

Appendix H

Noise Study

16800 Magnolia Mixed-Use Development

Noise Impact Study

City of Fountain Valley, CA

Prepared for:

Ms. Starla Barker
De Novo Planning Group
180 East Main St #108
Tustin, CA 92780

Prepared by:

MD Acoustics, LLC
Claire Pincock, INCE-USA
Naomi Jensen, INCE-USA
1197 Los Angeles Ave, Ste C-256
Simi Valley, CA 93065

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P) AZ - 602.774.1950

P) CA - 805.426.4477

www.mdacoustics.com
info@mdacoustics.com

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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 analysis of traffic noise impacts from the project site
- An analysis of construction noise impacts

1.2 Site Location and Study Area

The project site is located at 16800 Magnolia Street, 9025 Recreation Circle, and an easement over property owned by the Orange County Flood Control District in the City of Fountain Valley, CA, as shown in Exhibit A. Land uses surrounding the site include commercial and single-family residential to the south and single-family residential to the northeast. Land uses to the west of the project site are low-density residential uses within the jurisdiction of Huntington Beach, California. Magnolia Street is to the west, Warner Avenue is to the south, and Highway 405 is to the northeast.

1.3 Proposed Project Description

The project proposes the development of two (2) mixed-use seven-story buildings containing 657 apartments and 4,460 square feet of ground-floor retail. Residential and retail levels one and two will be type I construction, with levels three through seven comprised of type III-A wrap-style wood-frame construction. The North building will have 339 units averaging 923 square feet in size. The South building will have 318 units averaging 928 square feet in size. The two seven story buildings will include seven story Type I-A above grade parking structures. Amenities available to the residents will be located in both the northern and southern buildings and include rooftop pools and spas, pool adjacent rooftop clubrooms, indoor and outdoor fitness areas, business centers, BBQ grills, sky decks, multiple landscaped courtyards for outdoor recreation, indoor and outdoor game spaces, outdoor fireplaces, dog wash stations, and ground floor neighborhood retail. A public dog park will be provided in the eastern portion of the site. The site plan is illustrated in Exhibit B.

This study assesses the operational noise and traffic noise to and from the project site and compares the results to the applicable City noise standards. In addition, the study reviews noise generated by construction activities. Construction activities within the Project area will consist of grading, building, paving, and architectural coating.

Exhibit A
Location Map



2.0 Fundamentals of Noise

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

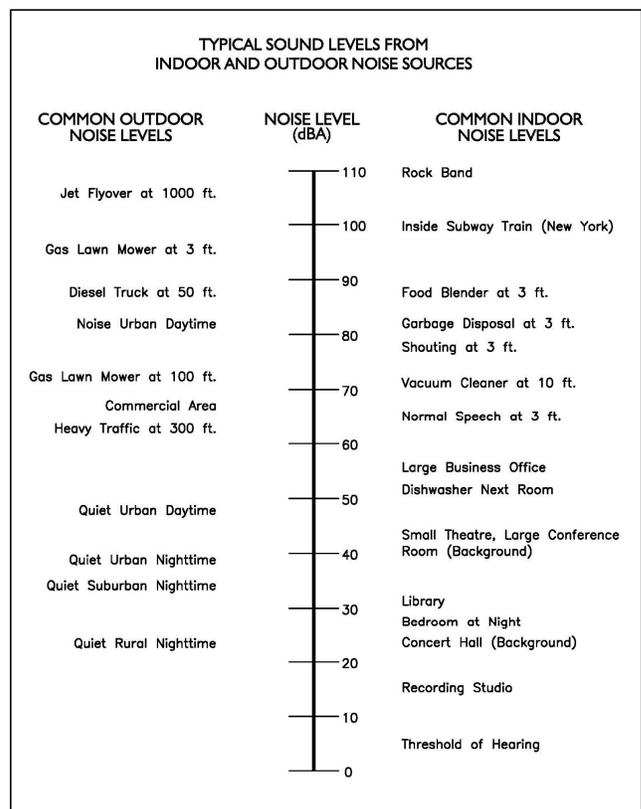
2.3 Sound Pressure Levels and Decibels

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 (N/m²), also called micro-Pascal (μPa). One μPa is approximately one hundred billionths (0.0000000001) 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 reference 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 of 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.

Exhibit C: Typical A-Weighted Noise Levels



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, (A-weighted scale) 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). Typically, the human ear can barely perceive the 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.

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

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: Any 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 how 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.

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 wave front, 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 wave front. 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 wave front. 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 Fountain 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 to regulate noise from aircraft and airports. The Federal Highway Administration (FHWA) is responsible to regulate 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 federal government advocates that local jurisdiction 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.

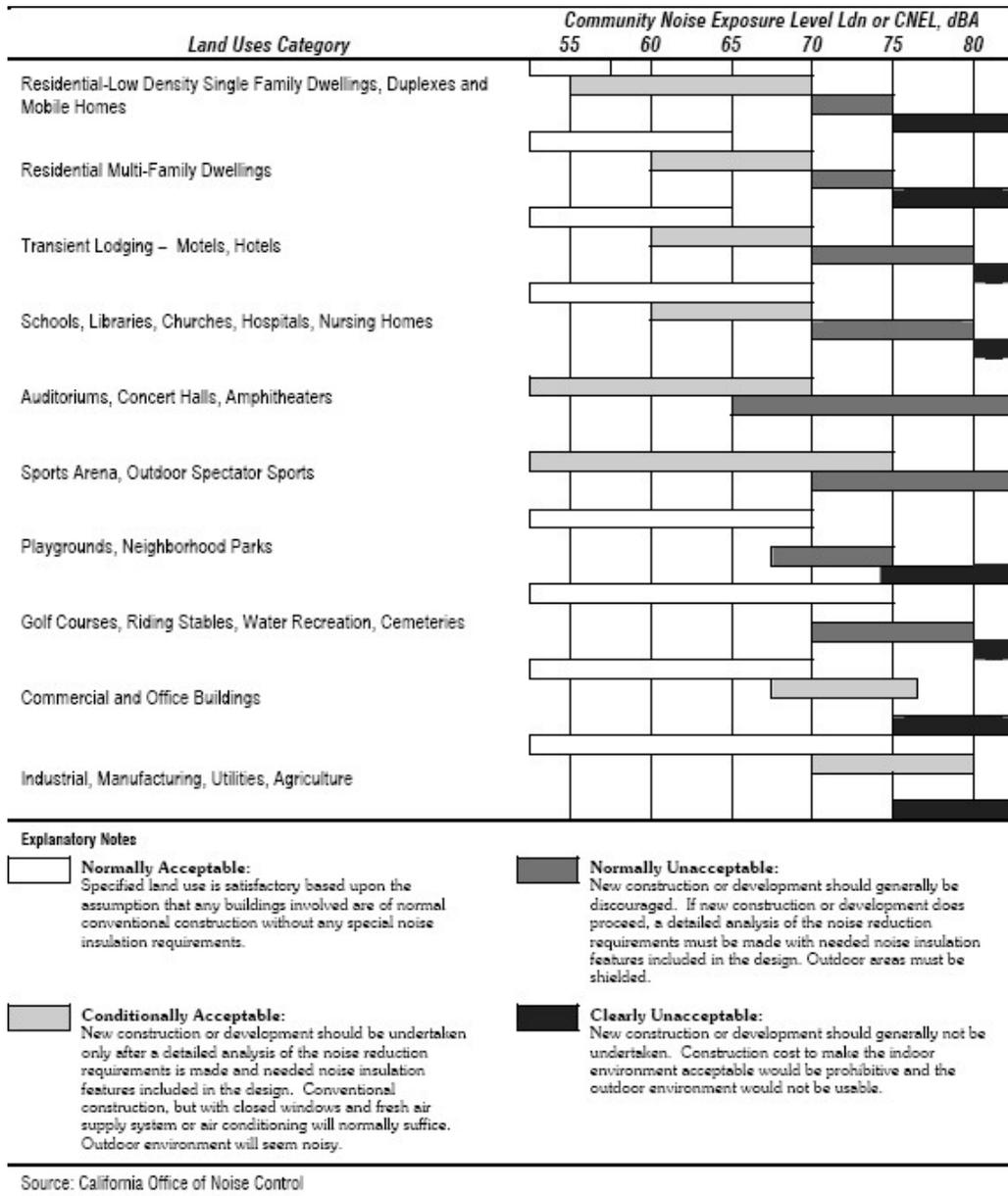
4.2 State Regulations

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regulatory 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 usually recognizes 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 Fountain Valley Noise Regulations

The City of Fountain Valley outlines its noise regulations and standards within the Noise Element from the General Plan and the Noise Ordinance from the Municipal Code.

City of Fountain Valley General Plan

Applicable policies and standards governing environmental noise in the City are set forth in the General Plan's Public Facilities and Safety Element.

The City has outlined goals, policies, and implementation measures to reduce potential noise impacts, which are presented below:

Goals and Policies

Goals and policies from the Noise Element that would mitigate potential impacts on noise include the following.

Goal PFS-5: Protect public health and welfare by eliminating existing noise problems and preventing significant degradation of the future acoustic environment.

Policies:

Policy PFS-5.1: Approve development and require mitigation measures to ensure existing and future land use compatibility as shown in the City's Noise Control Ordinance and state interior and exterior noise standards.

Policy PFS-5.2: When new residential development is proposed adjacent to land designated for industrial or commercial uses, require the developer to assess the potential noise impacts and fund feasible noise-related mitigation measures.

Policy PFS-5.5: Minimize persistent, periodic, or impulsive noise impacts of business operations as well as special events to reduce and avoid noise impacts on surrounding neighborhoods.

City of Fountain Valley Municipal Code

Chapter 6.28 of the Municipal Code outlines the City's exterior noise limits as it relates to stationary noise sources.

6.28.040 Designated noise zone.

The residential properties hereinafter described are assigned to the following noise zones:

Noise Zone 1: All properties located in residential zone districts.

6.28.050 Exterior noise standards.

a) The following noise standards, unless otherwise specifically indicated, shall apply to all residential property within a designated noise zone:

<Table 1, next page>

Table 1: Fountain Valley Exterior Noise Standards

Noise Zone	NOISE LEVEL (dBA)	
	Nighttime 10:00 p.m. - 7:00 a.m.	Daytime 7:00 a.m. - 10:00 p.m.
I	45	60
II	60	65
III	70	70

In the event the alleged offensive noise consists entirely of impact noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by 5 dBA.

b) It is unlawful for any person at any location within the city to create any noise, or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such person, when the foregoing causes the noise level, when measured on any other residential property, either incorporated or unincorporated, to exceed:

- (1) The noise standard for a cumulative period of more than thirty minutes in any hour; or
- (2) The noise standard plus five dB(A) for a cumulative period of more than fifteen minutes in any hour; or
- (3) The noise standard plus ten dB(A) for a cumulative period of more than five minutes in any hour; or
- (4) The noise standard plus fifteen dB(A) for a cumulative period of more than one minute in any hour; or
- (5) The noise standard plus twenty dB(A) for any period of time.

c) In the event the ambient noise level exceeds any of the first four noise limit categories set forth in subsection (b) of this section, the cumulative period applicable to said category shall be increased to reflect said ambient noise level. In the event the ambient noise level exceeds the fifth noise limit category, the maximum allowable noise level under said category shall be increased to reflect the maximum ambient noise level.

6.28.070 Special Provisions.

The following activities shall be exempt from the provisions of this chapter:

- (5) Noise sources associated with the construction, repair, remodeling or grading of any real property, provided said activities take place between the hours of seven a.m. and eight p.m. Monday through Friday, nine a.m. through eight p.m. on Saturday and at no time on Sunday or any legal holiday. For purposes of this exception the use of saws, buffers, sanders, drills, and sprayers shall be included, as shall similar activity.

4.4 City of Huntington Beach Noise Regulations

West of the project site is within the boundaries of the City of Huntington Beach. The City outlines its noise regulations and standards within the Municipal Code.

City of Huntington Beach Municipal Code

Chapter 8.40 of the Municipal Code outlines the City’s exterior noise limits as it relates to stationary noise sources.

8.40.050 – Exterior Noise Standards.

A. The following exterior noise standards shall apply to the applicable land use. It is unlawful for any person at any location within the incorporated area of the City to create any noise due to a fixed noise source (or any mobile source not preempted by State or Federal laws), or to allow the creation of any noise on property owned, leased, occupied, or otherwise controlled by such person, which causes the noise level when measured at the property line of any residential, hotel, motel, public institutional, recreational, or commercial property, either within or outside the City, to exceed the applicable noise standards:

Table 2: Huntington Beach Exterior Noise Standards

Land Use	Time Period	NOISE LEVEL (dBA)	
		Leq Noise Level	Lmax Noise Level
Low-Density Residential	7 a.m. to 10 p.m.	55	75
	10 p.m. to 7 a.m.	50	70
Medium, High-Density Residential, Hotels, Motels	7 a.m. to 10 p.m.	60	80
	10 p.m. to 7 a.m.	50	70
Schools	Hours of Operation	55	75
Hospitals, Churches, Cultural, Museum, Library, Public Park, Recreational	Hours of Operation	60	80
Commercial/Office	Hours of Operation	65	85

- B. The above standard does not apply to the establishment of multifamily residence private balconies and patios. Multifamily developments with balconies or patios that do not meet noise standards are required to provide occupancy disclosure notices to all future tenants regarding potential noise impacts.
- C. The above daytime (7:00 a.m.–10:00 p.m.) standards for hotels, motels and commercial uses shall apply only to active outdoor use areas such as a pool or outdoor courtyard.
- D. In the event the alleged offensive noise consists entirely of impact or impulsive noise, simple tone noise, speech, music, or any combination thereof, each of the above noise levels shall be reduced by five dBA.
- E. If the alleged offense affects a property outside the City's jurisdiction, the exterior noise standards shall be enforced at the City boundary.
- F. In the event the measured ambient noise level exceeds any of the noise limit categories above, the noise limit shall be increased to reflect said ambient noise level.
- G. In the event that the noise source and the affected property are within different land use categories, the noise standards of the affected property shall apply.

8.40.090 – Special Provisions.

- D. Noise sources associated with construction, repair, remodeling, or grading of any real property, provided that: (1) the City has issued a building, grading or similar permit for such activities; (2) said activities do not take place between the hours of 7:00 p.m. and 7:00 a.m., Monday through Saturday, or at any time on Sunday or a Federal holiday; and (3) the average construction noise levels do not exceed 80 dBA Leq at nearby noise-sensitive land uses. If outdoor construction activities are permitted by the City after 7:00 p.m. or before 7:00 a.m., the average construction Noise Levels at nearby noise-sensitive land uses shall be limited to 50 dBA Leq.

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 the County's 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

The noise monitoring locations were selected to obtain a baseline of the existing noise environment. Two (2) long-term 24-hour noise measurements were conducted at the Project site. Appendix A includes photos, the field sheet, and measured noise data. Exhibit E illustrates the location of the measurements.

5.3 Operational Noise

Sources of operational noise on site during nighttime hours will include HVAC units and three (3) transformers. All HVAC units are assumed to be on the rooftop of the project buildings. To calculate how many tons of HVAC will be needed for project operations, MD assumed 1-ton of HVAC per 350 sq-ft of residential building area. MD assumed the use of 10-ton HVAC units, each with a sound power level of 80 dBA. See Appendix C for HVAC unit assumptions and noise calculations. Transformer noise was calculated assuming ANSI and NEMA requirements for noise will be met. Thus, each transformer was assumed to have a sound pressure level of 67 dBA at 1 foot, as this is the loudest allowed level per ANSI and NEMA requirements.

Sources of operational noise during daytime hours will include HVAC units, transformers, and noise from the various outdoor amenities on the 7th floor and rooftop. The pool deck will likely be the loudest amenity and will be located on the 7th floor of both the north and south buildings. MD utilized a reference sound power level of 108 dBA for an open-air swimming pool from the SoundPlan library in order to estimate the noise impact from the swimming pools to adjacent properties.

5.4 FHWA Traffic Noise Prediction Model

Traffic noise from vehicular traffic was projected using the FHWA Traffic Noise Prediction Model (FHWA-RD-77-108) standards. The FHWA model arrives at the predicted noise level through a series of adjustments to the Reference Energy Mean Emission Level (REMEL). The referenced traffic data was applied to the model and is in Appendix B. The following outlines the key adjustments made to the REMEL for the roadway inputs:

- Roadway classification – (e.g., freeway, major arterial, arterial, secondary, collector, etc.),
- Roadway Active Width – (distance between the center of the outer most travel lanes on each side of the roadway)
- Average Daily Traffic Volumes (ADT), Travel Speeds, Percentages of automobiles, medium trucks and heavy trucks
- Roadway grade and angle of view
- Site Conditions (e.g., soft vs. hard)
- Percentage of total ADT which flows each hour through-out a 24-hour period

Table 3 indicates the roadway parameters and vehicle distribution utilized for this study.

Table 3: Roadway Parameters and Vehicle Distribution

Roadway	Segment	Existing ADT ¹	Existing + Project ADT ¹	Speed (MPH)	Site Conditions
Magnolia Street	North of Warner	25,900	27,800	45	Hard
Warner Avenue	West of Magnolia	27,700	29,100	45	Hard
Vehicle Distribution and Mix ²					
Motor-Vehicle Type		Daytime % (7AM to 7 PM)	Evening % (7 PM to 10 PM)	Night % (10 PM to 7 AM)	Total % of Traffic Flow
Automobiles		77.5	12.9	9.6	97.5
Medium Trucks		84.8	4.9	10.3	1.8
Heavy Trucks		86.5	2.7	10.8	0.7
Notes:					
¹ Existing ADT from Traffic Impact Analysis prepared for this Project by LLG.					
² Typical California Vehicle Distribution and Mix.					

To determine the project’s noise impact to the surrounding land uses, MD generated noise contours for projected traffic conditions. Noise contours are used to provide a characterization of sound levels

experienced at a set distance from the centerline of a subject roadway. They are intended to represent a worst-case scenario and do not take into account structures, sound walls, topography, and/or other sound attenuating features which may further reduce the actual noise level. Noise contours are developed for comparative purposes and are used to demonstrate potential increases/decreases along subject roadways because of a project.

5.5 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. The construction noise calculation output worksheet is in Appendix D.

Exhibit E

Measurement Locations

= Long-Term
Monitoring Location



6.0 Existing Noise Environment

Two (2) long-term 24-hour noise measurements were conducted at the project site to document the existing noise environment. The measurements include Leq, Lmin, Lmax, and other statistical data (e.g. L2, L8). Noise measurement field sheets are provided in Appendix A.

6.1 Long-Term Noise Measurement Results

The results of the long-term noise data are presented in Tables 4 and 5.

Table 4: Long-Term Noise Measurement Data, NM1¹

Date	Start	Stop	1-Hour dB(A)							
			LEQ	L _{MAX}	L _{MIN}	L ₂	L ₈	L ₂₅	L ₅₀	L ₉₀
7/31/2024	8:56 AM	9:56 AM	59.2	76.4	53.7	63.6	60.5	59.5	58.9	57.3
7/31/2024	9:56 AM	10:56 AM	58.1	74.1	54.2	60.4	59.8	58.9	57.6	56.2
7/31/2024	10:56 AM	11:56 AM	57.5	76.0	53.4	61.1	58.9	57.5	56.9	55.4
7/31/2024	11:56 AM	12:56 PM	58.1	79.2	53.7	63.4	60	58	57.4	55.5
7/31/2024	12:56 PM	1:56 PM	58.5	76.9	53.6	63.5	59.7	58.7	57.8	56.5
7/31/2024	1:56 PM	2:56 PM	57.7	69.6	54.1	60.2	59.4	58.1	57.2	56.3
7/31/2024	2:56 PM	3:56 PM	57.6	72.5	53.3	61.3	59	58.2	57.4	55.6
7/31/2024	3:56 PM	4:56 PM	58	77.0	53.9	60.8	59.1	58	57.4	56.5
7/31/2024	4:56 PM	5:56 PM	57.8	78.6	53.8	60.6	59.2	57.7	57.1	56.2
7/31/2024	5:56 PM	6:56 PM	56.7	65.9	53.5	58.6	57.7	57	56.5	55.7
7/31/2024	6:56 PM	7:56 PM	60.5	88.2	51.9	68.8	59.2	56.9	55.9	54.9
7/31/2024	7:56 PM	8:56 PM	58.1	73.0	53.1	62.6	59.9	58.4	57.2	56.2
7/31/2024	8:56 PM	9:56 PM	56.6	68.9	53.1	59.3	57.8	56.9	56.2	55.4
7/31/2024	9:56 PM	10:56 PM	57.4	73.1	52.3	61.6	58.6	57.4	56.7	55.9
7/31/2024	10:56 PM	11:56 PM	57.6	79.3	51.7	63.9	59.3	57.1	56.4	54.9
7/31/2024	11:56 PM	12:56 AM	58.6	84.0	47.9	65.8	64.5	55.8	54.3	51
8/1/2024	12:56 AM	1:56 AM	50.8	64.8	44.2	53.8	52.5	51.6	50.7	48
8/1/2024	1:56 AM	2:56 AM	51.3	63.1	42.7	55.6	53.8	52.2	50.4	48.3
8/1/2024	2:56 AM	3:56 AM	53.6	68.5	45.6	56	55.6	54.2	53.1	51.4
8/1/2024	3:56 AM	4:56 AM	55.6	72.1	48.6	57.9	56.9	55.6	55.2	54.3
8/1/2024	4:56 AM	5:56 AM	56	69.9	50.3	58.5	58.1	56.7	55.6	54
8/1/2024	5:56 AM	6:56 AM	57.8	74.6	52.2	60.4	59.3	58.2	57.4	56
8/1/2024	6:56 AM	7:56 AM	56.5	67.3	51.9	59.2	58.2	56.9	56.2	55.1
8/1/2024	7:56 AM	8:56 AM	56.2	74.2	51.0	59.7	57.8	56.4	55.6	54.3
8/1/2024	8:56 AM	9:23 AM	57.2	69.4	52.3	59.7	58.9	58.1	56.9	55.3
LDN			62.7							
Notes:										
¹ Long-term noise monitoring location (NM1) is illustrated in Exhibit E.										

Table 5: Long-Term Noise Measurement Data, NM2¹

Date	Start	Stop	1-Hour dB(A)							
			L _{EQ}	L _{MAX}	L _{MIN}	L ₂	L ₈	L ₂₅	L ₅₀	L ₉₀
7/31/2024	9:00 AM	10:00 AM	66.3	83.8	53.6	70.2	68.7	67.5	65.8	62.9
7/31/2024	10:00 AM	11:00 AM	66.6	90.4	53.5	69.3	68.3	67	65.7	63.6
7/31/2024	11:00 AM	12:00 PM	66.2	85.5	51.8	71.5	68.7	67.3	65	62.9
7/31/2024	12:00 PM	1:00 PM	66.3	85.8	51.3	71.7	69.7	66.8	65.1	62.3
7/31/2024	1:00 PM	2:00 PM	65.6	87.2	49.5	70.6	68.3	66	64.5	61.5
7/31/2024	2:00 PM	3:00 PM	65.2	86.7	50.5	69.7	67.8	65.7	64	61.7
7/31/2024	3:00 PM	4:00 PM	65.7	89.2	50.7	71.6	68.7	66.1	64.2	61.5
7/31/2024	4:00 PM	5:00 PM	67.3	95.2	51.2	69.2	68.4	66.6	64.7	61.8
7/31/2024	5:00 PM	6:00 PM	65.3	82.2	52.0	69.7	67.5	66	64.8	62.5
7/31/2024	6:00 PM	7:00 PM	65.7	82.4	52.1	69.4	68.5	67.1	64.6	62.6
7/31/2024	7:00 PM	8:00 PM	74.6	102.0	52.2	85.4	70	68.1	66	63.2
7/31/2024	8:00 PM	9:00 PM	69.3	95.0	53.4	76.4	70	67.8	65.7	63
7/31/2024	9:00 PM	10:00 PM	65.3	80.4	53.6	68.9	67.4	66.4	65.4	60.9
7/31/2024	10:00 PM	11:00 PM	65.2	86.6	53.6	70.2	67.4	66	64.1	60.6
7/31/2024	11:00 PM	12:00 AM	63.3	83.4	50.8	68.8	65.7	63.7	62.6	59.8
8/1/2024	12:00 AM	1:00 AM	67.9	95.5	50.2	79	65.1	63.5	62.1	58.9
8/1/2024	1:00 AM	2:00 AM	60.9	80.3	48.0	65.6	63.5	61.9	60	55.5
8/1/2024	2:00 AM	3:00 AM	59.4	78.5	47.2	65.6	61.9	60.2	58.3	54.7
8/1/2024	3:00 AM	4:00 AM	60.6	80.3	47.7	64.4	63.8	61.1	59.8	57.2
8/1/2024	4:00 AM	5:00 AM	64.1	80.4	50.6	67.5	66.5	65.2	63.8	59.2
8/1/2024	5:00 AM	6:00 AM	66.4	84.0	53.6	70.9	68.6	67.7	65.7	62
8/1/2024	6:00 AM	7:00 AM	67.4	92.2	56.0	70.7	69.6	67.4	66	62.7
8/1/2024	7:00 AM	8:00 AM	67	84.7	53.6	71.4	70.4	67.9	66.2	61.8
8/1/2024	8:00 AM	9:00 AM	67.4	92.5	53.5	71.4	70	67.6	66	61.5
8/1/2024	9:00 AM	9:26 AM	65.9	81.6	54.6	69.6	69.4	67.1	65.9	61.6
LDN			71.5							
Notes:										
¹ Long-term noise monitoring location (NM2) is illustrated in Exhibit E.										

Noise data indicates the ambient noise level ranged from 63 to 72 dBA LDN at the project site. The quietest hourly nighttime Leq levels are highlighted in green, and the quietest hourly daytime Leq levels are highlighted in yellow. Additional field notes and photographs are provided in Appendix A.

7.0 Future Noise Environment Impacts and Mitigation

This assessment analyzes future noise impacts from the project and compares the results to the City's Noise Standards. The analysis details the estimated exterior noise levels associated with traffic from adjacent roadway sources.

7.1 Future Off-Site Exterior Noise

The exterior noise level off-site of the project will be impacted by transportation-related sources and stationary sources from the site. The following outlines the impacts associated with exterior noise levels.

7.1.1 Future Off-Site Traffic Noise Impact

The potential off-site noise impacts caused by the increase in vehicular traffic as a result of the project were calculated at a distance of 100 feet. The distance to the 55, 60, 65, and 70 dBA CNEL noise contours are also provided for reference. The noise level at 100 feet is representative of approximate distances to existing single-family homes close to the subject roadways impacted by the project. The noise contours were calculated for the following scenarios and conditions:

- Existing Condition: This scenario refers to the existing traffic noise condition and is demonstrated in Table 6.
- Existing + Project Condition: This scenario refers to the existing plus project traffic noise condition and is demonstrated in Table 6.

<Table 6, next page>

Table 6: Existing/Existing + Project Scenario – Noise Levels Along Roadways (dBA CNEL)

Existing Exterior Noise Levels

Roadway	Segment	CNEL at 100 Ft (dBA)	Distance to Contour (Ft)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Magnolia Street	North of Warner	69.2	84	265	838	2650
Warner Avenue	West of Magnolia	69.6	91	288	910	2879

Existing + Project Exterior Noise Levels

Roadway	Segment	CNEL at 100 Ft (dBA)	Distance to Contour (Ft)			
			70 dBA CNEL	65 dBA CNEL	60 dBA CNEL	55 dBA CNEL
Magnolia Street	North of Warner	69.5	80	284	899	2844
Warner Avenue	West of Magnolia	69.8	96	302	956	3024

Change in Noise Levels as a Result of Projects

Roadway ¹	Segment	CNEL at 100 Feet dBA ²			
		Existing Without Project	Existing With Project	Change in Noise Level	Potential Significant Impact
Magnolia Street	North of Warner	69.2	69.5	0.3	No
Warner Avenue	West of Magnolia	69.6	69.8	0.2	No

Notes:
¹ Exterior noise levels calculated at 5 feet above ground level.
² Noise levels calculated from centerline of subject roadway.

Table 6 provides the Existing and Existing + Project noise conditions and shows the change in noise level because of the proposed project. As shown in Table 6, there will be a small increase in traffic noise of 0.3 dBA and 0.2 dBA at 100 feet from the centerline of Magnolia Street and Warner Avenue respectively due to the project. This will be inaudible (see Section 2.5) and therefore the impact is less than significant, and no mitigation is required.

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

The nearest sensitive receptor to the project site is a group of residences (Sendero Apartment Homes) located directly west of the Project site across Magnolia Street. These residences are within the City of Huntington Beach, California.

Project Operational Noise Levels

On-site operational noise during nighttime hours includes three (3) transformers and HVAC. All HVAC equipment is assumed to be located on the rooftops of the buildings and is assumed to operate 24 hours a day. To estimate how many HVAC units will be required for the project, MD assumed 1 ton of HVAC per 350 sq-ft of climate-controlled area. Per the project site plan, all HVAC equipment will be at least 175 feet away from the Sendero Apartment Homes property line. The maximum sound power level from a unit is 78 dBA. At 175 feet away, the sound pressure level from a single unit is 34 dBA. Assuming all units are running simultaneously, the north and south building HVAC units are estimated to produce sound levels of 55 and 54 dBA at the property line. The 5'6" parapet on the roof of the project buildings was calculated to provide a 10 dB reduction in HVAC noise. Thus, the total noise level due to HVAC at the property line is estimated to be 47 dBA Leq.

The Project site plan also includes three (3) transformers. Per ANSI and NEMA requirements for transformer noise, transformers must be no louder than 67 dBA at 1 foot. All transformers will be at least 180 feet away from the property line. Assuming all transformers are running simultaneously and continuously throughout the hour, three (3) transformers would produce a sound level of 27 dBA Leq at 180 feet away. Thus, the total nighttime Project-only operational noise level will be 48 dBA Leq.

Outdoor amenities are assumed to be operational during daytime hours only. The pool decks on both the north and south buildings are anticipated to be the loudest source of noise due to amenity operations. The sound power level of an open-air swimming pool is 108 dBA. The swimming pools will be as close as 370 feet to the nearest sensitive receptor (Sendero Apartment Homes to the west), and the proposed 5'6" parapet walls will provide a conservative 10 dB reduction. At a distance of 370 feet, the noise level from both pool decks operating continuously throughout the hour will be approximately 49 dBA Leq. Thus, the total daytime operational noise level due to HVAC units, transformers, and amenities will be 51 dBA Leq.

Nighttime Project Plus Ambient Operational Noise Levels

The quietest nighttime hourly noise level at NM2 (the level during the hour of 2AM) was selected to represent the existing ambient nighttime noise level at the neighboring residential properties as a conservative estimate. See Appendix A for field measurement data.

Table 7 summarizes the noise impacts from nighttime stationary noise sources to the property line of Sendero Apartment Homes. The Fountain Valley and Huntington Beach Municipal Codes prohibit noise from stationary sources from exceeding the ambient level. As shown in Table 7, the combined noise level due to all stationary sources operating simultaneously does not increase the existing nighttime ambient noise level during the quietest hour of nighttime project operations. Thus, the impact is less than significant.

<Table 7, next page>

Table 7: Nighttime Operational Noise Levels (dBA, Leq)

Receptor	Existing Ambient Noise Level ¹	Total Project Noise Level	Existing + Project Noise Level	Change in Noise Level
Sendero Apartments Property Line	59	48	59	0
Notes: ¹ See Table 5 for existing ambient level. The quietest hourly Leq level was selected as a conservative estimate.				

Daytime Project Plus Ambient Operational Noise Levels

The quietest daytime hourly noise level at NM2 (the level during the hour of 2PM) was selected to represent the existing ambient daytime noise level at the neighboring residential properties as a conservative estimate. See Appendix A for field measurement data.

Table 8 summarizes the noise impacts from daytime stationary noise sources to the property line of Sendero Apartment Homes. The Fountain Valley and Huntington Beach Municipal Codes prohibit noise from stationary sources from exceeding the ambient level. As shown in Table 8, the combined noise level due to all daytime stationary sources operating simultaneously does not increase the existing daytime ambient noise level during the quietest hour of daytime project operations. Thus, the impact is less than significant.

Table 8: Daytime Operational Noise Levels (dBA, Leq)

Receptor	Existing Ambient Noise Level ¹	Total Daytime Project Noise Level	Existing + Project Noise Level	Change in Noise Level
Sendero Apartments Property Line	65	51	65	0
Notes: ¹ See Table 4 for existing ambient level. The quietest hourly Leq level was selected as a conservative estimate.				

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. The construction noise and vibration level projections are provided in the sections below.

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 9.

Table 9: Typical Construction Noise Levels¹

Equipment Powered by Internal Combustion Engines	
Type	Noise Levels (dBA) at 50 Feet
Earth Moving	
Compactors (Rollers)	73 - 76
Front Loaders	73 - 84
Backhoes	73 - 92
Tractors	75 - 95
Scrapers, Graders	78 - 92
Pavers	85 - 87
Trucks	81 - 94
Materials Handling	
Concrete Mixers	72 - 87
Concrete Pumps	81 - 83
Cranes (Movable)	72 - 86
Cranes (Derrick)	85 - 87
Stationary	
Pumps	68 - 71
Generators	71 - 83
Compressors	75 - 86
Impact Equipment	
Type	Noise Levels (dBA) at 50 Feet
Saws	71 - 82
Vibrators	68 - 82
Notes:	
¹ Referenced Noise Levels from the Environmental Protection Agency (EPA)	

Construction is anticipated to occur during the permissible hours as described in the City's Municipal Code Section 6.28.090.

Construction noise is considered a short-term impact and would be considered significant if construction occurs outside the allowable times as described in 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. The construction noise impact is considered less than significant; however, construction noise level projections are provided. The City does not have a maximum acceptable noise level due to construction. Thus, construction noise levels are compared to the standards in the Construction Noise and Vibration Updates to Thresholds and Methodology prepared for the City of Los Angeles as a comparison to industry standards. These updates limit construction noise during daytime hours to a maximum of 80 dBA Leq(8-hour) at nearby sensitive uses.

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 are in Table 10. A likely worst-case construction noise scenario assumes equipment operating as close as 110 feet and an average of 315 feet from the nearest sensitive receptor, the residences to the west of the project site. The 8-hour Leq noise level for each phase of construction will not exceed the 80 dBA Leq(8-hour) limit provided in the Construction Noise and Vibration Updates at the nearest sensitive receptor. The construction noise levels at all other adjacent uses are expected to be lower due to the increased distance from construction noise operations. Thus, the noise due to construction will not exceed industry standards and is less than significant.

Table 10: Construction Noise Levels at Residences to the West

Phase	dBA Lmax	dBA Leq(8-hr)
Demo	74.9	62.6
Grading	74.9	62.0
Build	74.9	57.6
Paving	73.9	58.4
Arch Coating	68.9	52.8
Notes: Const Equip from Construction Questionnaire for 16800 Magnolia		

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 or vibratory rollers, 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:

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

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 11 (below) provides general thresholds and guidelines as to the vibration damage potential from vibratory impacts.

Table 11: 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 12 gives approximate vibration levels for particular construction activities. This data provides a reasonable estimate for a wide range of soil conditions.

Table 12: Vibration Source Levels for Construction Equipment¹

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.

The nearest building to the project is a commercial building located 10 feet southwest of the site. At a distance of 10 feet, a large bulldozer would yield a worst-case 0.244 PPV (in/sec) which may be perceptible but sustainably below any risk of damage (0.5 in/sec PPV is the threshold of old residential structures). The impact is less than significant, and no mitigation is required.

9.0 References

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

City of Fountain Valley: General Plan Public Facilities and Safety Element, 2023.

City of Fountain Valley: Municipal Code Chapter 6.28

City of Huntington Beach: Municipal Code Chapter 8.40

Caltrans Noise Technical Manual. 2013

Konan Vibration Criteria

W-Trans: Transportation Impact Study for The Crescent Project, December 2022.

Federal Highway Administration. Noise Barrier Design Handbook. June 2017.

Federal Transit Administration. Transit Noise and Vibration Impact Assessment Manual. September 2018

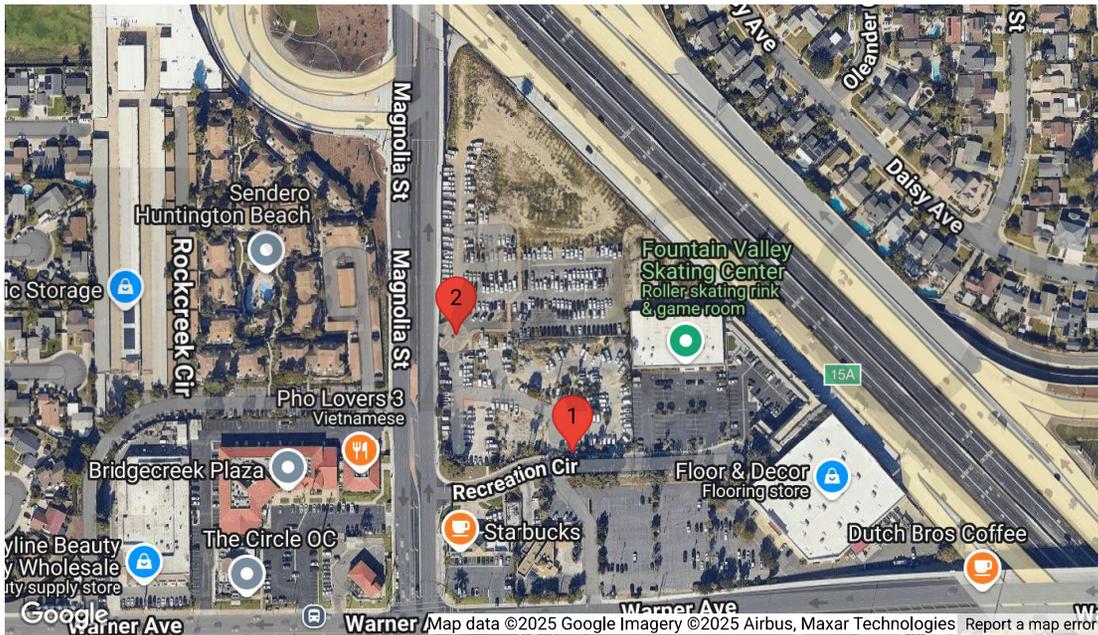
Appendix A:
Photographs and Field Measurement Data

24-Hour Continuous Noise Measurement Datasheet - NM1, NM2

Project Name: 16800 Magnolia
Project: #/Name: 0462-2024-015
Site Address/Location: 16800 Magnolia Street
Date: 08/01/2024
Field Tech/Engineer: Jason Schuyler/ Claire Pincock

Site Observations:
The primary noise source is traffic. Temps in the 70-low 80 during the day. The site enjoys the marine layer winds 1-4MPH.

Sound Meter: Piccolo 2, Soft dB **SN:** P0222021803
Settings: A-weighted, slow, 1-min, 24-hour duration
Site Id: NM1, NM2



24-Hour Continuous Noise Measurement Datasheet - Cont. - NM1, NM2

Project Name: 16800 Magnolia
Site Address/Location: 16800 Magnolia Street
Site Id: NM1, NM2

Calibrator:
Cal Check: Pre-test: Post Test:

Figure 1: NM1



Figure 2: NM1

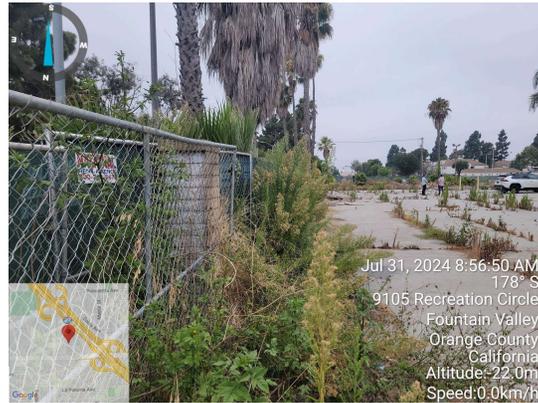


Figure 3: NM2



MD ACOUSTICS

24-Hour Continuous Noise Measurement Datasheet - Cont. - NM2

Project Name:	16800 Magnolia	Site Topo:	Buildings 1-2 stories	Day: 2 of 2
Site Address/Location:	16800 Magnolia Street		tall site	Noise Source(s) w/ Distance:
Site Id:	NM2	Meteorological Cond.:	70F over cast winds	Road and commercial noise
			0 MPH	
		Ground Type:	buildings and	
			asphalt	

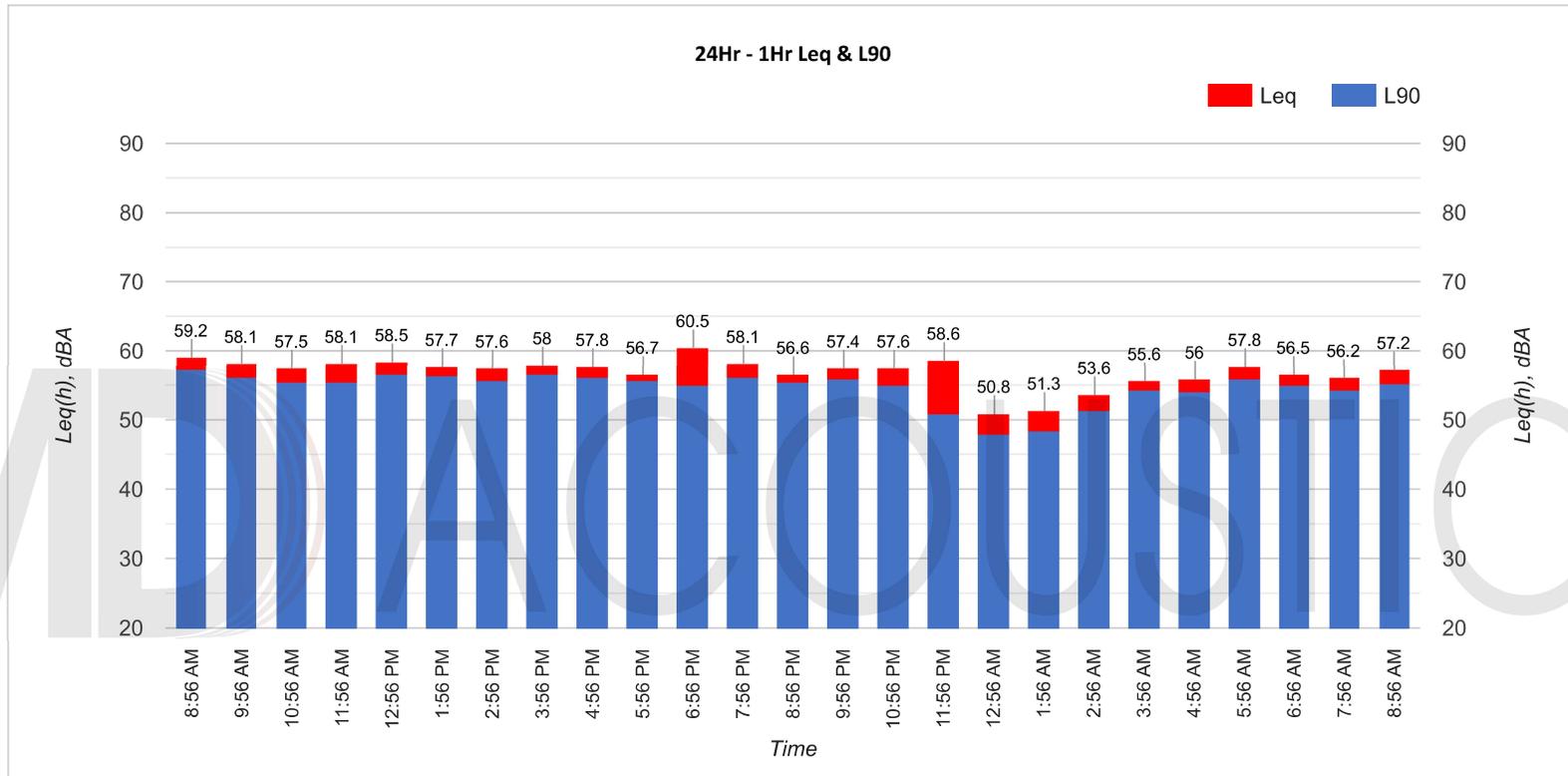
Table 2: Baseline Noise Measurement Summary

Date	Start	Stop	Leq	Lmax	Lmin	L2	L8	L25	L50	L90
7/31/2024	9:00 AM	10:00 AM	66.3	83.8	53.6	70.2	68.7	67.5	65.8	62.9
7/31/2024	10:00 AM	11:00 AM	66.6	90.4	53.5	69.3	68.3	67	65.7	63.6
7/31/2024	11:00 AM	12:00 PM	66.2	85.5	51.8	71.5	68.7	67.3	65	62.9
7/31/2024	12:00 PM	1:00 PM	66.3	85.8	51.3	71.7	69.7	66.8	65.1	62.3
7/31/2024	1:00 PM	2:00 PM	65.6	87.2	49.5	70.6	68.3	66	64.5	61.5
7/31/2024	2:00 PM	3:00 PM	65.2	86.7	50.5	69.7	67.8	65.7	64	61.7
7/31/2024	3:00 PM	4:00 PM	65.7	89.2	50.7	71.6	68.7	66.1	64.2	61.5
7/31/2024	4:00 PM	5:00 PM	67.3	95.2	51.2	69.2	68.4	66.6	64.7	61.8
7/31/2024	5:00 PM	6:00 PM	65.3	82.2	52.0	69.7	67.5	66	64.8	62.5
7/31/2024	6:00 PM	7:00 PM	65.7	82.4	52.1	69.4	68.5	67.1	64.6	62.6
7/31/2024	7:00 PM	8:00 PM	74.6	102.0	52.2	85.4	70	68.1	66	63.2
7/31/2024	8:00 PM	9:00 PM	69.3	95.0	53.4	76.4	70	67.8	65.7	63
7/31/2024	9:00 PM	10:00 PM	65.3	80.4	53.6	68.9	67.4	66.4	65.4	60.9
7/31/2024	10:00 PM	11:00 PM	65.2	86.6	53.6	70.2	67.4	66	64.1	60.6
7/31/2024	11:00 PM	12:00 AM	63.3	83.4	50.8	68.8	65.7	63.7	62.6	59.8
8/1/2024	12:00 AM	1:00 AM	67.9	95.5	50.2	79	65.1	63.5	62.1	58.9
8/1/2024	1:00 AM	2:00 AM	60.9	80.3	48.0	65.6	63.5	61.9	60	55.5
8/1/2024	2:00 AM	3:00 AM	59.4	78.5	47.2	65.6	61.9	60.2	58.3	54.7
8/1/2024	3:00 AM	4:00 AM	60.6	80.3	47.7	64.4	63.8	61.1	59.8	57.2
8/1/2024	4:00 AM	5:00 AM	64.1	80.4	50.6	67.5	66.5	65.2	63.8	59.2
8/1/2024	5:00 AM	6:00 AM	66.4	84.0	53.6	70.9	68.6	67.7	65.7	62
8/1/2024	6:00 AM	7:00 AM	67.4	92.2	56.0	70.7	69.6	67.4	66	62.7
8/1/2024	7:00 AM	8:00 AM	67	84.7	53.6	71.4	70.4	67.9	66.2	61.8
8/1/2024	8:00 AM	9:00 AM	67.4	92.5	53.5	71.4	70	67.6	66	61.5
8/1/2024	9:00 AM	9:26 AM	65.9	81.6	54.6	69.6	69.4	67.1	65.9	61.6

	DNL	71.5
--	-----	------

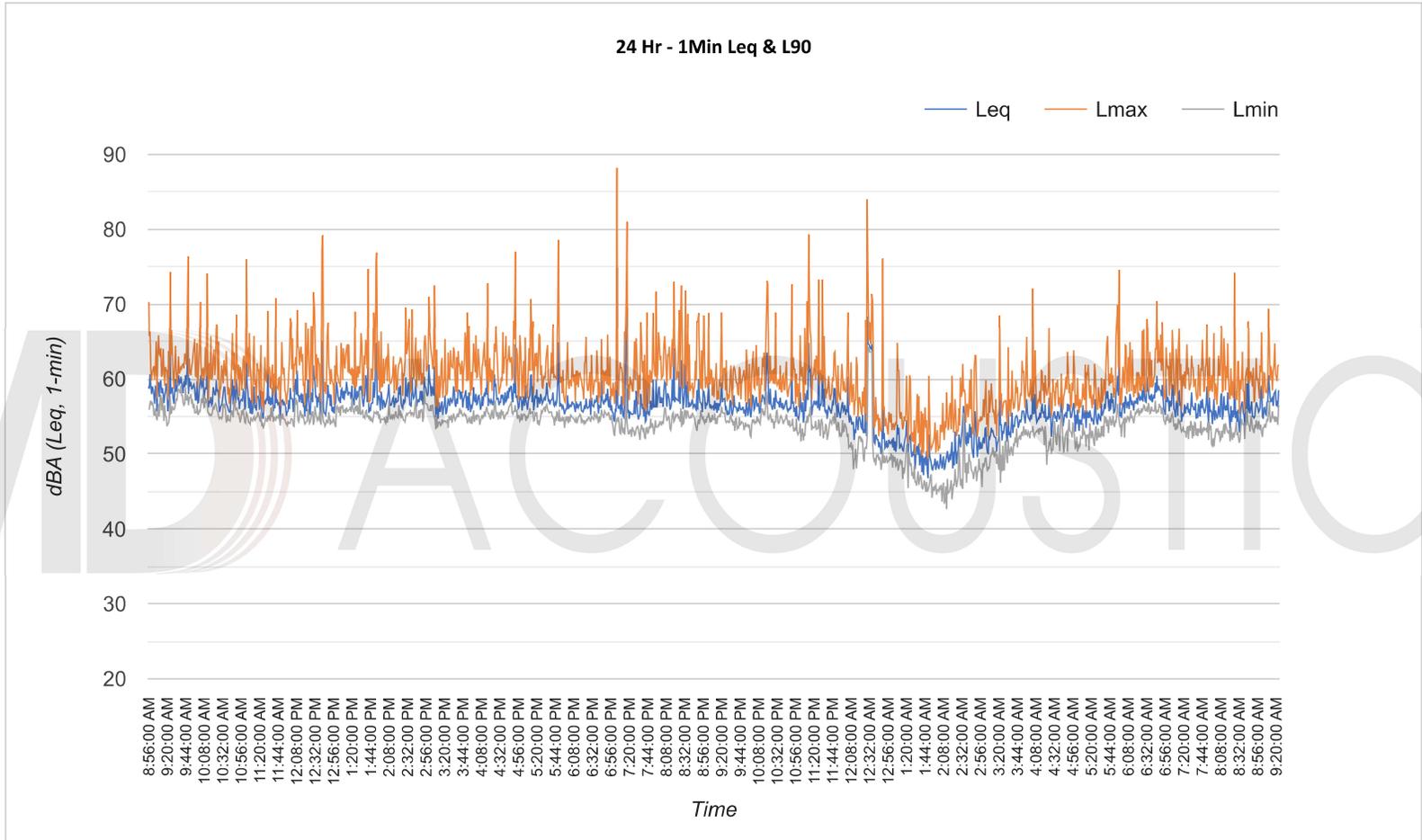
24-Hour Continuous Noise Measurement Datasheet - Cont. - NM1

Project Name:	16800 Magnolia	Site Topo:	Buildings 1-2 stories	Day: 1 of 2
Site Address/Location:	16800 Magnolia Street		tall site	Noise Source(s) w/ Distance:
Site Id:	NM1	Meteorological Cond.:	70F over cast winds	Road and commercial noise
			0 MPH	
		Ground Type:	crushed building	



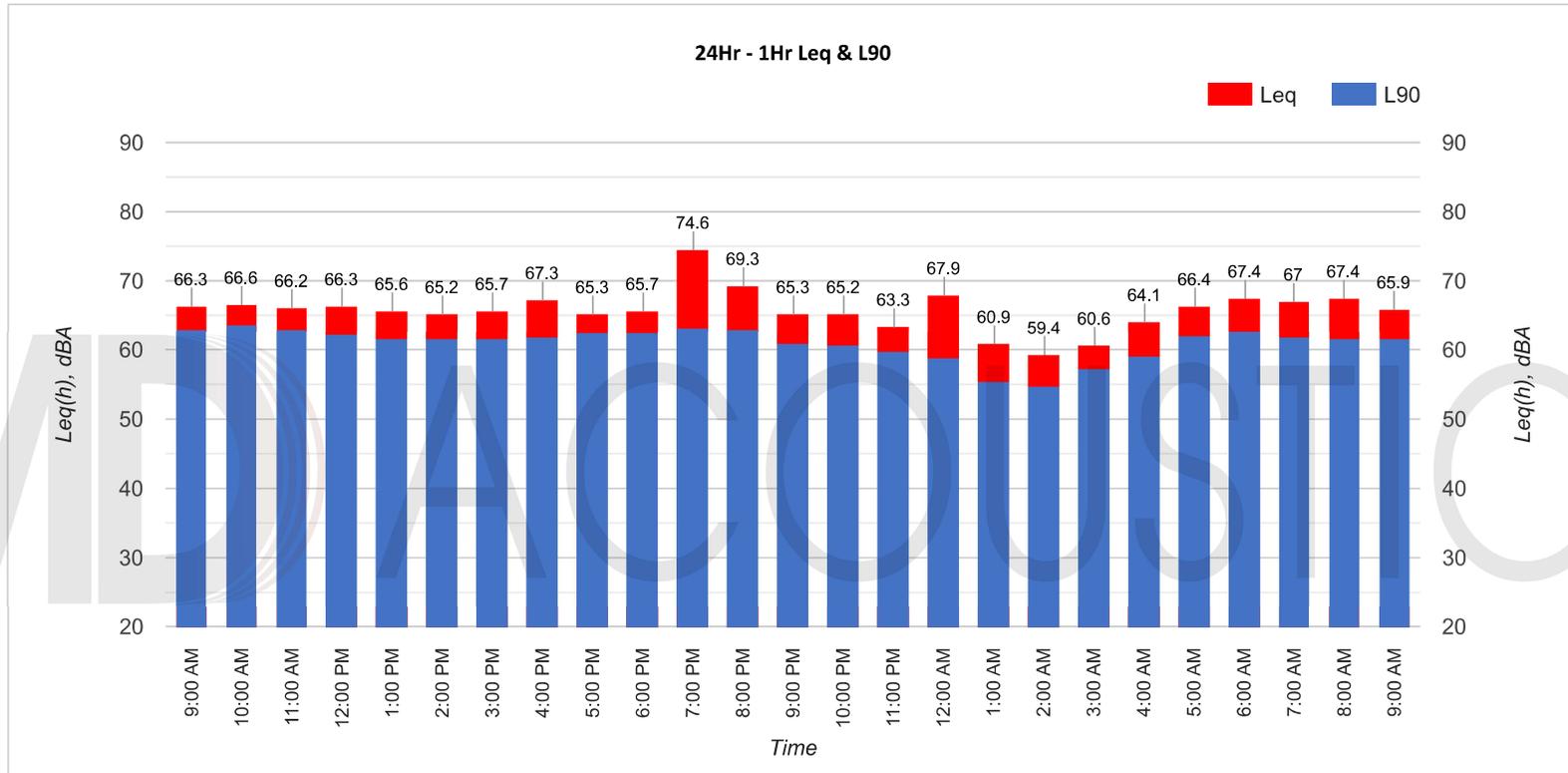
24-Hour Continuous Noise Measurement Datasheet - Cont. - NM1

Project Name:	16800 Magnolia	Site Topo:	Buildings 1-2 stories	Day: 1 of 2
Site Address/Location:	16800 Magnolia Street	tall site	Noise Source(s) w/ Distance:	
Site Id:	NM1	Meteorological Cond.:	70F over cast winds	Road and commercial noise
		0 MPH		
		Ground Type:	crushed building	



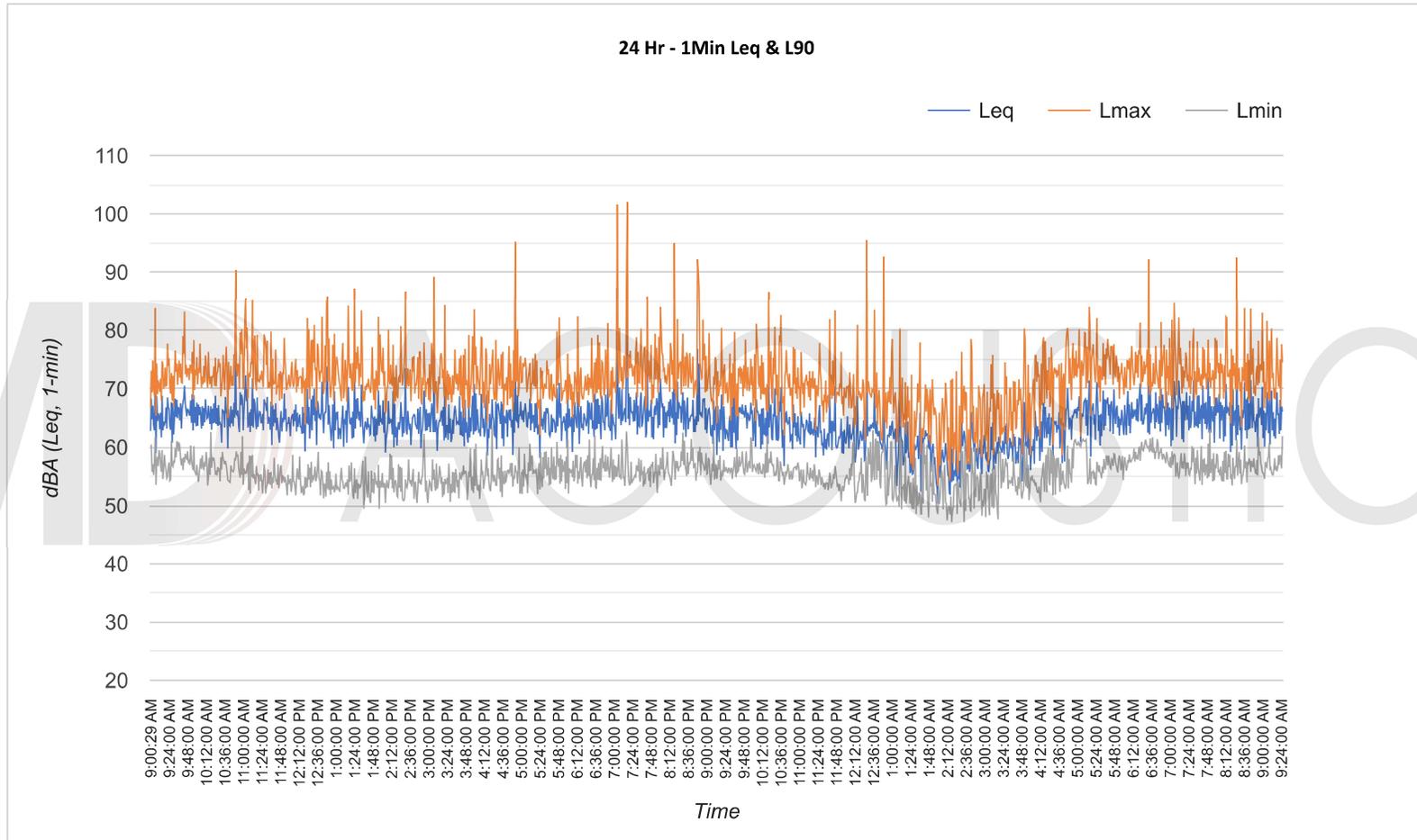
24-Hour Continuous Noise Measurement Datasheet - Cont. - NM2

Project Name: 16800 Magnolia	Site Topo: Buildings 1-2 stories	Day: 1 of 2
Site Address/Location: 16800 Magnolia Street	tall site	Noise Source(s) w/ Distance:
Site Id: NM2	Meteorological Cond.: 70F over cast winds	Road and commercial noise
	0 MPH	
	Ground Type: buildings and	
	asphalt	



24-Hour Continuous Noise Measurement Datasheet - Cont. - NM2

Project Name:	16800 Magnolia	Site Topo:	Buildings 1-2 stories	Day: 1 of 2
Site Address/Location:	16800 Magnolia Street	tall site	Noise Source(s) w/ Distance:	
Site Id:	NM2	Meteorological Cond.:	70F over cast winds	Road and commercial noise
		0 MPH		
		Ground Type:	buildings and	
		asphalt		



Appendix B:
Traffic Noise Modeling Output

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: 16800 Magnolia
 ROADWAY: Magnolia St
 LOCATION: N of Warner

JOB #: 0462-24-15
 DATE: 30-Jan-25
 ENGINEER: N. Jensen

NOISE INPUT DATA - EXISTING

ROADWAY CONDITIONS

ADT = 25,900
 SPEED = 45
 PK HR % = 10
 NEAR LANE/FAR LANE DI: 70
 ROAD ELEVATION = 0.0
 GRADE = 1.0 %
 PK HR VOL = 2,590

RECEIVER INPUT DATA

RECEIVER DISTANCE = 100
 DIST C/L TO WALL = 0
 RECEIVER HEIGHT = 5.0
 WALL DISTANCE FROM RECEIVER = 100
 PAD ELEVATION = 0.5
 ROADWAY VIEW: LF ANGLE= -90
 RT ANGLE= 90
 DF ANGLE= 180

SITE CONDITIONS

AUTOMOBILES = 10
 MEDIUM TRUCKS = 10 (10 = HARD SITE, 15 = SOFT SITE)
 HEAVY TRUCKS = 10

WALL INFORMATION

HTH WALL = 0.0
 AMBIENT= 0.0
 BARRIER = 0 (0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.775	0.129	0.096	0.9742
MEDIUM TRUCKS	0.848	0.049	0.103	0.0184
HEAVY TRUCKS	0.865	0.027	0.108	0.0074

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	93.74	--
MEDIUM TRUCKS	4.0	93.69	--
HEAVY TRUCKS	8.0	93.71	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	68.7	66.8	65.1	59.0	67.6	68.2
MEDIUM TRUCKS	59.8	58.3	51.9	50.4	58.8	59.0
HEAVY TRUCKS	60.3	58.9	49.9	51.1	59.5	59.6
NOISE LEVELS (dBA)	69.8	68.0	65.4	60.1	68.7	69.2

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	68.7	66.8	65.1	59.0	67.6	68.2
MEDIUM TRUCKS	59.8	58.3	51.9	50.4	58.8	59.0
HEAVY TRUCKS	60.3	58.9	49.9	51.1	59.5	59.6
NOISE LEVELS (dBA)	69.8	68.0	65.4	60.1	68.7	69.2

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	84	265	838	2650
LDN	74	235	744	2354

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: 16800 Magnolia
 ROADWAY: Magnolia St
 LOCATION: N of Warner

JOB #: 0462-24-15
 DATE: 30-Jan-25
 ENGINEER: N. Jensen

NOISE INPUT DATA - EXISTING + PROJECT

ROADWAY CONDITIONS

ADT = 27,800
 SPEED = 45
 PK HR % = 10
 NEAR LANE/FAR LANE DI: 70
 ROAD ELEVATION = 0.0
 GRADE = 1.0 %
 PK HR VOL = 2,780

RECEIVER INPUT DATA

RECEIVER DISTANCE = 100
 DIST C/L TO WALL = 0
 RECEIVER HEIGHT = 5.0
 WALL DISTANCE FROM RECEIVER = 100
 PAD ELEVATION = 0.5
 ROADWAY VIEW: LF ANGLE= -90
 RT ANGLE= 90
 DF ANGLE= 180

SITE CONDITIONS

AUTOMOBILES = 10
 MEDIUM TRUCKS = 10 (10 = HARD SITE, 15 = SOFT SITE)
 HEAVY TRUCKS = 10

WALL INFORMATION

HTH WALL = 0.0
 AMBIENT= 0.0
 BARRIER = 0 (0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.775	0.129	0.096	0.9742
MEDIUM TRUCKS	0.848	0.049	0.103	0.0184
HEAVY TRUCKS	0.865	0.027	0.108	0.0074

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	93.74	--
MEDIUM TRUCKS	4.0	93.69	--
HEAVY TRUCKS	8.0	93.71	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	69.0	67.1	65.4	59.3	67.9	68.5
MEDIUM TRUCKS	60.1	58.6	52.2	50.7	59.1	59.4
HEAVY TRUCKS	60.6	59.2	50.2	51.4	59.8	59.9
NOISE LEVELS (dBA)	70.1	68.3	65.7	60.5	69.0	69.5

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	69.0	67.1	65.4	59.3	67.9	68.5
MEDIUM TRUCKS	60.1	58.6	52.2	50.7	59.1	59.4
HEAVY TRUCKS	60.6	59.2	50.2	51.4	59.8	59.9
NOISE LEVELS (dBA)	70.1	68.3	65.7	60.5	69.0	69.5

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	90	284	899	2844
LDN	80	253	799	2526

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: 16800 Magnolia
 ROADWAY: Warner Ave
 LOCATION: West of Magnolia

JOB #: 0462-24-15
 DATE: 30-Jan-25
 ENGINEER N. Jensen

NOISE INPUT DATA - EXISTING

ROADWAY CONDITIONS

ADT = 27,700
 SPEED = 45
 PK HR % = 10
 NEAR LANE/FAR LANE DI: 76
 ROAD ELEVATION = 0.0
 GRADE = 1.0 %
 PK HR VOL = 2,770

RECEIVER INPUT DATA

RECEIVER DISTANCE = 100
 DIST C/L TO WALL = 95
 RECEIVER HEIGHT = 5.0
 WALL DISTANCE FROM RECEIVER = 5
 PAD ELEVATION = 0.5
 ROADWAY VIEW: LF ANGLE= -90
 RT ANGLE= 90
 DF ANGLE= 180

SITE CONDITIONS

AUTOMOBILES = 10
 MEDIUM TRUCKS = 10 (10 = HARD SITE, 15 = SOFT SITE)
 HEAVY TRUCKS = 10

WALL INFORMATION

HTH WALL = 6.0
 AMBIENT= 0.0
 BARRIER = 0 (0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.775	0.129	0.096	0.9742
MEDIUM TRUCKS	0.848	0.049	0.103	0.0184
HEAVY TRUCKS	0.865	0.027	0.108	0.0074

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	92.28	--
MEDIUM TRUCKS	4.0	92.20	--
HEAVY TRUCKS	8.0	92.18	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	69.1	67.2	65.4	59.4	68.0	68.6
MEDIUM TRUCKS	60.1	58.6	52.3	50.7	59.2	59.4
HEAVY TRUCKS	60.7	59.3	50.2	51.5	59.8	60.0
NOISE LEVELS (dBA)	70.1	68.3	65.8	60.5	69.1	69.6

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	62.8	60.9	59.1	53.0	61.7	62.3
MEDIUM TRUCKS	54.0	52.5	46.2	44.6	53.1	53.3
HEAVY TRUCKS	55.0	53.6	44.5	45.8	54.1	54.3
NOISE LEVELS (dBA)	63.9	62.1	59.5	54.3	62.9	63.4

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	91	288	910	2879
LDN	81	256	809	2557

FHWA-RD-77-108 HIGHWAY NOISE PREDICTION MODEL

PROJECT: 16800 Magnolia
 ROADWAY: Warner Ave
 LOCATION: East of Magnolia

JOB #: 0462-24-15
 DATE: 30-Jan-25
 ENGINEER: N. Jensen

NOISE INPUT DATA - EXISTING + PROJECT

ROADWAY CONDITIONS

ADT = 29,100
 SPEED = 45
 PK HR % = 10
 NEAR LANE/FAR LANE DI: 76
 ROAD ELEVATION = 0.0
 GRADE = 1.0 %
 PK HR VOL = 2,910

RECEIVER INPUT DATA

RECEIVER DISTANCE = 100
 DIST C/L TO WALL = 95
 RECEIVER HEIGHT = 5.0
 WALL DISTANCE FROM RECEIVER = 5
 PAD ELEVATION = 0.5
 ROADWAY VIEW: LF ANGLE= -90
 RT ANGLE= 90
 DF ANGLE= 180

SITE CONDITIONS

AUTOMOBILES = 10
 MEDIUM TRUCKS = 10 (10 = HARD SITE, 15 = SOFT SITE)
 HEAVY TRUCKS = 10

WALL INFORMATION

HTH WALL = 6.0
 AMBIENT= 0.0
 BARRIER = 0 (0 = WALL, 1 = BERM)

VEHICLE MIX DATA

VEHICLE TYPE	DAY	EVENING	NIGHT	DAILY
AUTOMOBILES	0.775	0.129	0.096	0.9742
MEDIUM TRUCKS	0.848	0.049	0.103	0.0184
HEAVY TRUCKS	0.865	0.027	0.108	0.0074

MISC. VEHICLE INFO

VEHICLE TYPE	HEIGHT	SLE DISTANCE	GRADE ADJUSTMENT
AUTOMOBILES	2.0	92.28	--
MEDIUM TRUCKS	4.0	92.20	--
HEAVY TRUCKS	8.0	92.18	0.00

NOISE OUTPUT DATA

NOISE IMPACTS (WITHOUT TOPO OR BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	69.3	67.4	65.6	59.6	68.2	68.8
MEDIUM TRUCKS	60.3	58.8	52.5	50.9	59.4	59.6
HEAVY TRUCKS	60.9	59.5	50.5	51.7	60.1	60.2
NOISE LEVELS (dBA)	70.3	68.5	66.0	60.7	69.3	69.8

NOISE IMPACTS (WITH TOPO AND BARRIER SHIELDING)

VEHICLE TYPE	PK HR LEQ	DAY LEQ	EVEN LEQ	NIGHT LEQ	LDN	CNEL
AUTOMOBILES	63.0	61.1	59.3	53.3	61.9	62.5
MEDIUM TRUCKS	54.2	52.7	46.4	44.8	53.3	53.5
HEAVY TRUCKS	55.2	53.8	44.7	46.0	54.3	54.5
NOISE LEVELS (dBA)	64.1	62.3	59.7	54.5	63.1	63.6

NOISE CONTOUR (FT)

NOISE LEVELS	70 dBA	65 dBA	60 dBA	55 dBA
CNEL	96	302	956	3024
LDN	85	269	850	2687

Appendix C:
HVAC Reference Sheets

50PG03-14

Ultra High Efficiency Single Package Electric Cooling with
Optional Electric Heat Commercial Rooftop Units with Puron®
(R-410A) Refrigerant, Optional EnergyX™ (Energy Recovery
Ventilator)
2 to 12.5 Nominal Tons

Carrier

turn to the experts



Not equipment being used, but a similar assumption

Product Data



AHRI* CAPACITY RATINGS

50PG03-14

UNIT 50PG	NOMINAL CAPACITY (Tons)	NET COOLING CAPACITY (Btuh)	TOTAL POWER (kW)	SEER	EER†	SOUND RATING (dB)	IEER
03	2.0	24,000	2.1	14.1	11.5	75	—
04	3.0	35,800	3.1	14.1	11.7	73	—
05	4.0	47,500	4.0	15.0	12.2	72	—
06	5.0	58,500	4.9	14.8	12.2	78	—
07	6.0	69,000	5.8	—	12.2	78	13.0
08	7.5	88,000	7.0	—	12.7	80	13.5
09	8.5	102,000	8.4	—	12.4	80	13.4
12	10.0	119,000	9.9	—	12.2	80	13.0
14	12.5	150,000	13.2	—	11.5	83	11.6

LEGEND

EER – Energy Efficiency Ratio

SEER – Seasonal Energy Efficiency Ratio

*Air Conditioning, Heating and Refrigeration Institute.

† AHRI does not require EER ratings for units with capacity below 65,000 Btuh.

NOTES:

1. Tested in accordance with AHRI Standards 210–94 (sizes 03–12), 360–93 (size 14).

2. Ratings are net values, reflecting the effects of circulating fan heat.

3. Ratings are based on:

Cooling Standard: 80°F db, 67°F wb indoor entering–air temperature and 95°F db air entering outdoor unit.

IPLV Standard: 80°F db, 67°F wb indoor entering–air temperature and 80°F db outdoor entering–air temperature.

4. All 50PG units are in compliance with Energy Star® and ASHRAE 90.1 2010 Energy Standard for minimum SEER and EER requirements.

5. Units are rated in accordance with AHRI sound standards 270 or 370.

6. Per AHRI, Integrated Energy Efficiency Ratio (IEER) became effective beginning January 1, 2010. Integrated Part–Load Value (IPLV) was superseded by IEER on January 1, 2010. IEER is intended to be a measure of merit for the part load performance of the unit. Each building may have different part load performance due to local occupancy schedules, building construction, building location and ventilation requirements. For specific building energy analysis, an hour–by–hour analysis program should be used.



Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to www.ahridirectory.org.

Barrier insertion loss For Flat Ground, North and South Building

Receiver - East Residences

Enter variables here:

Source Height H_s (ft)	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79
Receiver Height H_R (ft)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Barrier Height H_B (ft)	81.5	82.5	83.5	84.5	85.5	86.5	87.5	88.5	89.5	90.5	91.5	92.5	93.5	94.5	95.5	96.5
Distance Source to barrier (ft)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Distance Receiver to Barrier (ft)	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175
Soft Ground = 1; Hard Ground = 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Calculations

A	30.103986	30.203477	30.33562262	30.5	30.696091	30.923292	31.180924	31.468238	31.78443	32.128648	32.5	32.897568	33.320414	33.767588	34.238137	34.73111
B	190.99018	191.39292	191.8000261	192.21147	192.62723	193.04727	193.47157	193.9001	194.33283	194.76974	195.21078	195.65595	196.1052	196.55852	197.01586	197.47721
C	217.94724	217.94724	217.9472413	217.94724	217.94724	217.94724	217.94724	217.94724	217.94724	217.94724	217.94724	217.94724	217.94724	217.94724	217.94724	217.94724
P	3.1469281	3.6491558	4.188407371	4.7642308	5.3760803	6.0233249	6.7052565	7.4210998	8.1700219	8.9511422	9.7635422	10.606275	11.478374	12.378862	13.306758	14.261083
Ground type H_{eff} (with barrier)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ground type H_{eff} (no barrier)	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
H_{eff} (with barrier)	123.5	124.5	125.5	126.5	127.5	128.5	129.5	130.5	131.5	132.5	133.5	134.5	135.5	136.5	137.5	138.5
H_{eff} no barrier	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
G_B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G_{NB}	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
$A_{barrier}$	17.972345	18.615399	19.21396379	19.773402	20.298132	20.791837	21.257628	21.698157	22.115707	22.512259	22.889549	23.249103	23.592278	23.920282	24.234197	24.534999

IL_{barrier} 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4 10.4

Barrier Height (ft) IL (dBA)

81.5	10
82.5	10
83.5	10
84.5	10
85.5	10
86.5	10
87.5	10
88.5	10
89.5	10
90.5	10
91.5	10
92.5	10
93.5	10
94.5	10
95.5	10
96.5	10

Appendix D:
Construction Noise Modeling Output

Receptor - Residences to the West

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	Receptor Item Leq, dBA
DEMO									
Excavator	1	81	110	315	40	0.66	0.40	71.9	55.8
Dozer	1	82	110	315	40	0.66	0.40	72.9	56.8
Front End Loader	1	79	110	315	40	0.66	0.40	69.9	53.8
Tractor	1	84	110	315	40	0.66	0.40	74.9	58.8
							Log Sum	74.9	62.6
GRADE									
Excavator	1	81	110	315	40	0.66	0.40	71.9	55.8
Front End Loader	2	79	110	315	40	0.66	0.40	69.9	53.8
Tractor	1	84	110	315	40	0.66	0.40	74.9	58.8
								74.9	62.0
BUILD									
Auger Drill Rig	1	84	110	315	20	0.66	0.20	74.9	55.7
Crane	1	81	110	315	16	0.66	0.16	71.9	51.8
Man Lift	1	75	110	315	20	0.66	0.20	65.9	46.7
								74.9	57.6
PAVE									
Front End Loader	1	79	110	315	40	0.66	0.40	69.9	53.8
Compactor (ground)	1	83	110	315	20	0.66	0.20	73.9	54.7
Roller	1	80	110	315	20	0.66	0.20	70.9	51.7
								73.9	58.4
ARCH COAT									
Compressor (air)	1	78	110	315	40	0.66	0.40	68.9	52.8
								68.9	52.8

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

VIBRATION LEVEL IMPACT

Project: 16800 Magnolia St Date: 1/30/25
Source: Large Bulldozer
Scenario: Unmitigated
Location: Adjacent residences to west
Address: 16800 Magnolia St
PPV = $PPV_{ref}(25/D)^n$ (in/sec)

DATA INPUT

Equipment = 2 Large Bulldozer INPUT SECTION IN BLUE
Type
PPVref = 0.089 Reference PPV (in/sec) at 25 ft.
D = 10.00 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 = 0.244 IN/SEC OUTPUT IN RED