationary noise limit of 45 dBA.

A total of seven (7) receptors were modeled to evaluate the proposed project's operational impact. A receptor is denoted by a yellow dot. All yellow dots represent a property line.

This study compares the Project's operational noise levels to two (2) different noise assessment scenarios: 1) Project Only operational noise level projections, 2) Project plus ambient noise level projections.

Project Operational Noise Levels
Exhibit F shows the "project only" operational noise levels at the property lines and adjacent areas. Exhibit F shows the noise contours at the project site and illustrates how the noise will propagate at the site. Operational noise levels at the adjacent uses are anticipated to range between 41 dBA to 44 dBA Leq (depending on the location).

The "project only" noise projections to the adjacent uses are below the City's nighttime 45 dBA light density residential limit, as outlined within the City's noise ordinance (see Section 4.3).

Project Plus Ambient Operational Noise Levels
Table 3 demonstrates the project plus the ambient noise levels. Project plus ambient noise level projections are anticipated measure 51 dBA Leq at receptors (R1 – R7).

<Table 3 Next Page>

Table 4: Worst-case Predicted Operational Leq Noise Level[1]

Receptor[1]	Floor	Existing Ambient Noise Level (dBA, Leq)[2]	Project Noise Level (dBA, Leq)[3]	Total Combined Noise Level (dBA, Leq)	Nighttime (10PM – 7AM) Stationary Noise Limit (dBA, Leq)	Change in Noise Level as Result of Project
1	1	50	43	51	**45**	1
2	1		43	51		1
3	1		44	51		1
4	1		43	51		1
5	1		43	51		1
6	1		42	51		1
7	1		41	51		1

Notes:
[1.] Receptor 1 -7 represents the noise level at the nearest residential receptors
[3.] See Exhibit f for the operational noise level projections at said receptors.

As shown in Table 4, the project will increase the worst-case noise level by approximately 1 dBA Leq at receptors (R1 – R7). It takes a change of 3 dBA to hear a noticeable difference. The increase in noise level is below the typical noticeable difference in change of noise levels.

Table 5 provides the characteristics associated with changes in noise levels.

Table 5: Change in Noise Level Characteristics[1]

Changes in Intensity Level, dBA	Changes in Apparent Loudness
1	Not perceptible
3	Just perceptible
5	Clearly noticeable
10	Twice (or half) as loud

https://www.fhwa.dot.gov/environMent/noise/regulations_and_guidance/polguide/polguide02.cfm

The change in noise level would fall within the “Not Perceptible” acoustic characteristic.

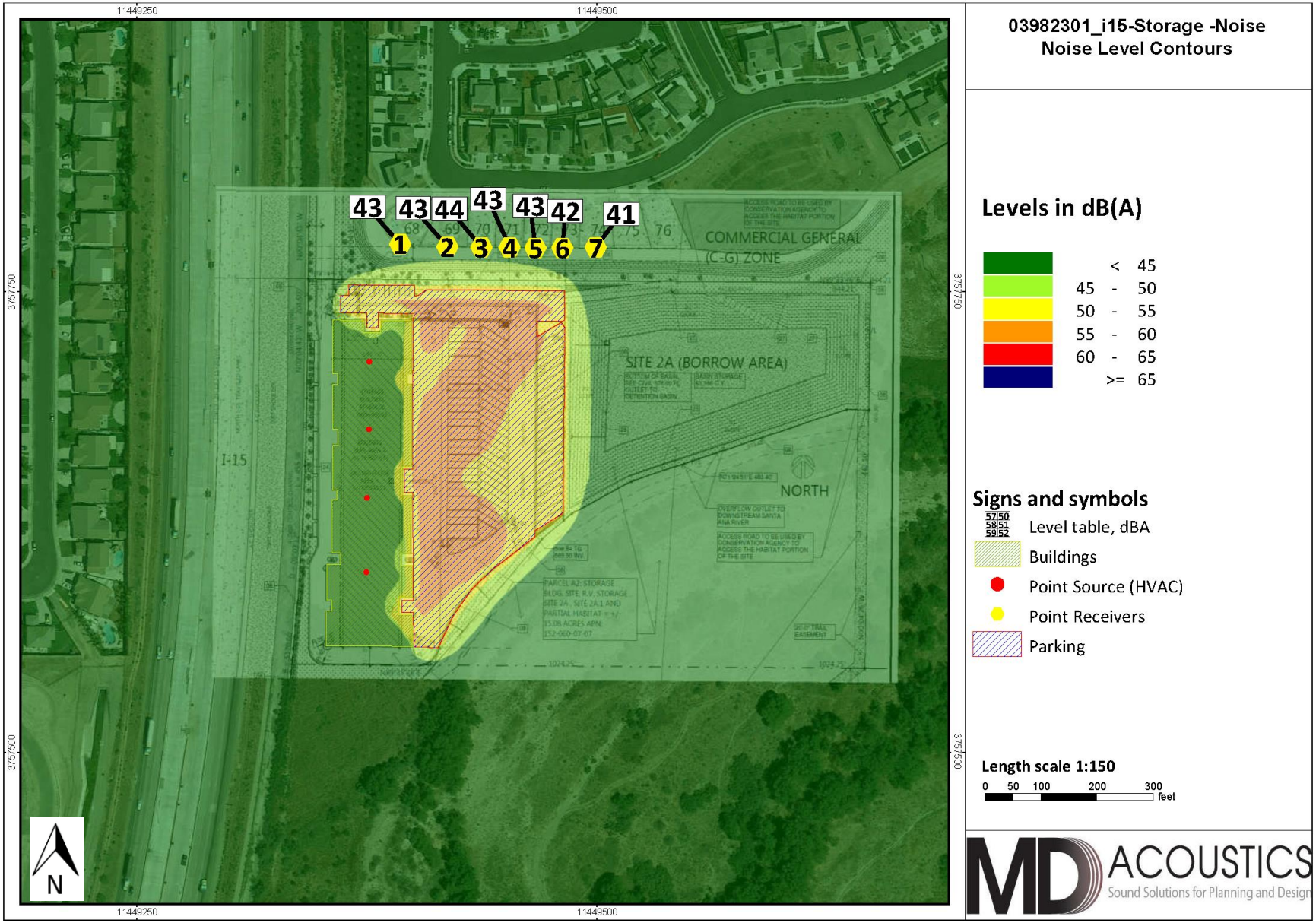
7.1.2 Noise Impacts to On/Off-Site Receptors Due to Project Generated Traffic

Traffic along the subject roadways would need to double in average daily traffic volumes to see a 3 dBA increase in noise level. The proposed project generates less than 50 peak hour trips and less than 250 daily trips. Therefore, based on the City of Jurupa Valley Traffic Impact Analysis Guidelines, the proposed project does not require a TIA that includes LOS analysis or a comprehensive VMT assessment per the memo provided by TJW Engineering, 4/13/2023 (*Jurupa Valley Self-Storage Trip Generation and VMT Analysis*), see Appendix B.

Since the project generates a nominal amount of traffic relative to the existing ADTs, the project's traffic noise level increase would be nominal and therefore less than significant.

Exhibit F

Operational Noise Levels



8.0 Construction Noise Impact

The degree of construction noise may vary for different areas of the project site and also vary depending on the construction activities. Noise levels associated with the construction will vary with the different phases of construction.

8.1 Construction Noise

The Environmental Protection Agency (EPA) has compiled data regarding the noise generated characteristics of typical construction activities. The data is presented in Table 6.

Table 6: Typical Construction Equipment Noise Levels[1]

Type	Lmax (dBA) at 50 Feet
Backhoe	80
Truck	88
Concrete Mixer	85
Pneumatic Tool	85
Pump	76
Saw, Electric	76
Air Compressor	81
Generator	81
Paver	89
Roller	74

Notes:
[1] Referenced Noise Levels from FTA noise and vibration manual.

Construction is considered a short-term impact and would be considered significant if construction activities are taken outside the allowable times as described in the City's Noise Element Section 11.05.040 Table 1. Construction is anticipated to occur during the permissible hours according to the City's Municipal Code. Construction noise will have a temporary or periodic increase in the ambient noise level above the existing within the project vicinity. Furthermore, noise reduction measures are provided to further reduce construction noise. The impact is considered less than significant however construction noise level projections are provided.

Typical operating cycles for these types of construction equipment may involve one or two minutes of full power operation followed by three to four minutes at lower power settings. Noise levels will be loudest during site preparation phase. A likely worst-case construction noise scenario during site preparation assumes the use of 4-tractors, and 3-dozers operating at 290 feet from the property boundary.

Assuming a usage factor of 40 percent for each piece of equipment, unmitigated noise levels at 290 feet have the potential to reach 67.4 dBA L_{eq} at the property boundary during site preparation.

8.2 Construction Vibration

Construction activities can produce vibration that may be felt by adjacent land uses. The construction of the proposed project would not require the use of equipment such as pile drivers, which are known to generate substantial construction vibration levels. The primary vibration source during construction may be from a bulldozer. A large bulldozer has a vibration impact of 0.089 inches per second peak particle velocity (PPV) at 25 feet which is perceptible but below any risk to architectural damage.

The fundamental equation used to calculate vibration propagation through average soil conditions and distance is as follows:

$$PPV_{equipment} = PPV_{ref} (100/D_{rec})^n$$

Where: PPV_{ref} = reference PPV at 100ft.
D_{rec} = distance from equipment to receiver in ft.
n = 1.1 (the value related to the attenuation rate through ground)

The thresholds from the Caltrans Transportation and Construction Induced Vibration Guidance Manual in Table 7 (below) provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts.

Table 7: Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent 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 structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Table 19, Transportation and Construction Vibration Guidance Manual, Caltrans, Sept. 2013.
Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Table 8 gives approximate vibration levels for particular construction activities. This data provides a reasonable estimate for a wide range of soil conditions.

<Table 8, next page>

Table 8: Vibration Source Levels for Construction Equipment[1]

Equipment	Peak Particle Velocity (inches/second) at 25 feet	Approximate Vibration Level LV (dVB) at 25 feet
Pile driver (impact)	1.518 (upper range)	112
	0.644 (typical)	104
Pile driver (sonic)	0.734 upper range	105
	0.170 typical	93
Clam shovel drop (slurry wall)	0.202	94
Hydromill	0.008 in soil	66
(slurry wall)	0.017 in rock	75
Vibratory Roller	0.21	94
Hoe Ram	0.089	87
Large bulldozer	0.089	87
Caisson drill	0.089	87
Loaded trucks	0.076	86
Jackhammer	0.035	79
Small bulldozer	0.003	58

[1] Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006.

At a distance of 67 feet (distance of nearest structure from the site's eastern boundary), a large bulldozer would yield a worst-case 0.030 PPV (in/sec) which may be perceptible for short periods of time during grading along the eastern property line of the project site, but is below any threshold of damage. The impact is less than significant, and no mitigation is required.

8.3 Construction Noise Reduction Measures

Construction operations must follow the City's General Plan and the Noise Ordinance, which states that construction, repair or excavation work performed must occur within the permissible hours. To further ensure that construction activities do not disrupt the adjacent land uses, the following measures should be taken:

1. Construction should occur during the permissible hours as defined in NE3.5 Policy and Section 11.05.020.

2. During construction, the contractor shall ensure all construction equipment is equipped with appropriate noise attenuating devices.

3. The contractor should locate equipment staging areas that will create the greatest distance between construction-related noise/vibration sources and sensitive receptors nearest the project site during all project construction.

4. Idling equipment should be turned off when not in use.

5. Equipment shall be maintained so that vehicles and their loads are secured from rattling and banging.

9.0 References

State of California General Plan Guidelines: 1998. Governor's Office of Planning and Research

City of Jurupa Valley: General Plan Noise Element. Chapter 7.

Traffic Engineering & Transportation Planning Consulting (TJW) – Jurupa Valley Self-Storage Trip Generation and VMT Analysis, City of Jurupa Valley – 4/14/2023

Appendix A:

Photographs and Field Measurement Data

MD ACOUSTICS
Sound Solutions for Planning and Design
www.mdacoustics.com

AZ Office
4960 S. Gilbert Rd, Ste 1-461
Chandler, AZ 85249

CA Office
1197 E Los Angeles Ave, C-256
Simi Valley, CA 93065

24-Hour Continuous Noise Measurement Datasheet

Project:	I-15/Jurupa Valley Storage Noise	**Site Observations:**	Clear Sky, Meter at the northwest corner of the site as close to the homes as possible.
Site Address/Location:	East side of 1-15 freeway, Jurupa Valley CA		
Date:	4/21/2023 to 4/22/2022		
Field Tech/Engineer:	Jason Schuyler		

General Location:

Sound Meter:	NTi XL2 **SN:** 80206	**Site Topo:**	Flat
Settings:	A-weighted, slow, 1-min, 24-hour duration	**Ground Type:**	Soft site, Open raw ground with a road
Meteorological Con.:	88 degrees F, 1 to 3 mph wind, west to east diretion		
Site ID:	LT-1		

Noise Source(s) w/ Distance:
C/L of I-15 is 265 feet from meter

Figure 1: LT-1 Monitoring Location

Figure 2: LT-1 Photo

MD ACOUSTICS
Sound Solutions for Planning and Design
www.mdacoustics.com

AZ Office
4960 S. Gilbert Rd, Ste 1-461
Chandler, AZ 85249

CA Office
1197 E Los Angeles Ave, C-256
Simi Valley, CA 93065

24-Hour Noise Measurement Datasheet - Cont.

Project: I-15/Jurupa Valley Storage Noise **Day:** 1 of 1

Site Address/Location: East side of 1-15 freeway, Jurupa Valley CA

Site ID: LT-1

Date	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
4/21/2023	12:00 AM	1:00 AM	55.0	67.7	50.5	66.4	63.2	60.9	58.9	55.9
4/21/2023	1:00 AM	2:00 AM	52.6	65.3	50.6	66.5	63.3	61.0	59.0	56.0
4/21/2023	2:00 AM	3:00 AM	51.4	64.1	50.8	66.7	63.5	61.2	59.2	56.2
4/21/2023	3:00 AM	4:00 AM	49.6	62.3	52.0	67.9	64.7	62.4	60.4	57.4
4/21/2023	4:00 AM	5:00 AM	50.6	63.3	53.6	69.5	66.3	64.0	62.0	59.0
4/21/2023	5:00 AM	6:00 AM	54.4	67.1	53.2	69.1	65.9	63.6	61.6	58.6
4/21/2023	6:00 AM	7:00 AM	60.8	73.5	51.5	67.4	64.2	61.9	59.9	56.9
4/21/2023	7:00 AM	8:00 AM	63.1	75.8	50.1	66.0	62.8	60.5	58.5	55.5
4/21/2023	8:00 AM	9:00 AM	61.2	73.9	49.0	64.9	61.7	59.4	57.4	54.4
4/21/2023	9:00 AM	10:00 AM	60.2	72.9	48.3	64.2	61.0	58.7	56.7	53.7
4/21/2023	10:00 AM	11:00 AM	60.1	72.8	47.3	63.2	60.0	57.7	55.7	52.7
4/21/2023	11:00 AM	12:00 PM	60.3	73.0	46.7	62.6	59.4	57.1	55.1	52.1
4/21/2023	12:00 PM	1:00 PM	60.4	73.1	45.1	61.0	57.8	55.5	53.5	50.5
4/21/2023	1:00 PM	2:00 PM	60.5	73.2	42.7	58.6	55.4	53.1	51.1	48.1
4/21/2023	2:00 PM	3:00 PM	60.7	73.4	41.5	57.4	54.2	51.9	49.9	46.9
4/21/2023	3:00 PM	4:00 PM	61.9	74.6	39.7	55.6	52.4	50.1	48.1	45.1
4/21/2023	4:00 PM	5:00 PM	63.5	76.2	40.7	56.6	53.4	51.1	49.1	46.1
4/21/2023	5:00 PM	6:00 PM	63.1	75.8	44.5	60.4	57.2	54.9	52.9	49.9
4/21/2023	6:00 PM	7:00 PM	61.4	74.1	50.9	66.8	63.6	61.3	59.3	56.3
4/21/2023	7:00 PM	8:00 PM	60.0	72.7	53.2	69.1	65.9	63.6	61.6	58.6
4/21/2023	8:00 PM	9:00 PM	58.9	71.6	51.3	67.2	64.0	61.7	59.7	56.7
4/21/2023	9:00 PM	10:00 PM	58.2	70.9	50.3	66.2	63.0	60.7	58.7	55.7
4/21/2023	10:00 PM	11:00 PM	57.2	69.9	50.2	66.1	62.9	60.6	58.6	55.6
4/21/2023	11:00 PM	12:00 AM	56.6	69.3	50.4	66.3	63.1	60.8	58.8	55.8

CNEL: 63.8

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Chandler, AZ 85249

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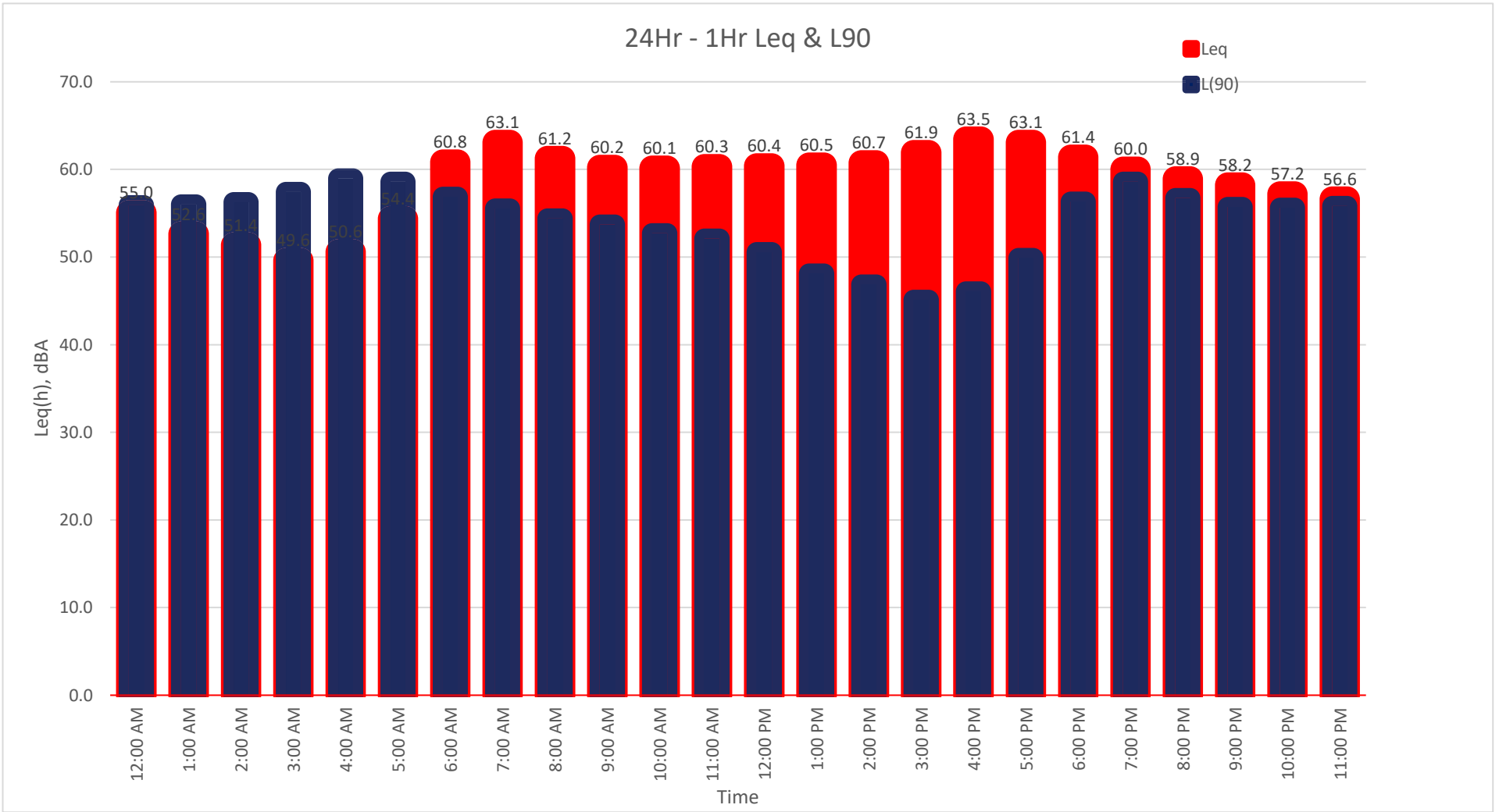
Simi Valley, CA 93065

24-Hour Continuous Noise Measurement Datasheet - Cont.

Project: I-15/Jurupa Valley Storage Noise **Day:** 1 of 1

Site Address/Location: East side of 1-15 freeway, Jurupa Valley CA

Site ID: LT-1



Appendix B:
TJW Engineering Memo

April 14, 2023

TJW ENGINEERING, INC.
TRAFFIC ENGINEERING &
TRANSPORTATION PLANNING
CONSULTANTS

Mr. Steve Galvez
20 Paseo Verde
San Clemente, CA 92673

SUBJECT: Jurupa Valley Self-Storage Trip Generation and VMT Analysis, City of Jurupa Valley

Dear Mr. Galvez,

*TJW Engineering, Inc. (*TJW*)* is pleased to submit this Trip Generation and Vehicle Miles Traveled (VMT) Analysis for the proposed project located south of 68th Street and Pats Ranch Road in the City of Jurupa Valley. The proposed project is a 135,365 square foot self-storage facility. A site plan is attached for reference. The purpose of this memorandum is to summarize the project Trip Generation and VMT.

Proposed Project

The project site is located south of 68th Street and Pats Ranch Road in the City of Jurupa Valley. The project will construct a 135,365 square foot self-storage facility. Site access will be provided via access road from 68th Street between I-15 and the adjacent existing homes.

LOS Analysis Threshold and Trip Generation

The need to evaluate LOS for the proposed project was evaluated based on the City of Jurupa Valley Traffic Impact Analysis Guidelines (November 2020). The guidelines state land uses that generate less than 50 peak hour trips will not require a TIA that includes LOS analysis.

The trip generation for the proposed project was determined using the Institute of Transportation Engineers Trip Generation Manual (11th Edition). Based on the proposed project's intended use, the projected trip generation was determined using the Mini-Warehouse Land Use Code 151. The proposed project is projected to generate 12 total AM peak hour trips, 20 total PM peak hour trips, and 196 total daily trips.

Table 1 – Trip Generation

Proposed Land Use	Qty	Unit	Daily Trips (ADTs)		AM Peak Hour					PM Peak Hour				
			Rate	Volume	Rate	In:Out Split	Volume			Rate	In:Out Split	Volume		
							In	Out	Total			In	Out	Total
Mini-Warehouse (151)	135.365	TSF	1.45	196	0.09	59:41	7	5	12	0.15	47:53	9	11	20
Total				**196**			**7**	**5**	**12**			**9**	**11**	**20**

Notes: ITE Trip Generation (11th Edition, 2021); TSF = Thousand Square Feet.

Vehicle Miles Traveled (VMT)

Senate Bill (SB) 743 was adopted in 2013 requiring the Governor's Office of Planning and Research (OPR) to identify new metrics for identifying and mitigating transportation impacts within the California Environmental Quality Act (CEQA). For land use projects, OPR has identified Vehicle Miles Traveled (VMT) as the new metric for transportation analysis under CEQA. The regulatory changes to the CEQA guidelines that implement SB 743 were approved on December 28th, 2018 with an implementation date of July 1st, 2020 as the new metric.

The City of Jurupa Valley updated their Transportation Impact Analysis Guidelines for Vehicle Miles Traveled and Level of Service Assessment in November 2020. The document outlines guidelines for CEQA analysis including screening criteria and requirements for VMT assessment of land use projects. The VMT guidelines provide several screening criteria for projects including Transit Priority Area (TPA) Screening, Low VMT Area Screening, and Project Type Screening.

The City of Jurupa Valley VMT Analysis Guidelines indicates projects generating less than 250 daily vehicle trips may be presumed to have a less than significant impact based on substantial evidence provided in the OPR Technical Advisory supporting SB 743 implementation. Thus, the project can be considered low vehicle trip generating and is presumed to have a less than significant impact on VMT.

Summary

This memorandum provides an overview of the trip generation and VMT analysis for the proposed project. Based on the City of Jurupa Valley Traffic Impact Analysis Guidelines (November 2020), the proposed project generates less than 50 peak hour trips and less than 250 daily trips. Therefore, the project does not require a TIA that includes LOS analysis or a comprehensive VMT assessment.

Please contact us at (949) 878-3509 if you have any questions regarding this analysis.

Sincerely,

Thomas Wheat, PE, TE
President

David Chew, PTP
Transportation Planner

Registered Civil Engineer *#69467*
Registered Traffic Engineer *#2565*

Brandon Alvarado, EIT
Transportation Planner

Appendix C:

SoundPlan Input/Output

Capacity ratings

AHRI RATINGS

COOLING MODE

50GCQ	NOM. CAPACITY (tons)	NET COOLING CAPACITY (Btuh)	TOTAL POWER (kW)	SEER	EER
M04	3	35,000	2.8	16.2	12.5
M05	4	47,500	3.9	16.2	12.2
M06	5	60,000	4.9	16.2	12.2

HEATING MODE

50GCQ	HSPF	HIGH HEATING CAPACITY (Btuh)	HIGH HEAT COP	LOW HEATING CAPACITY (Btuh)	LOW HEAT COP
M04	8.3	34,000	3.8	17,600	2.4
M05	8.3	45,500	3.7	24,400	2.3
M06	8.3	55,500	3.9	30,000	2.4

LEGEND

AHRI — Air Conditioning, Heating and Refrigeration Institute
ASHRAE — American Society of Heating, Refrigerating and Air Conditioning Engineers
COP — Coefficient of Performance
EER — Energy Efficiency Ratio
HSPF — Heating Seasonal Performance Factor
SEER — Seasonal Energy Efficiency Ratio

NOTES:

1. Rated and certified under AHRI Standard 210/240.
2. Ratings are based on:
   Cooling Standard: 80°F (27°C) db, 67°F (19°C) wb indoor air temperature and 95°F (35°C) db outdoor air temperature.
   High Temperature Heating Ratings: 47°F (8°C) db, 43°F (6°C) wb outdoor air temperature and 70°F (21°C) entering indoor coil air.
   Low Temperature Heating Ratings: 17°F (–8°C) db, 15°F (–9°C) wb outdoor air temperature and 70°F (21°C) entering indoor coil air.
3. All 50GCQ units comply with ASHRAE 90.1 Energy Standard for minimum SEER and EER requirements.

SOUND RATINGS TABLE

50GCQ UNIT	COOLING STAGES	OUTDOOR SOUND (dB) AT 60 Hz								
		A-WEIGHTED	63	125	250	500	1000	2000	4000	8000
M04	2	75.4	81.8	81.8	77.0	72.6	69.9	64.6	59.3	55.6

LEGEND

dB — Decibel

NOTES:

1. Outdoor sound data is measured in accordance with AHRI.
2. Measurements are expressed in terms of sound power. Do not compare these values to sound pressure values because sound pressure depends on specific environmental factors which normally do not match individual applications. Sound power values are independent of the environment and therefore more accurate.
3. A-weighted sound ratings filter out very high and very low frequencies, to better approximate the response of “average” human ear. A-weighted measurements for Carrier units are taken in accordance with AHRI.

MINIMUM - MAXIMUM AIRFLOW RATINGS (CFM) — COOLING UNITS AND ACCESSORY ELECTRIC HEAT

UNIT	COOLING				ELECTRIC HEAT*	
	MINIMUM AIRFLOW CFM	MINIMUM 2-SPEED AIRFLOW (LOW SPEED)	MINIMUM 2-SPEED AIRFLOW (HIGH SPEED)	MAXIMUM AIRFLOW CFM	MINIMUM AIRFLOW CFM	MAXIMUM ARIFLOW CFM
50GCQM04	900	675	900	1500	900	1500
50GCQM05	1200	900	1200	2000	1200	2000
50GCQM06	1500	1125	1500	2500	1500	2500

* Electric heat modules are available as both factory-installed options or field-installed accessories for 50GCQ units.

MINIMUM - MAXIMUM AIRFLOWS (CFM) COOLING AND ELECTRIC HEAT

UNIT	COOLING			ELECTRIC HEATERS		
	Minimum CFM	Minimum CFM 2-Speed Fan Motor (at High Speed)	Minimum CFM 2-Speed Fan Motor (at Low Speed)	Maximum CFM	Minimum CFM	Maximum CFM
50HCQA04	900	N/A	N/A	1500	900	1500
50HCQA05	1200	N/A	N/A	2000	1200	2000
50HCQA06	1500	N/A	N/A	2500	1500	2500
50HCQA07	1800	N/A	N/A	3000	1800	3000
50HCQD07	1800	1800	1200	3000	1800	3000
50HCQD08	2250	2250	1500	3750	2250*	3750
50HCQD09	2550	2873	1915	4250	2252*	4250
50HCQD12	3000	3380	2253	5000	3000*	5000

* Minimum electric heat CFM exceptions:

UNIT	UNIT VOLTAGE	HEATER kW	UNIT CONFIGURATION	REQUIRED MINIMUM CFM
50HCQD08 50HCQD09	575	17.0	Horizontal or Vertical	2800
		34.0		2350
50HCQD12	230	50.0	Vertical	3550
		50.0	Horizontal	3420
		43.5	Horizontal or Vertical	3040
	575	50.0	Vertical	3150
		33.5	Vertical	3520
		33.5	Horizontal	3420
		26.5	Vertical	3610

SOUND PERFORMANCE

50HCQ UNIT	OUTDOOR SOUND (dB) AT 60 Hz								
	A-Weighted	63	125	250	500	1000	2000	4000	8000
A04	76	51.8	69.0	64.6	67.8	70.7	63.8	60.9	59.0
A05	79	56.1	69.6	68.7	72.5	72.8	68.9	65.0	61.2
A06	79	57.7	66.6	68.7	72.9	74.5	71.1	67.6	62.6
A07	81	86.7	82.7	79.1	78.4	75.4	71.2	67.8	62.9
D07	81	86.7	82.7	79.1	78.4	75.4	71.2	67.8	62.9
D09	87	61.7	74.7	77.4	82.6	84.9	81.9	78.8	75.9
D12	83	61.0	67.3	75.1	77.7	78.1	75.5	71.2	66.7

LEGEND

dB —Decibel

NOTES:

1. Outdoor sound data is measure in accordance with AHRI standard 270.
2. Measurements are expressed in terms of sound power. Do not compare these values to sound pressure values because sound pressure depends on specific environmental factors which normally do not match individual applications. Sound power values are independent of the environment and therefore more accurate.
3. A-weighted sound ratings filter out very high and very low frequencies, to better approximate the response of “average” human ear. A-weighted measurements for Carrier units are taken in accordance with AHRI standard 270.

i15-Storage -Noise
Contribution spectra - 001 - i15-Storage: Outdoor SP

Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	12.5kHz	16kHz	20kHz	
	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	
Receiver R1 Fl G Lr,lim dB(A) Leq,d 42.6 dB(A)																																
Leq,d	42.6					28.7			37.7			26.1			32.3			35.4			36.1			31.9			21.5			-0.7		
Leq,d	13.3	-36.6	-30.6	-26.6	-13.6	-8.6	-14.6	-6.6	-4.7	-5.8	-3.8	-3.8	-1.8	-0.9	0.1	4.0	5.7	1.6	3.4	4.4	1.8	2.1	-2.3	-3.3	-8.4	-13.2	-25.3	-40.8	-57.4	-80.8		
Leq,d	15.8	-34.4	-28.4	-24.4	-11.4	-6.4	-12.4	-4.4	-2.5	-3.5	-1.6	-1.5	0.4	1.4	2.3	6.3	8.1	3.9	5.8	6.9	4.4	4.8	0.8	0.3	-4.2	-7.9	-18.5	-31.6	-44.9	-64.0	-88.7	
Leq,d	18.7	-31.7	-25.7	-21.7	-8.7	-3.7	-9.7	-1.7	0.2	-0.8	1.2	1.2	3.1	4.1	5.1	9.0	10.9	6.8	8.6	9.8	7.5	8.0	4.3	4.1	0.4	-2.4	-11.5	-22.4	-32.7	-47.8	-67.6	
Leq,d	22.8	-27.9	-21.9	-17.9	-4.9	0.1	-5.9	2.1	4.0	3.0	5.0	5.0	7.0	8.0	9.0	12.9	14.8	10.7	12.7	13.8	11.6	12.3	8.8	9.1	6.0	4.2	-3.4	-12.3	-19.7	-30.8	-45.7	
Leq,d																																
Leq,d																																
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Leq,d																																
Leq,d																																
Receiver R2 Fl G Lr,lim dB(A) Leq,d 43.4 dB(A)																																
Leq,d	43.4					29.2			38.3			26.9			33.1			36.4			37.1			32.9			22.3			-0.5		
Leq,d	13.1	-36.7	-30.7	-26.7	-13.7	-8.8	-14.8	-6.8	-4.8	-5.9	-3.9	-3.9	-2.0	-1.1	-0.1	3.8	5.6	1.4	3.2	4.2	1.7	1.9	-2.5	-3.5	-8.7	-13.6	-25.9	-41.5	-58.3	-82.0		
Leq,d	15.5	-34.7	-28.6	-24.6	-11.7	-6.7	-12.7	-4.7	-2.7	-3.8	-1.8	-1.8	0.1	1.1	2.1	6.0	7.8	3.6	5.5	6.6	4.1	4.5	0.4	-0.2	-4.6	-8.5	-19.2	-32.6	-46.3	-65.8	-91.1	
Leq,d	18.2	-32.2	-26.2	-22.2	-9.2	-4.2	-10.2	-2.2	-0.3	-1.3	0.7	0.7	2.6	3.6	4.6	8.5	10.3	6.2	8.1	9.2	6.9	7.4	3.6	3.4	-0.4	-3.4	-12.7	-24.0	-34.8	-50.6	-71.2	
Leq,d	21.6	-29.1	-23.1	-19.1	-6.1	-1.1	-7.1	0.9	2.9	1.8	3.8	3.8	5.8	6.8	7.8	11.7	13.6	9.5	11.4	12.6	10.3	11.0	7.4	7.6	4.3	2.2	-5.8	-15.3	-23.4	-35.7	-51.9	
Leq,d																																
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Leq,d																																
Receiver R3 Fl G Lr,lim dB(A) Leq,d 43.5 dB(A)																																
Leq,d	43.5					29.2			38.3			27.0			33.2			36.5			37.2			33.0			22.4			-0.4		
Leq,d	12.9	-37.0	-31.0	-27.0	-14.0	-9.0	-15.0	-7.0	-5.1	-6.2	-4.2	-4.2	-2.2	-1.3	-0.3	3.6	5.3	1.1	2.9	4.0	1.4	1.6	-2.8	-3.9	-9.2	-14.2	-26.7	-42.6	-59.8	-84.1		
Leq,d	15.0	-35.0	-29.0	-25.0	-12.0	-7.1	-13.1	-5.1	-3.1	-4.2	-2.2	-2.2	-0.2	0.7	1.7	5.6	7.4	3.2	5.1	6.2	3.7	4.0	-0.1	-0.7	-5.3	-9.4	-20.3	-34.1	-48.3	-68.5	-94.7	
Leq,d	17.5	-32.8	-26.8	-22.8	-9.8	-4.9	-10.9	-2.9	-0.9	-2.0	0.0	0.0	2.0	3.0	3.9	7.9	9.7	5.6	7.4	8.6	6.2	6.7	2.8	2.5	-1.5	-4.6	-14.3	-26.1	-37.6	-54.2	-75.9	
Leq,d	20.4	-30.3	-24.3	-20.3	-7.3	-2.3	-8.3	-0.3	1.6	0.6	2.6	2.6	4.5	5.5	6.5	10.4	12.3	8.2	10.1	11.5	9.6	10.1	6.3	6.2	2.5	0.0	-8.6	-18.7	-27.9	-41.4	-59.3	
Leq,d																																
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Leq,d																																
Receiver R4 Fl G Lr,lim dB(A) Leq,d 43.3 dB(A)																																
Leq,d	43.3					29.1			38.2			26.7			32.9			36.3			37.0			32.8			22.0			-0.6		

i15-Storage -Noise
Contribution spectra - 001 - i15-Storage: Outdoor SP

Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	12.5kHz	16kHz	20kHz	
	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	
Leq,d	12.6	-37.2	-31.2	-27.2	-14.2	-9.3	-15.3	-7.3	-5.3	-6.4	-4.4	-4.4	-2.5	-1.6	-0.6	3.3	5.0	0.9	2.6	3.7	1.1	1.2	-3.2	-4.4	-9.7	-14.9	-27.6	-43.8	-61.5	-86.4		
Leq,d	14.6	-35.4	-29.4	-25.4	-12.4	-7.5	-13.5	-5.5	-3.5	-4.6	-2.6	-2.6	-0.7	0.3	1.3	5.2	7.0	2.8	4.6	5.7	3.2	3.5	-0.6	-1.4	-6.1	-10.3	-21.6	-35.7	-50.5	-71.4	-98.6	
Leq,d	17.1	-33.5	-27.4	-23.5	-10.5	-5.5	-11.5	-3.5	-1.5	-2.6	-0.6	-0.6	1.3	2.3	3.3	7.2	9.0	4.9	7.4	8.5	6.1	6.5	2.4	1.9	-2.4	-5.8	-15.9	-28.2	-40.4	-57.9	-80.8	
Leq,d	19.1	-31.4	-25.3	-21.4	-8.4	-3.4	-9.4	-1.4	0.6	-0.5	1.5	1.5	3.5	4.4	5.4	9.4	11.2	7.1	9.0	10.1	7.8	8.4	4.7	4.6	0.9	-1.8	-10.7	-21.5	-31.5	-46.1	-65.4	
Leq,d																																
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Leq,d																																
Receiver R5 Fl G Lr,lim dB(A) Leq,d 42.7 dB(A)																																
Leq,d	42.7					28.2			37.3			26.3			32.5			35.9			36.7			32.3			21.5			-1.0		
Leq,d	12.3	-37.5	-31.5	-27.5	-14.5	-9.5	-15.5	-7.5	-5.6	-6.7	-4.7	-4.7	-2.8	-1.8	-0.9	3.0	4.8	0.6	2.4	3.4	0.8	0.9	-3.6	-4.8	-10.2	-15.6	-28.5	-45.1	-63.3	-88.8		
Leq,d	14.2	-35.8	-29.8	-25.8	-12.8	-7.9	-13.9	-5.8	-3.9	-5.0	-3.0	-3.0	-1.0	-0.1	0.9	4.8	6.6	2.4	4.2	5.3	2.8	3.1	-1.2	-2.0	-6.8	-11.2	-22.8	-37.3	-52.7	-74.4		
Leq,d	16.6	-34.1	-28.0	-24.1	-11.1	-6.1	-12.1	-4.1	-2.1	-3.2	-1.2	-1.2	0.7	1.7	2.7	6.6	8.4	4.3	6.1	8.5	6.1	6.4	2.3	1.7	-2.8	-6.6	-17.2	-30.2	-43.2	-61.7	-85.8	
Leq,d	18.1	-32.3	-26.3	-22.3	-9.3	-4.3	-10.3	-2.3	-0.4	-1.4	0.6	0.6	2.5	3.5	4.5	8.4	10.3	6.1	8.0	9.2	6.8	7.3	3.5	3.3	-0.6	-3.5	-12.9	-24.3	-35.2	-51.0	-71.8	
Leq,d																																
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Leq,d																																
Leq,d																																
Leq,d																																
Receiver R6 Fl G Lr,lim dB(A) Leq,d 41.9 dB(A)																																
Leq,d	41.9					27.6			36.6			25.2			31.4			35.1			35.9			31.4			20.0			-3.1		
Leq,d	11.9	-37.8	-31.8	-27.8	-14.8	-9.8	-15.9	-7.8	-5.9	-7.0	-5.0	-5.0	-3.1	-2.1	-1.2	2.7	4.4	0.3	2.0	3.0	0.4	0.5	-4.0	-5.3	-10.9	-16.4	-29.7	-46.7	-65.4	-91.7		
Leq,d	13.7	-36.3	-30.2	-26.3	-13.3	-8.3	-14.3	-6.3	-4.4	-5.4	-3.5	-3.4	-1.5	-0.6	0.4	4.3	6.1	1.9	3.7	4.8	2.2	2.5	-1.8	-2.7	-7.7	-12.3	-24.2	-39.3	-55.3	-78.0		
Leq,d	15.9	-34.7	-28.7	-24.7	-11.7	-6.7	-12.7	-4.7	-2.8	-3.9	-1.9	-1.9	0.1	1.0	2.0	5.9	7.7	3.6	5.4	7.9	5.4	5.7	1.5	0.8	-3.9	-8.0	-19.0	-32.6	-46.5	-66.1	-91.6	
Leq,d	17.0	-33.2	-27.2	-23.2	-10.2	-5.3	-11.3	-3.2	-1.3	-2.4	-0.4	-0.4	1.6	2.6	3.5	7.5	9.3	5.2	7.0	8.1	5.8	6.2	2.3	2.0	-2.1	-5.4	-15.3	-27.4	-39.3	-56.4	-78.9	
Leq,d																																
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Leq,d																																
Leq,d																																
Leq,d																																
Receiver R7 Fl G Lr,lim dB(A) Leq,d 40.9 dB(A)																																
Leq,d	40.8					27.5			36.3			23.2			29.6			33.8			34.5			29.7			17.1			-8.6		
Leq,d	11.4	-38.2	-32.2	-28.2	-15.2	-10.3	-16.3	-8.3	-6.3	-7.4	-5.4	-5.4	-3.5	-2.6	-1.6	2.3	4.0	-0.2	1.5	2.5	-0.1	-0.1	-4.7	-6.1	-11.8	-17.6	-31.3	-48.9	-68.5	-95.9		
Leq,d	13.8	-36.8	-30.8	-26.8	-13.8	-8.9	-14.9	-6.9	-4.9	-6.0	-4.0	-4.0	-2.1	-1.2	-0.2	3.7	5.5	2.9	4.6	5.6	3.0	3.1	-1.4	-2.6	-8.0	-13.2	-25.8	-41.8	-58.9	-82.9		

i15-Storage -Noise
Contribution spectra - 001 - i15-Storage: Outdoor SP

Time slice	Sum	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz	12.5kHz	16kHz	20kHz	
	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	
Leq,d	14.5	-35.5	-29.5	-25.5	-12.5	-7.5	-13.6	-5.5	-3.6	-4.7	-2.7	-2.7	-0.7	0.2	1.2	5.1	6.9	2.7	4.5	5.6	3.1	3.4	-0.7	-1.5	-6.2	-10.5	-21.8	-36.0	-50.9	-72.0	-99.3	
Leq,d	15.9	-34.3	-28.3	-24.3	-11.3	-6.3	-12.3	-4.3	-2.4	-3.5	-1.5	-1.4	0.5	1.5	2.4	6.3	8.1	4.0	5.9	7.0	4.5	4.9	0.9	0.4	-4.0	-7.7	-18.2	-31.3	-44.5	-63.4	-88.0	
Leq,d																																
Leq,d																																
Leq,d																																
Leq,d																																
Leq,d																																

Source group	Source type	Tr. lane	Leq,d dB(A)	A dB	
Receiver R1 Fl G Lr,lim dB(A) Leq,d 42.6 dB(A)					
Default parking lot noise	PLot		42.6	0.0	
Default industrial noise	Point		22.8	0.0	
Default industrial noise	Point		18.7	0.0	
Default industrial noise	Point		15.8	0.0	
Default industrial noise	Point		13.3	0.0	
Receiver R2 Fl G Lr,lim dB(A) Leq,d 43.4 dB(A)					
Default parking lot noise	PLot		43.4	0.0	
Default industrial noise	Point		21.6	0.0	
Default industrial noise	Point		18.2	0.0	
Default industrial noise	Point		15.5	0.0	
Default industrial noise	Point		13.1	0.0	
Receiver R3 Fl G Lr,lim dB(A) Leq,d 43.5 dB(A)					
Default parking lot noise	PLot		43.5	0.0	
Default industrial noise	Point		20.4	0.0	
Default industrial noise	Point		17.5	0.0	
Default industrial noise	Point		15.0	0.0	
Default industrial noise	Point		12.9	0.0	
Receiver R4 Fl G Lr,lim dB(A) Leq,d 43.3 dB(A)					
Default parking lot noise	PLot		43.3	0.0	
Default industrial noise	Point		19.1	0.0	
Default industrial noise	Point		17.1	0.0	
Default industrial noise	Point		14.6	0.0	
Default industrial noise	Point		12.6	0.0	
Receiver R5 Fl G Lr,lim dB(A) Leq,d 42.7 dB(A)					
Default parking lot noise	PLot		42.7	0.0	
Default industrial noise	Point		18.1	0.0	
Default industrial noise	Point		16.6	0.0	
Default industrial noise	Point		14.2	0.0	
Default industrial noise	Point		12.3	0.0	
Receiver R6 Fl G Lr,lim dB(A) Leq,d 41.9 dB(A)					
Default parking lot noise	PLot		41.9	0.0	
Default industrial noise	Point		17.0	0.0	
Default industrial noise	Point		15.9	0.0	
Default industrial noise	Point		13.7	0.0	
Default industrial noise	Point		11.9	0.0	
Receiver R7 Fl G Lr,lim dB(A) Leq,d 40.9 dB(A)					
Default parking lot noise	PLot		40.8	0.0	
Default industrial noise	Point		15.9	0.0	
Default industrial noise	Point		14.5	0.0	
Default industrial noise	Point		13.8	0.0	
Default industrial noise	Point		11.4	0.0	

i15-Storage -Noise
Octave spectra of the sources in dB(A) - 001 - i15-Storage: Outdoor SP

Name	Source type	I or A m,m²	Li dB(A)	R'w dB	L'w dB(A)	Lw dB(A)	KI dB	KT dB	LwMax dB(A)	DO-Wall dB	Time histogram	Emission spectrum	63Hz dB(A)	125Hz dB(A)	250Hz dB(A)	500Hz dB(A)	1kHz dB(A)	2kHz dB(A)	4kHz dB(A)	8kHz dB(A)	16kHz dB(A)
	PLot	13552.87			50.6	91.9	0.0	0.0		0	100%/24h	Typical spectrum	75.2	86.8	79.3	83.8	83.9	84.3	81.6	75.4	62.6
HVAC	Point				74.9	74.9	0.0	0.0		0	100%/24h	HVAC: 67.7dB @ 3ft - Carrier 50TFQ0006 -	52.0	60.5	62.9	67.2	69.5	69.1	66.1	61.2	48.9
HVAC	Point				74.9	74.9	0.0	0.0		0	100%/24h	HVAC: 67.7dB @ 3ft - Carrier 50TFQ0006 -	52.0	60.5	62.9	67.2	69.5	69.1	66.1	61.2	48.9
HVAC	Point				74.9	74.9	0.0	0.0		0	100%/24h	HVAC: 67.7dB @ 3ft - Carrier 50TFQ0006 -	52.0	60.5	62.9	67.2	69.5	69.1	66.1	61.2	48.9
HVAC	Point				74.9	74.9	0.0	0.0		0	100%/24h	HVAC: 67.7dB @ 3ft - Carrier 50TFQ0006 -	52.0	60.5	62.9	67.2	69.5	69.1	66.1	61.2	48.9

Appendix D:
Construction Input

Receptor - Residences to the North

Construction Phase Equipment Item	# of Items	Item Lmax at 50 feet, dBA[1]	Edge of Site to Receptor, feet	Center of Site to Receptor, feet	Item Usage Percent[1]	Ground Factor[2]	Usage Factor	Receptor Item Lmax, dBA	Recptor. Item Leq, dBA
SITE PREP									
Tractor	4	84	76	290	40	0.66	0.40	79.2	59.7
Dozer	3	82	76	290	40	0.66	0.40	77.2	57.7
							Log Sum	79.2	67.4
GRADE									
Excavator	1	81	76	290	40	0.66	0.40	76.2	56.7
Grader	1	85	76	290	40	0.66	0.40	80.2	60.7
Dozer	1	82	76	290	40	0.66	0.40	77.2	57.7
Crane	3	81	76	290	16	0.66	0.16	76.2	52.7
Dozer	2	82	76	290	40	0.66	0.40	77.2	57.7
								80.2	66.0
BUILD									
Crane	1	81	76	290	16	0.66	0.16	76.2	52.7
Man lift	3	75	76	290	20	0.66	0.20	70.2	47.7
Generator	1	81	76	290	50	0.66	0.50	76.2	57.7
Tractor	3	84	76	290	40	0.66	0.40	79.2	59.7
Welder/Torch	1	74	76	290	40	0.66	0.40	69.2	49.7
								79.2	65.9
PAVE									
Paver	2	77	76	290	50	0.66	0.50	72.2	53.7
Compactor (ground)	2	83	76	290	20	0.66	0.20	78.2	55.7
Roller	2	80	76	290	20	0.66	0.20	75.2	52.7
								78.2	62.0
ARCH COAT									
Compressor (air)	1	78	76	290	40	0.66	0.40	73.2	53.7
								73.2	53.7

[1]FHWA Construction Noise Handbook: Table 9.1 RCNM Default Noise Emission Reference Levels and Usage Factors

VIBRATION LEVEL IMPACT

Project:	I-15/Jurupa Valley Storage	Date: 4/21/23
Source:	Large Bulldozer	
Scenario:	Unmitigated	
Location:	Adjacent residences	
Address:	Jurupa Valley	

PPV = PPVref(25/D)^n (in/sec)

DATA INPUT

Equipment = Type	2	Large Bulldozer	INPUT SECTION IN BLUE
PPVref =	0.089	Reference PPV (in/sec) at 25 ft.	
D =	67.00	Distance from Equipment to Receiver (ft)	
n =	1.10	Vibration attenuation rate through the ground	

Note: Based on reference equations from Vibration Guidance Manual, California Department of Transportation, 2006, pgs 38-43.

DATA OUT RESULTS

PPV =	**0.030**	IN/SEC	OUTPUT IN RED