Appendix I

Noise Technical Report

Noise and Vibration Technical Report

Aquabella Project

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Acronyms and Abbreviations

Acronym/Abbreviation	Meaning
ADT	Average Daily Trips
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	Community Noise Equivalent Level
dB	Decibel
dBA	A-Weighted Decibel
d_{ref}	The Reference Distance that Helps Define Leq (Activity)
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HUD	U.S. Department of Housing and Urban Development
HVAC	Heating, Ventilation and Air Conditioning
Hz	Hertz
L_{dn}	Day-Night Sound Level
L_{eq}	Equivalent Sound Level
L_{max}	Maximum Sound Level
L_{min}	Minimum Sound Level
L_v	Vibration Level
L_{xx}	Percentile-Exceeded Sound Levels
MW	Megawatt
PPV	Peak Particle Velocity
RCNM	Roadway Construction Noise Model
USEPA	United States Environmental Protection Agency
U.S.C.	U.S. Code
VdB	Vibration Decibel

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1 Introduction

1.1 Executive Summary

This Noise Technical Report has been prepared in support of an application submitted by T/Cal Realty II, LLC to amend the Aquabella Specific Plan (Amendment 2 to the Specific Plan) and for other entitlements needed to implement a mixed-use residential community of up to 15,000 units in the City of Moreno Valley (City), herein referred to as the "Project."

The purpose of this Noise and Vibration Technical Report is to assess the potential noise and vibration impacts associated with implementation of the Project. This assessment uses the significance thresholds in Appendix G of the California Environmental Quality Act (CEQA) Guidelines (14 CCR 15000 et seq.), as well as standards established in the Moreno Valley 2040 General Plan and Municipal Code, in determining the significance of Project impacts related to noise and vibration.

This Noise and Vibration Technical Report evaluates the potential for Project-generated construction, operational, and traffic noise emissions that could result in adverse impacts to sensitive receptors (i.e., structures and humans). This Noise and Vibration Technical Report also includes an assessment of ground-borne vibration impacts to sensitive receptors (i.e., structures and humans) based on vibration significance guidelines for Project construction and operation.

This Noise and Vibration Technical Report was prepared by Jonathan Leech, AICP, INCE. Mr. Leech's resume is provided in Appendix A.

1.2 Project and Approach Overview

The applicant is seeking entitlements to implement a mixed-use residential community on the Project site with commercial uses, a lake complex and lake promenade, and other amenities, while modifying residential uses to better help the City meet local and regional housing goals. The Project proposes the Aquabella Specific Plan Amendment to comprehensively update the previously approved 1999 Moreno Valley Field Station Specific Plan and 2005 Aquabella Specific Plan Amendment. The Aquabella Specific Plan Amendment provides comprehensive plans and a new vision to guide the continued implementation of the Aquabella Project and bring significant public benefits, housing, and economic growth to the City and the region. The Project's Specific Plan Amendment contains updated land use and other plans, site development standards, design guidelines, and implementation measures necessary to implement the new vision for the Aquabella residential and mixed-use planned community that will guide development of the undeveloped Specific Plan areas. The Project also includes the potential development of a school site on a parcel designated Residential 5 (R5) on the Project site's eastern boundary. The Project is located within the City of Moreno Valley, who will serve as the CEQA lead agency for environmental review.

1.3 Project Description

The Project comprises 770.5 acres and would include land use and other changes to accommodate 15,000 multi-family and workforce housing options for all ages and income levels, a 49,900 square feet (sf) mixed-use commercial and retail Town Center with a 300-room hotel; 80 acres of parks, comprised of a 40-acre lake system, a 15-acre lake promenade encircling the lake, and an additional 25 acres of active parkland; 40 acres of schools with up to three elementary school sites and one middle school site; public services and facilities; infrastructure improvements; and other amenities.

Significant grading and development was previously completed pursuant to prior approvals. Approximately 70 percent of the site has been graded or developed, including the lake complex. The Project site's master drainage and master flood control improvements have already been completed. Backbone infrastructure and transportation facilities have been installed, including the extension of Nason Street between Cactus Avenue and Iris Avenue, and improvements to Cactus Avenue. In addition, the 50-acre high school (Vista del Lago High School) has been completed in the southwest area of the site and a 220-unit market rate, multi-family apartment complex has been built on 11-acres in the northwest area of the site. Accordingly, while the site comprises 770.5 acres, Project development is proposed to occur only on the undeveloped 668.6 acres of the Project site.

The Aquabella Specific Plan Amendment, while implementing a new vision, maintains many of the site's previously approved features including the 40-acre lake; the 15-acre lake promenade, parks, trails; and commercial uses, including the 300-room hotel. The Aquabella Specific Plan Amendment's primary land use change consists of the creation of an innovative Town Center with 15,000 multi-family housing options in lieu of the previously approved active-adult community of 2,922 detached and attached units 2,702 units of which were age-restricted. The Project also adds an approximate 10- acre area to the Specific Plan along the eastern boundary of the site, which is proposed for a potential school site.

1.3.1 Project Location and Access

The Project site is in the southeastern portion of the City of Moreno Valley in the western portion of Riverside County. The Project site is irregularly shaped and located east of Interstate (I)-215, south of State Route (SR)-60, and north of Lake Perris. The Project site is bounded by Cactus Avenue and Brodiaea Avenue to the north, Iris Avenue to the south, Laselle Street to the west, and Oliver Street to the east. The Project site is in Sections 15, 16, 21, and 22 of Township 3 South, Range 3 West on the USGS Sunnymead 7.5 Minute Quadrangle.

Regional access to the Project site is provided by Alessandro Boulevard, Cactus Avenue, John F. Kennedy Drive, Iris Avenue, Perris Boulevard, and Laselle Street. The Project site's primary circulation spine roads (Nason Street and Cactus Avenue) have already been completed and connect with the local and regional roadway network.

1.3.2 Project Construction Phasing

The Project site is generally flat with elevations ranging from 1,490 feet to 1,560 feet above mean sea level. Currently, approximately 70% of the Project site has been subject to mass grading, particularly with contouring for a planned artificial lake feature. Construction of the Project is envisioned to occur in six separate phases. Table 1 provides a description of the envisioned construction phases. Construction equipment needed for each phase is identified in Appendix C.

Table 1. Project Construction Phasing Descriptions and Durations

Phase No.	Construction Activity Description	Duration (Months)
Phase 1	Site Preparation	12
	Paving	1
	Residential Building Construction (2,500 units)	21
	Mixed Use/Retail Building Construction 49,900 Square Feet)	12
	Park Construction (Promenade, Lake)	12
	Architectural Coating Application	4
Phase 2	Site Preparation	12
	Paving	1
	Residential Building Construction (2,500 units)	21
	Hotel Construction (300 rooms)	12
	Park Construction (5-acre park site)	5
	Architectural Coating Application	4
Phase 3	Site Preparation	12
	Paving	1
	Residential Building Construction (2,500 units)	21
	Elementary School Construction (1,332 students)	12
	Middle School Construction (2,049 students)	12
	Park Construction (17.5 acres, promenade, lake)	9
	Architectural Coating Application	4
Phase 4	Site Preparation	12
	Paving	1
	Residential Building Construction (2,500 units)	21
	Elementary School Construction (1,332 students)	12
	Park Construction (16 acres, promenade, lake)	9
	Architectural Coating Application	4
Phase 5	Site Preparation	12
	Paving	1
	Residential Building Construction (2,500 units)	21
	Park Construction (11.5 acres, promenade, lake)	6
	Architectural Coating Application	4
Phase 6	Site Preparation	12
	Paving	1
	Residential Building Construction (2,500 units)	21
	Elementary School Construction (1,332 students)	12
	Architectural Coating Application	4

1.4 Noise Background and Terminology

1.4.1 Fundamentals of Environmental Noise

Vibrations, traveling as waves through air from a source, exert a force perceived by the human ear as sound. Sound pressure level (referred to as sound level) is measured on a logarithmic scale in decibel (dB) that represents the fluctuation of air pressure above and below atmospheric pressure. Frequency, or pitch, is a physical characteristic of sound and is expressed in units of cycles per second or hertz. The normal frequency range of hearing for most people extends from about 20 to 20,000 hertz. The human ear is more sensitive to middle and high frequencies, especially when the noise levels are quieter. As noise levels get louder, the human ear starts to hear the frequency spectrum more evenly. To accommodate for this phenomenon, a weighting system to evaluate how loud a noise level is to a human was developed. The frequency weighting, called "A" weighting, is typically used for quieter noise levels, which de-emphasizes the low-frequency components of the sound in a manner similar to the response of a human ear. This A-weighted sound level is called the "noise level" and is referenced in units of A-weighted decibel (dBA). Table 2 presents typical noise levels for common outdoor and indoor activities.

Table 2. Typical Noise Levels Associated with Common Activities

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock Band
Jet Flyover at 1,000 feet	105	
	100	
Gas Lawn Mower at three feet	95	
	90	
Diesel Truck at 50 feet, 50 miles per hour	85	Food Blender at 3 feet
	80	Garbage Disposal at 3 feet
Noisy Urban Area, Daytime	75	
	70	Vacuum Cleaner at 10 feet
Commercial Area	65	Normal speech at 3 feet
Heavy Traffic at 300 feet	60	
	55	Large Business Office
Quiet Urban Daytime	50	Dishwasher (in next room)
	45	
Quiet Urban Nighttime	40	Theater, Conference Room (background)
Quiet Suburban Nighttime	35	
	30	Library
Quiet Rural Nighttime	25	Bedroom at Night, Concert Hall (background)
	20	
	15	Broadcast/Recording Studio
	10	
	5	
Lowest Threshold of Human Hearing (Healthy)	0	Lowest Threshold of Human Hearing (Healthy)

Source: Caltrans 2020a. **Notes:** dBA = A-weighted decibel.

Since sound is measured on a logarithmic scale, a doubling of sound energy results in a 3-dBA increase in the noise level. Changes in a community noise level of less than 3 dBA are not typically noticed by the human ear (Caltrans 2020a). Changes from 3 to 5 dBA may be noticed by some individuals who are extremely sensitive to changes in noise. A 5-dBA increase is readily noticeable (EPA 1974). The human ear perceives a 10-dBA increase in sound level as a doubling of the sound level (i.e., 65 dBA sounds twice as loud as 55 dBA to a human ear).

An individual's noise exposure occurs over time; however, noise level is a measure of noise at a given instant in time. Community noise sources vary continuously, being the product of many noise sources at various distances, all of which constitute a relatively stable background or ambient noise environment. The background, or ambient, noise level gradually changes throughout a typical day, corresponding to distant noise sources such as traffic volume and changes in atmospheric conditions. The time-varying character of environmental noise is often described with use of statistical or percentile noise descriptors including L_{10}, L_{50}, and L_{90}. These are the noise levels equaled or exceeded during 10, 50, and 90 percent of the measured time interval. Sound levels associated with L_{10} typically describe transient or short-term events, such as the noise from distinct passing cars and trucks. L_{50} represents the median sound level during the measurement. Levels will be above and below this value exactly one-half of the accumulated measurement time. L_{90} is the sound level exceeded 90 percent of the time, and often is used to describe background noise conditions or sources that are continuous or "steady-state" in character.

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

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (L_{eq}), the minimum and maximum sound levels (L_{min} and L_{max}, respectively), percentile-exceeded sound level (L_{xx}), the day-night sound level (L_{dn}), and the CNEL. The following list provides brief definitions of noise terminology used in this report.

- **Decibel** (dB) is a unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micropascals.
- **A-weighted decibel** (dBA) is an overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
- **Equivalent sound level** (L_{eq}) is the constant level that, over a given time period, transmits the same amount of acoustic energy as the actual time-varying sound. Equivalent sound levels are the basis for both the L_{dn} and CNEL scales.
- **Percentile-exceeded sound level** (L_{xx}) is the sound level exceeded X% of a specific time period. L_{10} is the sound level exceeded 10% of the time.
- **Day-Night Average Sound Level** (L_{dn}) is a 24-hour average A-weighted sound level with a 10 dB penalty added each of the hourly average noise levels occurring in the nighttime hours from 10:00 p.m. to 7:00 a.m. The 10 dB penalty is applied to account for increased noise sensitivity during the nighttime hours.
- **Community Noise Equivalent Level** (CNEL) is the average equivalent A-weighted sound level during a 24 hour day. CNEL accounts for the increased noise sensitivity during the evening hours (7:00 p.m. to 10:00 p.m.) and nighttime hours (10:00 p.m. to 7:00 a.m.) by adding 5 dB to the recorded hourly average sound levels in the evening and 10 dB to the hourly average sound levels at night.

- **Maximum sound level** (L_{max}) is the maximum sound level measured during the measurement period.
- **Minimum sound level** (L_{min}) is the minimum sound level measured during the measurement period.

1.4.1.1 Exterior Noise Distance Attenuation

Noise sources are classified in two forms: (1) point sources, such as stationary equipment or a group of construction vehicles and equipment working within a spatially limited area at a given time; and (2) line sources, such as a roadway with a large number of pass-by sources (motor vehicles). Sound generated by a point source typically diminishes (attenuates) at a rate of 6.0 dBA for each doubling of distance from the source to the receptor at acoustically "hard" sites and at a rate of 7.5 dBA for each doubling of distance from source to receptor at acoustically "soft" sites (Caltrans 2020a). Sound generated by a line source (i.e., a roadway) typically attenuates at a rate of 3 dBA and 4.5 dBA per doubling distance, for hard and soft sites, respectively (Caltrans 2020a). For the purpose of a sound attenuation discussion, a hard or reflective site does not provide any excess ground-effect attenuation and is characteristic of asphalt or concrete ground surfaces, as well as very hard-packed soils. An acoustically soft or absorptive site is characteristic of unpaved loose soil or vegetated ground.

With respect to examples of this distance-attenuation relationship for exterior noise, a 60-dBA noise level measured at 50 feet from a tractor installing fenceposts within a packed earth feedlot site would diminish to 54 dBA at 100 feet from the source, and to 48 dBA at 200 feet from the source. This scenario is addressed by the point source attenuation for a hard site (6 dBA with each doubling of the distance). For the scenario where soft-site conditions exist between the point source and receptor, represented by natural vegetation, planted row crop, or plowed furrows adjacent to the work area, an attenuation rate of 7.5 dBA per doubling of distance would apply; the tractor noise measured as 60 dBA at 50 feet would diminish to 52.5 dBA at 100 feet from the source and to 45 dBA at 200 feet from the source, where soft ground exists between the sound source and the receptor location.

1.4.1.2 Natural Barriers and Structural Noise Attenuation

Sound levels can also be attenuated by human-made or natural barriers (i.e., topographic ridges or very dense forests). Solid walls, berms, or elevation differences typically reduce noise levels in the range of approximately 5 to 15 dBA (Caltrans 2020a). Structures can also provide noise reduction by insulating interior spaces from outdoor noise. The outside-to-inside noise attenuation provided by typical structures in California ranges between 17 to 30 dBA with open and closed windows, respectively, as shown in Table 3. With the advent of building code updates since 1971 that emphasize energy efficiency through increased insulation, modern buildings are assumed to provide greater overall outdoor to indoor attenuation than depicted in Table 3.

Table 3. Outside-to-Inside Noise Attenuation (dBA)

Building Type	Typical Attenuation with Open Windows	Typical Attenuation with Closed Windows
Residences	17	25
Schools	17	25
Churches	20	30
Hospitals/offices/hotels	17	25
Theaters	17	25

Source: Transportation Research Board, National Research Council 1971.
Notes: dBA = A-weighted decibel.
As shown, structures with closed windows can attenuate exterior noise by a minimum of 25 to 30 dBA

1.4.2 Fundamentals of Vibration

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. Heavy equipment operation, including stationary equipment that produces substantial oscillation or construction equipment that causes percussive action against the ground surface, may be experienced by building occupants as perceptible vibration. It is also common for groundborne vibration to cause windows, pictures on walls, or items on shelves to rattle; this transfer of vibration energy in the ground to structures resulting in audible sound is termed groundborne noise. The metric for groundborne noise is the vibration decibel, written VdB. Although the perceived vibration from such equipment operation can be intrusive to building occupants, the vibration is seldom of sufficient magnitude to cause even minor cosmetic damage to buildings.

Peak particle velocity (PPV) that describes particle movement over time (in terms of physical displacement of mass, expressed as inches/second or in/sec) is generally employed for the discussion of vibration impacts on structures. Groundborne vibration generated by construction projects is usually highest during pile driving, rock blasting, soil compacting, jack hammering, and demolition-related activities. Next to pile driving and soil compacting, grading activity has the greatest potential for vibration impacts when earthwork involves large bulldozers, large trucks, or other heavy equipment.

1.4.3 Health Effects of Noise

Excessively noisy conditions can affect an individual's quality of life, health, and well-being. The effects of noise can be organized into six broad categories: sleep disturbance, permanent hearing loss, human performance and behavior, social interaction or communication, extra-auditory health effects, and general annoyance. An individual's reaction to noise and its level of disturbance depends on many factors such as the source of the noise, its loudness relative to the background noise level, time of day, whether the noise is temporary or permanent, and subjective sensitivity.

In 1974, the U.S. Environmental Protection Agency (EPA) provided guidance based on its "*Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA 550/ 9-74-004), which estimated potential noise interference with common activities, human health and welfare effects from noise, and annoyance with noise. To summarize, where federal or local regulations concerning noise may be lacking, the EPA recommended a public-protecting guideline of 55 dBA day-night sound level (Ldn) assessed at the exterior of any existing noise sensitive land use (including residences) where the existing outdoor ambient sound level is not already in excess of this value. This represents the level below which there is no reason to suspect that the general population will be at risk from any of the identified effects of noise. It does not represent a standard, criterion, or regulation, as it was derived without consideration for feasibility or desirability and has not been adopted as a standard by the City.

1.5 Noise Regulation and Management

1.5.1 Federal

1.5.1.1 Noise Control Act

The Noise Control Act of 1972 and its subsequent amendments in the Quiet Communities Act of 1978 (42 United States Code [U.S.C.] 4901 et seq.) delegate authority to the states to regulate environmental noise and direct government agencies to ensure compliance with local community noise statutes and regulations.

1.5.1.2 Federal Aviation Administration Standards

Enforced by the Federal Aviation Administration, Code of Federal Regulations Title 14, Part 150, prescribes the procedures, standards, and methodology governing the development, submission, and review of airport noise exposure maps and airport noise compatibility programs, including the process for evaluating and approving or disapproving those programs. Title 14 also identifies those land uses that are normally compatible with various levels of exposure to noise by individuals. The Federal Aviation Administration has determined that interior sound levels up to 45 dBA L_{dn} (or CNEL) are acceptable within residential buildings. The Federal Aviation Administration also considers residential land uses to be compatible with exterior noise levels at or less than 65 dBA L_{dn} (or CNEL). The Project is not located within the mapped noise contours of any public airport.

1.5.1.3 Federal Transit Administration (FTA)

In its Transit Noise and Vibration Impact Assessment guidance manual, the FTA recommends a daytime construction noise level threshold of 80 dBA L_{eq} over an eight-hour period when detailed construction noise assessments are performed to evaluate potential impacts to community residences surrounding a project (FTA 2018). The FTA also recommends using a construction noise threshold of 75 dBA L_{dn} averaged over 30 days for residences exposed to construction noise lasting 30 days or longer. Although this FTA guidance is not a regulation, it can serve as a quantified standard in the absence of such limits at the state and local jurisdictional levels.

1.5.1.4 Federal Interagency Committee on Noise (FICON)

For the assessment of transportation noise impacts and degradation of the existing ambient noise environment, significance thresholds developed by the Federal Interagency Committee on Noise (FICON) are often employed. FICON specifies a maximum allowable increase in noise level (using CNEL), which is dependent upon the baseline ambient noise level. Under FICON recommended criteria (FICON 1992), as existing ambient noise increases, the threshold level for the allowable increase in noise exposure resulting from a project is reduced (i.e., the allowable increase in noise level has an inverse relationship with the ambient noise levels without a project). Table 4.5-5 illustrates the FICON criteria considered when evaluating traffic noise generated by a project. If sensitive receptors (i.e., residences) would be exposed to long-term traffic noise increases exceeding these criteria, impacts may be considered significant.

Table 4. Significance of Changes in Roadway Noise Exposure

Existing Noise Exposure (dBA CNEL)	Allowable Noise Exposure Increase / Significance Threshold (dBA CNEL)
Less than 60	5
60 - 65	3
Greater than 65	1.5

Source: FICON 1992.
Notes: dBA = A-weighted decibel. CNEL = Community Noise Equivalent Level.

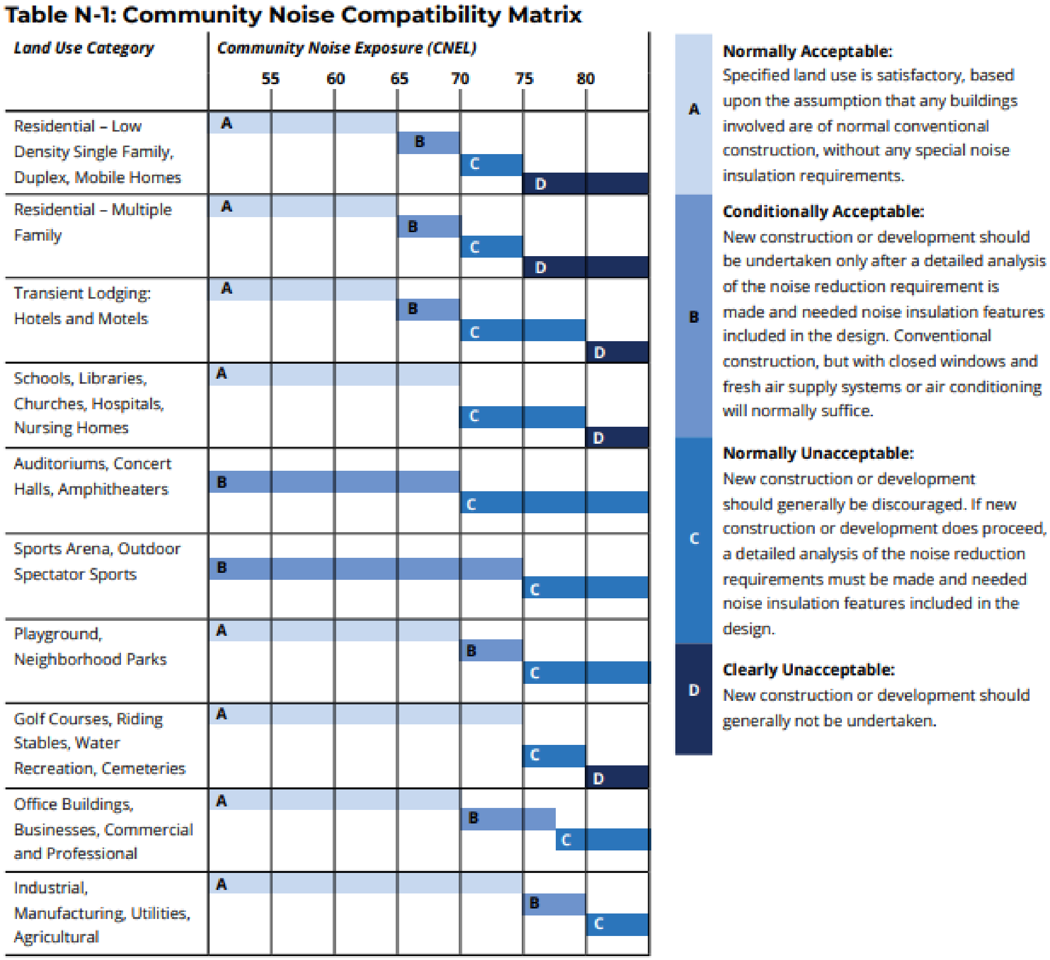
1.5.2 State

1.5.2.1 California Department of Health Services

DHS has developed guidelines of community noise acceptability for use by local agencies, which have been published by the Governor's Office of Planning and Research (2017) as the Land Use Compatibility for Community Noise Environments Matrix, provided herein.

Land Use Compatibility for Community Noise Environments Matrix

Table N-1: Community Noise Compatibility Matrix



Source: Governor's Office of Planning and Research 2017.

Note: The City of Moreno Valley 2040 General Plan Noise Element Incorporates N-1 as their Exterior Noise Exposure Limit Guidelines

1.5.2.2 California Department of Transportation Vibration Standards

The California Department of Transportation (Caltrans) conducted extensive research on human annoyance and damage to structures caused by vibration from short term construction activities and from long term highway operations and has published criteria for vibration management (Transportation and Construction Vibration Guidance Manual 2020). These criteria established by Caltrans are commonly used to assess vibration impacts from all types of projects and activities. Caltrans uses a threshold of 0.2 in/sec PPV for annoyance to persons where a continuous vibration source is involved. For transient sources, represented by construction activities, Caltrans uses a threshold of 0.24 in/sec PPV, which equates to a distinctly perceptible level. For groundborne noise, Caltrans uses a daytime threshold of 78 VdB for residential occupants. For commercial buildings constructed of concrete and steel, Caltrans identifies a damage threshold of 0.5 in/sec PPV. For residential structures employing concrete foundation and wood frame construction, Caltrans identifies a conservative damage threshold vibration level standard of 0.3 in/sec PPV (Caltrans 2020b).

1.5.2.3 California Noise Control Act of 1973

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

1.5.2.4 California Code of Regulations

Interior noise levels for residential habitable rooms are regulated by Title 24 of the California Code of Regulations California Noise Insulation Standards. Title 24, Chapter 12, Section 1206.4, of the 2022 California Building Code requires that interior noise levels attributable to exterior sources not exceed 45 CNEL in any habitable room (California Code of Regulations 2022). A habitable room is a room used for living, sleeping, eating, or cooking. Bathrooms, closets, hallways, utility spaces, and similar areas are not considered habitable rooms for this regulation (Title 24 California Code of Regulations, Chapter 12, Section 1206.4).

For non-residential structures, Title 24, Chapter 12, Section 1206.5 refers to 2022 California Green Building Standards, Chapter 5 – Nonresidential Mandatory Measures, Division 5.5 – Environmental Quality, Section 5.507 – Environmental Comfort, Subsection 5.507.4 – Acoustical Control. Pursuant to these standards, all non-residential building construction shall employ building assemblies and components that achieve a composite sound transmission class rating of at least 50 or shall otherwise demonstrate that exterior noise shall not result in interior noise environment where noise levels exceed 50 dB(A) L_{eq} in occupied areas during any hour of operation.

1.5.3 Local

1.5.3.1 City of Moreno Valley

General Plan Noise Element

The City of Moreno Valley has incorporated the Land Use Compatibility for Community Noise Environments Matrix (OPR 2017) in their 2040 General Plan Noise Element as their exterior noise exposure guidelines for each land use category (City of Moreno 2021). The Noise Element has several policies that would be applicable to the Aquabella Specific Plan, presented below.

N.1-2: Guide the location and design of transportation facilities, industrial uses, and other potential noise generators to minimize the effects of noise on adjacent land uses.

N.1-3: Apply the community noise compatibility standards (Table N-1) to all new development and major redevelopment projects outside the noise and safety compatibility zones established in the March Air Reserve Base/Inland Port Airport Land Use Compatibility (ALUC) Plan in order to protect against the adverse effects of noise exposure. Projects within the noise and safety compatibility zones are subject to the standards contained in the ALUC Plan.

N.1-4: Require a noise study and/or mitigation measures if applicable for all projects that would expose people to noise levels greater than the "normally acceptable" standard and for any other projects that are likely to generate noise in excess of these standards.

N.1-5: Noise impacts should be controlled at the noise source where feasible, as opposed to at receptor end with measures to buffer, dampen, or actively cancel noise sources. Site design, building orientation, building design, hours of operation, and other techniques, for new developments deemed to be noise generators shall be used to control noise sources.

N.1-6: Require noise buffering, dampening, or active cancellation, on rooftop or other outdoor mechanical equipment located near residences, parks, and other noise sensitive land uses.

N.2-1: Use the development review process to proactively identify and address potential noise compatibility issues.

N.2-3: Limit the potential noise impacts of construction activities on surrounding land uses through noise regulations in the Municipal Code that address allowed days and hours of construction, types of work, construction equipment, and sound attenuation devices.

Municipal Code Chapter 11.80 of the Moreno Valley Municipal Code provides performance standards and noise control guidelines for operational activities and for construction activities, as described below.

<u>Operational Noise Standards</u>

Moreno Valley Municipal Code Section 11.80.030.C, Nonimpulsive Sound Decibel Limits, provides the following restriction:

> No person shall maintain, create, operate or cause to be operated on private property any source of sound in such a manner as to create any nonimpulsive sound which exceeds the limits set forth for the source land use category (as defined in Section 11.80.020) in Table 11.80.030-2 when

measured at a distance of two hundred (200) feet or more from the real property line of the source of the sound, if the sound occurs on privately owned property, or from the source of the sound, if the sound occurs on public right-of-way, public space or other publicly owned property. Any source of sound in violation of this subsection shall be deemed prima facie to be a noise disturbance.

Table 11.80.030-2 of Municipal Code Section 11.80.030.C. provides:

Table 11.80.030-2. Maximum Sound Levels (in dB(A)) for Source Land Uses

Residential		Commercial	
Daytime[1]	Nighttime[2]	Daytime[1]	Nighttime[2]
60 dBA	55 dBA	65 dBA	60 dBA

Source: Section 11.80.030(C) of the City of Moreno Valley Municipal Code.
[1] Daytime means 8:00 a.m. to 10:00 p.m.
[2] Nighttime means 10:01 p.m. to 7:59 a.m.
dBA = A-weighted decibels
Leq = equivalent continuous sound level

As stated above, Section 11.80.030.C. of the City's Municipal Code establishes limits on non-impulsive noise where no person shall maintain, create, operate, or cause noise on private property to exceed the noise standards shown in Table 11.80.030-2. The standards are applicable for each source land use category (residential, commercial) when measured at a distance of 200 feet from the property line of the source of the noise, if the noise occurs on privately owned property. Noise levels that exceed the noise standards in Table 11.80.030-2 are deemed to be a noise disturbance.

For industrial and commercial land uses, based on the commercial land use standard of Moreno Valley Municipal Code Table 11.80.030-2, the operational noise level limits are 65 dBA L_{eq} during the daytime hours (8:00 a.m. to 10:00 p.m.) and 60 dBA L_{eq} during the nighttime hours (10:01 p.m. to 7:59 a.m.). For residential uses, the operational noise level limits are 60 dBA L_{eq} during the daytime hours (8:00 a.m. to 10:00 p.m.) and 55 dBA L_{eq} during the nighttime hours (10:01 p.m. to 7:59 a.m.).

Construction Noise Standards

The Municipal Code limits construction activities in two parts of the code: Sections 8.14.040(E) and 11.80.030(D)(7). Section 8.14.040(E) states that construction within the city shall only occur from 7:00 a.m. to 7:00 p.m. from Monday through Friday excluding holidays and from 8:00 a.m. to 4:00 p.m. on Saturdays. Section 11.80.030(D)(7) states that no person shall operate or cause the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work between the hours of 8:00 p.m. and 7:00 a.m. such that the sound creates a noise disturbance. For power tools, specifically, 11.80.030(D)(9) states that no person shall operate or permit the operation of any mechanically, electrically or gasoline motor-driven tool during nighttime hours that causes a noise disturbance across a residential property line. A noise disturbance is defined as any sound that disturbs a reasonable person of normal sensitivities, exceeds the sound level limits set forth in the Noise Ordinance, or is plainly audible (as measured at a distance of 200 feet from the property line of the source of the sound if the sound occurs on privately owned property, or public right-of-way, public space, or other publicly owned property).

Local Vibration Standards

Moreno Valley has not adopted quantified standards governing vibration from construction projects or heavy industry. Municipal Code Section 9.10.170 states that "No vibration shall be permitted which can be felt at or beyond the property line."

1.6 Significance Criteria

Section XIII of Appendix G of the State CEQA Guidelines addresses typical adverse effects due to noise and includes the following threshold questions to evaluate a project's impacts due to noise. Would the project:

1. Result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
2. Result in generation of excessive groundborne vibration or groundborne noise levels?
3. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels?

NOTE: For purposes of CEQA, for residential projects, the effects of noise generated by project occupants and their guests on human beings is not a significant effect on the environment. (Pub. Resources Code, § 21085)

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2 Environmental Setting

2.1 Sensitive Receptors

Noise- and vibration-sensitive land uses are locations where people reside or where the presence of unwanted sound or vibration could adversely affect the use of the land. Residences, hospitals, nursing care or assisted living facilities, guest lodging, schools and churches would be considered noise- and vibration-sensitive. Parks are also considered noise-sensitive. In addition, vibration-sensitive land uses also include institutional uses such as laboratories where the activities within the building are particularly sensitive to vibration.

Noise and vibration-sensitive receptors in the Project vicinity include single- and multi-family residences along the western, southern and northeastern Project boundaries, , the Riverside University Health System Medical Center to the north and Kaiser Permanente Hospital and medical complex to the southeast of the site., Vista del Lago High School along the southwest Project boundary, and Celebration Park adjacent to the eastern Project boundary.

2.2 Ambient Noise Survey

In order to establish existing baseline community noise levels (also known as outdoor ambient noise levels) Dudek performed a series of sound level measurements. Sound-pressure level measurements of short duration (i.e., less than an hour apiece) and long duration (at least 24 hours in length) were conducted in the vicinity of the Project site to quantify and characterize the existing outdoor ambient noise levels. The short-term measurements were conducted to characterize typical daytime noise levels in the Project area as well as to gather data necessary to calibrate the traffic noise model, while the long-term measurements provide sound level data throughout the day and night to describe representative ambient noise levels for receptors in the vicinity of the long-term measurement locations.

The short-term sound-pressure level measurements were performed by a Dudek field investigator using a Rion NL-52 model sound level meter equipped with a 0.5-inch, pre-polarized condenser microphone with pre-amplifier. The Rion NL-52 sound level meter meets the current American National Standards Institute standard for a Type 1 (precision) sound level meter. The long-term sound pressure level measurements were unattended but were performed using a SoftdB Piccolo model sound level meter equipped with a 0.5-inch, pre-polarized condenser microphone with pre-amplifier secured in a locked case to prevent tampering. The SoftdB Piccolo sound level meter meets the current American National Standards Institute standard for a Type 2 (general purpose) sound level meter. The accuracy of the sound level meters was verified using a field calibrator before and after the measurements, and the measurements were conducted with the microphone positioned approximately five feet above the ground. Table 5, Measured Short-Term Baseline Outdoor Noise Levels, and Table 5, Measured Long-Term Baseline Outdoor Noise Levels, provides the location and time at which these baseline noise level measurements were taken.

As detailed in Table 5, seven short-term noise level measurement locations were selected (ST1-ST7) that represent existing sensitive receivers at the Project boundaries, which could be subject to increases in ambient noise levels as a result of Project implementation. As detailed in Table 5, the long-term measurement locations (LT1 and LT2) were placed adjacent to residential neighborhoods immediately adjacent to the Project boundary. These noise measurement locations are depicted on Figure 1, Ambient Noise Monitoring Locations.

The L_{eq} noise levels measured at the short-term measurement locations are provided in Table 5. The primary noise sources at the sites identified in Table 5 consisted of traffic along roadways in the vicinity, as indicated in the table for each location. As shown in Table 5, the measured existing ambient sound levels at ST1–ST7 ranged from approximately 48 dBA L_{eq} at ST6 to 72 dBA L_{eq} at ST3. The higher ambient noise levels correlate to measurement points adjacent to heavily traveled major roadways, while the lower levels (ST4 and ST6) are adjacent to local residential streets. Noise measurement data summarized in Table 5 is also included in Appendix B, along with field data sheets that provide additional information about field conditions and noise contributors to each measured sound level.

Table 5. Measured Short-Term Ambient Outdoor Noise Levels

Receptor	Location (Street) / Primary Noise Contributor	Time	Leq (dBA)
ST1	Riverside University Health Medical Center, south side of **Cactus Avenue** (north Project boundary)	12:33 PM to 12:47 PM	70
ST2	Laselle Street residential neighborhood, west side of **Laselle Street** south of Delphinium Ave. (west Project boundary)	12:14 PM to 12:28 PM	71
ST3	Casa Encantador residential neighborhood/Vista del Lago High School, north side of **Casa Encantador Rd.** east of Camino Lago (south boundary for western portion of Project)	12:35 PM to 12:50 PM	72
ST4	Avenida Fiesta residential neighborhood, east side of **Avenida Fiesta** (southwestern Project boundary)	11:55 AM to 12:09 PM	53
ST5	Iris Avenue residential neighborhood/Kaiser Moreno Valley, south side of **Iris Avenue** west side of Hammett Court (south boundary for easter portion of Project)	11:32 AM to 11:46 AM	71
ST6	Delphinium residential neighborhood, north side of **Delphinium Avenue** west of Silver Mountain Way (northeastern Project boundary)	11:13 AM to 11:28 AM	48
ST7	Nason Street residential neighborhood, east side of **Nason Street** south of Damascus Rd. (eastern boundary for the northeastern portion of Project)	10:55 AM to 11:09 AM	66

Source: Appendix B
Notes: L_{eq} = equivalent continuous sound level (time-averaged sound level); dBA = A-weighted decibels; ST = short-term noise measurement locations.

For the long-term measurements, each Piccolo sound level meter was configured to record data for one-hour intervals. Sound level metrics including L_{eq}. L_{max}, L_{min}, were recorded for each one-hour period. Data logs for each of the two measurement locations are included in Appendix B. Table 6 presents a summary of the results of the long-term measurements.

Table 6. Measured Long-Term Ambient Outdoor Noise Levels

Receptor	Location/Address	Daytime L_{eq} (dBA)	Evening L_{eq} (dBA)	Nighttime L_{eq} (dBA)	CNEL (dBA)
LT1	Avenida Fiesta residential neighborhood, east side of Avenida Fiesta (southwestern Project boundary)	55	52	46	56
LT2	Nason Street residential neighborhood, east side of Nason St. south of Damascus Rd. (eastern boundary for the northeastern portion of Project)	67	65	66	72

Source: Appendix B
Notes: L_{eq} = equivalent continuous sound level (time-averaged sound level); dBA = A-weighted decibels; CNEL = community noise equivalent level; LT = long-term noise measurement locations.

Based upon Table 6, existing ambient noise levels at the residences represented by LT2 are strongly influenced by traffic along Nason Street. In contrast, existing ambient noise levels at receptors represented by LT1 are much lower, indicating this vicinity is less exposed to traffic noise from Nason Street or Iris Avenue. The daytime L_{eq} values recorded at LT1 and LT2 correlate well with the short-term noise measurements conducted at the same locations (ST4 and ST7. Respectively). As such, the short-term ambient noise measurement results should be representative of daytime ambient noise levels in the vicinity of each of the short-term measurement locations.

2.3 Existing Traffic Noise Levels

Urban Crossroads evaluated existing average daily traffic (ADT) on the roadway network surrounding and serving the Project site (Urban Crossroads, October 2023). The roadway system immediately surrounding the Project site is included in the “Focus Study Area” of the Urban Crossroads report; this part of the roadway network would experience the greatest Project-added trips and is used for the evaluation of Project traffic noise impacts.

Based upon identified existing ADT for surrounding roadway segments, Dudek modeled existing traffic noise exposure along roadways within the Focus Area. Dudek calculated the traffic noise level along the roadways using equations adapted from the Federal Highway Administration (FHWA) Traffic Noise Model (TNM 2.5). A roadway speed of 45 miles per hour was used for Alesandro Blvd., Cactus Ave., and John F. Kennedy Drive (the posted speed limit); a speed of no greater than 40 miles per hour was assumed for all remaining roadways (which is considered representative as the maximum allowable speed for local arterial and collector roads). Dudek applied a standard vehicle fleet composition of 97% automobile, 2% medium truck, and 1% heavy truck for all roadway segments. Roadway noise was calculated for a receiver located 50 feet from the roadway centerline. The 50-foot distance was used for roadway noise calculations because commonly the front-yard setback for residences is no less than 50 feet from the adjoining public street. Appendix C provides detailed data for the roadway traffic analysis.

Table 7 provides a summary of the results for the analysis of roadway noise based on existing ADT volumes for each studied roadway segment. The traffic noise levels in Table 7 are based upon reported existing ADTs, and not on the manual traffic counts conducted during the short-term ambient noise measurements (short term manual counts are used in calibrating the model to ensure accuracy for local conditions).

Table 7. Modeled Existing Traffic Noise Levels

No.	Street Name	From	To	CNEL (dBA) [1]
1	Allesandro BL	Kitching ST.	Laselle ST.	70.2
2	Allesandro BL	Laselle ST.	Morison ST.	70.0
3	Allesandro BL	Morison ST.	Mason ST.	69.8
4	Allesandro BL	Mason ST.	Moreno Beach DR.	71.0
5	Kitching ST	Alessandro BL	Brodiaea AV	71.0
6	Kitching ST	Brodiaea AV	John F. Kennedy RD	70.9
7	Kitching ST	John F. Kennedy RD	Gentian AVE	71.0
8	Kitching ST	Gentian AVE	Moreno Beach DR.	71.0
9	Iris AV	Kitching ST.	Laselle ST.	70.4
10	Iris AV	Laselle ST.	Intersection 40	69.2
11	Iris AV	Intersection 40	Mason ST.	68.7
12	Iris AV	Mason ST.	Kaiser Hospital	59.8
13	Iris AV	Kaiser Hospital	Oliver ST	64.3
14	Moreno Beach DR	Oliver ST	John F. Kennedy RD	62.4
15	Moreno Beach DR	Cactus AV	John F. Kennedy RD	70.5
16	Moreno Beach DR	Brodiaea AV	Cactus AV	71.2
17	Moreno Beach DR	Alessandro BL	Brodiaea AV	69.8
18	Laselle ST	Alessandro BL	Brodiaea AV	62.2
19	Laselle ST	Brodiaea AV	Cactus AV	57.3
20	Laselle ST	Cactus AV	Delphinium AV	58.5
21	Laselle ST	Delphinium AV	John F. Kennedy RD	56.8
22	Laselle ST	John F. Kennedy RD	Gentian AV	67.4
23	Laselle ST	Gentian AV	Iris AV	64.1
24	Mason ST	Alessandro BL	E Hospital	62.2
25	Mason ST	E Hospital	Cactus AV	61.6
26	Mason ST	Cactus AV	Delphinium AV	60.8
27	Mason ST	Delphinium AV	Iris AV	70.2
28	Oliver ST	Alessandro BL	Cactus AV	70.0
29	Oliver ST	Cactus AV	John F. Kennedy RD	69.8
30	Oliver ST	John F. Kennedy RD	Moreno Beach DR.	71.0
31	Cactus AV	Kitching ST.	Laselle ST.	71.0
32	Cactus AV	Laselle ST.	Mason ST.	70.9
33	Cactus AV	Mason ST.	Moreno Beach DR.	71.0
34	Brodiaea AV	Kitching ST.	Laselle ST.	71.0
35	Brodiaea AV	Oliver ST	Moreno Beach DR.	70.4
36	Delphinium AV	Kitching ST.	Laselle ST.	69.2
37	Delphinium AV	Intersection 20	Delphinium AV	68.7
38	John F Kennedy DR	Kitching ST.	Laselle ST.	59.8
39	John F Kennedy DR	Intersection 12	PA-2	64.3
40	John F Kennedy DR	Oliver ST	Moreno Beach DR.	62.4

Table 7. Modeled Existing Traffic Noise Levels

No.	Street Name	From	To	CNEL (dBA) [1]
41	Gentian AV	Kitching ST.	Laselle ST.	70.5
42	Gentian AV	Intersection 13	Gentian AV	71.2

Source: Appendix B
Notes: [1] Sound level calculated at 50 feet from road centerline. dBA = A-weighted decibels; CNEL = community noise equivalent level.

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3 Methodology

3.1 Construction Noise

One of the most extensive and widely used databases for sound levels from motorized or powered equipment is the FHWA Roadway Construction Noise Model (RCNM). While the focus of data compilation was for equipment that would typically be employed for the construction of transportation facilities, the list is comprehensive enough to be useful in assessing sound levels for nearly every activity for which powered equipment is used. Table 8 provides an excerpt from the RCNM of the sound levels generated by various powered equipment that could be associated with Project construction. Note that the equipment noise levels presented in Table 8 are maximum noise levels. Usually, construction equipment operates in alternating cycles of full power and low power, producing average noise levels over time that are less than the maximum noise level. The average sound level of construction activity also depends on the amount of time that the equipment operates and the intensity of construction activities during that time.

Table 8. Selected Powered Equipment Noise Emission Levels from RCNM

Equipment	Maximum Sound Level (dBA L_{max}) – 50 feet from Source
Air Compressor	81
Backhoe	80
Compactor	82
Compressor	78
Concrete Mixer	85
Crane, Mobile	83
Dozer	85
Excavator	81
Generator	81
Grader	85
Loader	85
Man Lift	75
Paver	89
Pneumatic Tool	85
Pump	76
Roller	74
Saw	76
Scraper	89
Tractor	84
Truck	88
Welder / Torch	74

Source: FHWA 2006a, 2006b.
Notes: dBA = decibel (A-weighted).

Noise emissions from the construction of each phase of the Project were estimated based upon construction scenario information provided by the Project applicant, including phasing, equipment mix, and vehicle trips, and default values from the statewide air emissions model (CalEEMod) when Project specifics were not known. Generally, construction is anticipated to occur in six (6) phases over 12-15 years that each include site preparation, paving, building construction, and architectural coating. The Project is not anticipated to require extensive site preparation work due to prior grading and the flat nature of the site. The construction equipment mixes, and vehicle trips used for estimating the Project-generated construction noise emissions in each phase and associated with each construction activity are included in Appendix C.

A Microsoft Excel–based noise prediction model emulating and using reference data from the FHWA RCNM was used to estimate construction noise levels at the nearest noise-sensitive land use (i.e., residence). Two scenarios were analyzed per construction phase. The first scenario uses the distance between the closest Project construction activities and a representative neighboring residence. Because there is limited space along the perimeter of a project phase (compared to the entire area of the total phase) to accommodate simultaneously operating equipment, approximately 10% of the equipment for the entire phase construction was used to predict noise levels from construction activity along the boundary of any Project phase. Aggregate noise emission from this 10% of the equipment inventory for each Project phase was predicted for the worst-case construction activity occurring along the closest construction boundary to the off-site closest residence. Under the second scenario, all identified construction equipment for a given phase is assumed to be operating simultaneously but distributed across the entire area of the Project phase. With equipment frequently changing position over the construction phase, the average noise level from the entire fleet is best represented by calculating noise levels for the aggregate equipment all operating at the geographic center (or acoustic center) of the phase. Equipment will sometimes be closer than the geographic center to an adjacent receiver, but equipment will also be further away, balancing out the average noise levels experienced by any given receiver adjacent to the Project.

Dudek compared predicted construction noise levels to the recommended FTA construction noise exposure standard and to measured ambient noise levels.

3.2 Traffic Noise

Urban Crossroads evaluated Project-related ADT on the roadway network surrounding and serving the Project site (Urban Crossroads, October 2023). The roadway system immediately surrounding the Project site is included in the "Focus Study Area" of the Urban Crossroads report; this part of the roadway network would experience the greatest Project-added trips and is used for the evaluation of Project traffic noise impacts.

Project-related traffic noise levels were examined along the Focus Study Area roadways using the results of the traffic analysis. Acoustical calculations using standard noise modeling equations adapted from the FHWA noise prediction model were performed for the following scenarios: Year 2045 Under Partial World Logistics Center (WLC) Buildout – without and with Project, and Year 2045 Under Full WLC Buildout – without and with Project

The modeling calculations take into account the posted vehicle speed, average daily traffic volumes for each scenario, and the estimated vehicle mix (i.e., automobiles, medium and heavy trucks). The model assumed hard-site propagation conditions, as the roadways are within developed urban areas. Noise levels were modeled at 50 feet from the centerline of each road. The 50-foot distance was used for roadway noise calculations because commonly the front-yard setback for residences is no less than 50 feet from the adjoining public street. Noise levels at greater distances from the roadway centerline would be lower due to attenuation provided by increased distance from the noise source. Generally, noise from heavily traveled roadways would experience a decrease of approximately 3 dBA for every doubling of distance from the roadway. The noise model does not take into account the sound-attenuating effect of intervening structures, barriers, vegetation, or topography. Therefore, the noise levels predicted by the model are conservative with respect to traffic noise exposure levels along these roadways.

3.3 Operational Noise Level Quantification

Approach

The Aquabella Specific Plan envisions multi-story residential buildings generally along the outside perimeter of the Plan area adjacent to existing residential neighborhoods. These buildings would effectively provide a noise barrier for sound sources within the central, or interior areas, of the Project site. Therefore, Dudek evaluated heating ventilation and air conditioning (HVAC) systems anticipated to be located on the rooftop of the multi-family residential buildings along the Specific Plan perimeter, as the primary Project operational noise source with the potential to increase ambient noise levels at sensitive receivers adjacent to the Project. Other sources of operational noise would primarily be associated with noise generated by residents and their guests, which is not an environmental impact under CEQA. (Pub. Resources Code, § 21085).

Sound Reference Levels

The applicant provided a concept for distribution of the multi-family structures along the site perimeter that includes twenty (20) garden apartment buildings each with 40 dwelling units, and 14 high-density multi-family structures each with 120 dwelling units. Dudek used a reference sound level for a Bryant BH16-024 (2-ton capacity) to represent the HVAC equipment for each dwelling unit. The garden apartment buildings were assigned 40 roof-top HVAC packages while the high-density multi-family structures were assigned 120 roof-top HVAC packages, corresponding to an individual HVAC package per dwelling unit in each structure.

Stationary Source Operational Sound Level Modeling

Prediction of operation noise attributed to the Project involved creation of a sound propagation model using a CadnaA. CadnaA is used for calculation, presentation, assessment, and prediction of environmental noise. Estimated sound emission from the HVAC packages on the perimeter multi-family structures were entered into the CadnaA model.

Calculation parameters that establish how the CadnaA model predicts combined noise level from the above-listed Project sources include as follows:

- Sound propagation per International Organization of Standardization (ISO) 9613-2 (ISO 1996);
- Default ground acoustical absorption coefficient = 0.5 (on a scale of 0 = reflective, 1 = absorptive);
- 68 degrees Fahrenheit and 70% relative humidity; and
- First order of south path reflection (i.e., up to one contact with an intervening ray obstruction).

3.4 Methodology – Vibration Assessment

Caltrans has been assembling data for vibration levels generated by heavy construction equipment operation during the building of transportation projects for many years. The vibration levels from use of such equipment are representative for other types of construction efforts, not just transportation projects, and are therefore widely employed to assess vibration levels from heavy equipment use for any effort. According to Caltrans (2020b) the most important equipment relative to generation of vibration, and the vibration levels produced by such equipment, is illustrated in Table 9.

Table 9. Vibration Velocities for Typical Construction Equipment

Equipment	PPV at 25 Feet (Inches Per Second)	Approximate VdB at 25 feet
Vibratory Roller	0.210	94
Large Bulldozer	0.089	87
Loaded Trucks	0.076	86
Drill Rig / Auger	0.089	97
Jackhammer	0.035	79
Small Bulldozer	0.003	58

Source: Caltrans 2020b.

As described above, Moreno Valley has not adopted quantified standards governing vibration from construction projects but Section 9.10.170 of the Municipal Code states that "No vibration shall be permitted which can be felt at or beyond the property line." Accordingly, for the purposes of this analysis, Caltrans' vibration annoyance threshold of 0.2 in/sec shall be used to assess the potential impacts due to Project construction at nearby sensitive receptor locations. Using the vibration level value for each of the equipment listed in Table 9, the distance to the target vibration level of 0.2 in/sec PPV was determined, using the following formula:

$$\text{Peak particle velocity at distance (d)} = \text{peak particle velocity}(d_{ref}) * (d_{ref}/d)^{1.5}$$

In the above equation, "d" is the distance between the receptor and a vibration source, "d_{ref}" is the reference distance that applies for the indicated vibration magnitude. The calculated distance to a vibration level of 0.2 in/sec PPV represents the radius from each equipment type within which potentially significant vibration impacts from Project construction could occur. Table 10 presents the results of applying the above equation to the equipment in Table 8.

As illustrated in Table 10, groundborne vibration levels for most construction equipment would attenuate to less than 0.2 in/sec PPV within approximately 15 feet from the equipment. For a vibratory roller, the distance at which ground borne vibration levels would attenuate to 0.2 in/sec PPV would be approximately 30 feet.

Table 10. Distance Radius From Construction Equipment to Vibration Level of 0.2 in/sec PPV

Equipment	Distance From Equipment Where Vibration Level is Reduced to 0.2 in/sec PPV (Feet)
Vibratory Roller	30
Large Bulldozer	15
Loaded Trucks	15
Drill Rig / Auger	15
Jackhammer	10
Small Bulldozer	2

Source: Caltrans 2020b

4 Impacts Analysis

4.1 Project Impacts – Increases in Ambient Noise Levels

Significance Criteria 1: Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

4.1.1 Project Construction

As described under Section 3.1 (Construction Noise Methodology), construction noise modeling was performed to predict construction noise levels at noise-sensitive land uses in the Project vicinity. Figure 2, Modeled Construction Noise Receivers, illustrates the location of the closest receiver to each Project construction phase. These receivers each represent the worst-case noise exposure position in each phase of Project construction.

Overlap of construction phases or activities may occur but would not be anticipated to worsen these construction noise estimates in light of the physical distance between such activities and different receivers that are closest to the different phase area boundaries. Tables 11 to 16 provide a summary of the construction noise modeling for each Project phase and each construction activity. Detailed information is provided in Appendix C.

Table 11. Phase 1 Construction Noise Levels at Nearby Noise-Sensitive Receiver

Activity	Construction Noise Level (dBA) at CR1 From Closest Construction Boundary	Construction Noise Level (dBA) at CR1 From Construction Acoustic Center	Recommended Limit (FTA)
	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$
(1) Site Preparation	74	54	80
(2) Paving	74	54	
(3) Residential Building Construction	62	57	
(4) Park Construction	73	51	
(5) Architectural Coating Res. Bld.	66	50	
(6) Architectural Coating Park	68	45	

Source: Appendix C

Table 12. Phase 2 Construction Noise Levels at Nearby Noise-Sensitive Receiver

Phase	Construction Noise Level (dBA) at CR2 From Closest Construction Boundary	Construction Noise Level (dBA) at CR2 From Construction Acoustic Center	Recommended Limit (FTA)
	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$
(1) Site Preparation	55	47	80
(2) Paving	54	47	
(3) Residential Building Construction	49	50	
(4) Hotel Construction	51	44	
(5) Park Construction	49	42	
(6) Architectural Coating Res. Bld.	42	35	
(7) Architectural Coating Hotel	45	38	
(8) Architectural Coating Park	45	38	

Source: Appendix C

Table 13. Phase 3 Construction Noise Levels at Nearby Noise-Sensitive Receiver

Phase	Construction Noise Level (dBA) at CR3 From Closest Construction Boundary	Construction Noise Level (dBA) at CR3 From Construction Acoustic Center	Recommended Limit (FTA)
	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$
(1) Site Preparation	75	58	80
(2) Paving	74	58	
(3) Residential Building Construction	72	60	
(4) Elem. School Construction	72	51	
(5) Middle School Construction	72	51	
(6) Park Construction	72	52	
(7) Architectural Coating Res. Bld.	62	45	
(8) Architectural Coating Elem. School	65	48	
(9) Architectural Coating Middle School	65	48	
(10) Architectural Coating Park	65	48	

Source: Appendix C

Table 14. Phase 4 Construction Noise Levels at Nearby Noise-Sensitive Receiver

Phase	Construction Noise Level (dBA) at CR4 From Closest Construction Boundary	Construction Noise Level (dBA) at CR4 From Construction Acoustic Center	Recommended Limit (FTA)
	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$
(1) Site Preparation	**85**	62	80
(2) Paving	**85**	62	

Table 14. Phase 4 Construction Noise Levels at Nearby Noise-Sensitive Receiver

Phase	Construction Noise Level (dBA) at CR4 From Closest Construction Boundary	Construction Noise Level (dBA) at CR4 From Construction Acoustic Center	Recommended Limit (FTA)
	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$
(3) Residential Building Construction	79	65	
(4) Elem. School Construction	79	56	
(5) Park Construction	80	57	
(6) Architectural Coating Res. Bld.	70	58	
(7) Architectural Coating Elem. School	73	53	
(8) Architectural Coating Park	73	53	

Source: Appendix C. Note: **Bold** values exceed the recommended limit

Table 15. Phase 5 Construction Noise Levels at Nearby Noise-Sensitive Receiver

Phase	Construction Noise Level (dBA) at CR5 From Closest Construction Boundary	Construction Noise Level (dBA) at CR5 From Construction Acoustic Center	Recommended Limit (FTA)
	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$
(1) Site Preparation	**84**	54	80
(2) Paving	**84**	54	
(3) Residential Building Construction	78	57	
(4) Park Construction	79	51	
(5) Architectural Coating Res. Bld.	69	50	
(6) Architectural Coating Park	72	45	

Source: Appendix C
Note: **Bold** values exceed the recommended limit.

Table 16. Phase 6 Construction Noise Levels at Nearby Noise-Sensitive Receiver

Phase	Construction Noise Level (dBA) at CR6 From Closest Construction Boundary	Construction Noise Level (dBA) at CR6 From Construction Acoustic Center	Recommended Limit (FTA)
	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$
(1) Site Preparation	75	62	80
(2) Paving	75	62	
(3) Residential Building Construction	69	65	
(4) Elem. School Construction	69	56	
(5) Architectural Coating Res. Bld.	62	58	
(6) Architectural Coating Elem. School	61	53	

Source: Appendix C

As shown in Tables 11, 12, 13 and 16, construction noise levels from activity along the closest boundary to an adjacent residence during Phases 1, 2, 3, and 6 would remain below the FTA's recommended limit of 80 dBA $_{Leq\ 8hr}$. This represents worst-case noise exposures during these phases. Average noise levels at the closest residence would fall even further below the recommended limit of 80 dBA $_{Leq\ 8hr}$ using the distance from the geographic center (acoustic center) of each phase's development area (which would be representative of average noise exposure levels for construction across the entire phase). Noise levels at more distance sensitive receptors would also be lower than these worst-case estimates.

As shown in Tables 14 and 15, construction noise levels from site preparation and paving activity along the closest boundary to an adjacent residence during Phases 4 and 5 would exceed the recommended limit of 80 dBA $_{Leq\ 8hr}$ which is considered a **potentially significant short-term noise impact.** The other construction activities when conducted along the closest boundary would produce noise levels that would be below the recommended limit. Construction noise mitigation, in the form of a perimeter noise barrier located along the Phase 4 and 5 boundaries with noise sensitive land uses, is recommended to prevent noise levels at the closest residences to construction of these Phases from exceeding the recommended FTA noise limit for construction activities. Note that, as with the other Phases, Tables 14 and 15 present the worst-case noise exposures during Phases 4 and 5. Average noise levels at the closest residences would fall well below the recommended limit of 80 dBA $_{Leq\ 8hr}$, using the distance from the geographic center (acoustic center) of the Phase 4 and Phase 5 areas, which would be representative of average noise exposure levels for construction across the entire phase, Noise levels at more distance sensitive receptors would also be lower than these worst-case estimates..

Construction Noise Compared to Ambient Noise Levels and Moreno Valley Standards

Measured daytime ambient noise levels at residences in the Project vicinity ranged from 53 to 72 dBA L_{eq} while modeled traffic noise exposure from existing traffic volumes ranged from 57 to 71 dBA CNEL (with daytime average L_{eq} values normally close to the CNEL values). Construction noise levels with activity along the Phase boundaries closest to adjacent residents would produce noise levels in the range of 69 – 84 dBA L_{eq} which represents a temporary increase of up to 27 dBA L_{eq}. Using the average noise levels from construction across an entire phase, as represented by the acoustic center distances, more typical average construction noise levels at sensitive receivers would range from 45 to 62 dBA L_{eq} which would increase ambient levels by 5 dBA Leq or less.

Exterior construction noise levels at the closest receivers along the closest Project construction phase boundary would be easily noticeable above ambient levels and would likely result in some annoyance. However, the exterior noise levels at the closest residences during construction would remain below the Moreno Valley Municipal Code limit of 90 dBA L_{eq} over an 8-hour exposure (typical construction shift). Therefore, construction noise at the predicted maximum of 85 dBA L_{eq} at the closest residences would not be considered harmful. In addition, mitigation is specified to limit exterior exposure levels from construction activities at the closest residences to no more than 80 dBA $L_{eq\ 8hr}$. Such mitigation would reduce the potential for construction noise annoyance for the closest noise sensitive receivers. Further, these exterior noise levels would be attenuated by approximately 25 dBA inside the affected residences, such that interior daytime construction noise levels would not be expected to exceed 60 dBA L_{eq} and would therefore not interfere with conversations or other household noise-sensitive activities. With the mitigation proposed, construction noise impacts would be less than significant.

4.1.2 Project Traffic Noise

Urban Crossroads evaluated Project-related ADT on the roadway network surrounding and serving the Project site (Urban Crossroads, October 2023). Project-related traffic noise levels were examined along the Focus Study Area roadways using the results of the traffic analysis.

Project Construction Traffic Noise

On an average day of construction, it is anticipated that the maximum number of construction worker trips would be approximately 200 with a maximum of 20 vendor truck trips. These construction-related trips would represent a very small percentage of the existing traffic trips on the roadway network within the Focus Study area, and therefore construction-related traffic noise impacts would be **less than significant.**

Project Operational Traffic Noise

As described in Section 3.2 (Traffic Noise Methodology), acoustical calculations using standard noise modeling equations adapted from the FHWA noise prediction model were performed using the above ADT values for Year 2045 Under Partial World Logistics Center (WLC) Buildout – without and with Project, and Year 2045 Under Full WLC Buildout – without and with Project. Tables 17 and 18 present the results of the traffic noise modeling, detailed information is provided in Appendix D.

Table 17. 2045 Partial WLC Buildout Traffic Noise Levels – Without and With Project

Street Name	From	To	Noise Level Without Project CNEL dBA	Noise Level With Project CNEL dBA	Project Increase CNEL dBA
Allesandro BL	Kitching ST.	Laselle ST.	73.4	73.9	0.5
Allesandro BL	Laselle ST.	Morison ST.	72.6	73.1	0.6
Allesandro BL	Morison ST.	Mason ST.	72.0	72.6	0.6
Allesandro BL	Mason ST.	Moreno Beach DR.	71.0	71.8	0.7
Kitching ST	Alessandro BL	Brodiaea AV	70.7	70.8	0.1
Kitching ST	**Brodiaea AV**	**John F. Kennedy RD**	**70.3**	**72.4**	**2.2**
Kitching ST	**John F. Kennedy RD**	**Gentian AVE**	**70.6**	**72.5**	**2.0**
Kitching ST	**Gentian AVE**	**Moreno Beach DR.**	**70.1**	**71.7**	**1.6**
Iris AV	Kitching ST.	Laselle ST.	72.7	73.4	0.7
Iris AV	Laselle ST.	Intersection 40	73.6	74.5	0.9
Iris AV	Intersection 40	Mason ST.	73.2	74.3	1.1
Iris AV	Mason ST.	Kaiser Hospital	72.2	72.6	0.4
Iris AV	Kaiser Hospital	Oliver ST	71.4	71.7	0.3
Moreno Beach DR	Oliver ST	John F. Kennedy RD	71.0	71.2	0.3
Moreno Beach DR	Cactus AV	John F. Kennedy RD	70.1	70.4	0.3
Moreno Beach DR	Brodiaea AV	Cactus AV	70.1	70.4	0.2
Moreno Beach DR	Alessandro BL	Brodiaea AV	70.7	70.9	0.2
Laselle ST	Alessandro BL	Brodiaea AV	70.4	71.0	0.6
Laselle ST	Brodiaea AV	Cactus AV	70.2	70.7	0.6
Laselle ST	Cactus AV	Delphinium AV	72.1	72.4	0.3
Laselle ST	Delphinium AV	John F. Kennedy RD	71.5	71.9	0.4
Laselle ST	John F. Kennedy RD	Gentian AV	71.9	72.5	0.6
Laselle ST	Gentian AV	Iris AV	71.4	71.7	0.4
Mason ST	Alessandro BL	E Hospital	72.1	73.5	1.4
Mason ST	**E Hospital**	**Cactus AV**	**71.4**	**73.1**	**1.7**
Mason ST	**Cactus AV**	**Delphinium AV**	**70.1**	**72.5**	**2.4**
Mason ST	**Delphinium AV**	**Iris AV**	**69.7**	**72.1**	**2.4**
Oliver ST	Alessandro BL	Cactus AV	61.7	63.7	1.9
Oliver ST	Cactus AV	John F. Kennedy RD	63.8	66.7	2.9
Oliver ST	John F. Kennedy RD	Moreno Beach DR.	62.5	65.5	3.0
Cactus AV	Kitching ST.	Laselle ST.	71.8	73.4	1.6
Cactus AV	Laselle ST.	Mason ST.	73.1	74.5	1.4
Cactus AV	Mason ST.	Moreno Beach DR.	70.5	72.5	2.0
Brodiaea AV	Kitching ST.	Laselle ST.	62.7	62.8	0.1
Brodiaea AV	Oliver ST	Moreno Beach DR.	56.8	58.5	1.8
Delphinium AV	Kitching ST.	Laselle ST.	61.4	63.3	1.9
Delphinium AV	Intersection 20	Delphinium AV	59.8	59.8	0.0

Table 17. 2045 Partial WLC Buildout Traffic Noise Levels – Without and With Project

Street Name	From	To	Noise Level Without Project CNEL dBA	Noise Level With Project CNEL dBA	Project Increase CNEL dBA
John F Kennedy DR	Kitching ST.	Laselle ST.	69.7	71.1	1.3
John F Kennedy DR	**Intersection 12**	**PA-2**	**67.1**	**70.8**	**3.8**
John F Kennedy DR	Oliver ST	Moreno Beach DR.	63.7	66.3	2.6
Gentian AV	Kitching ST.	Laselle ST.	66.1	66.3	0.2
Gentian AV	Intersection 13	Gentian AV	61.2	62.5	1.3

Source: Appendix B **Bold entries** indicate an exceedance of applicable FICON threshold.
Notes: [1] Sound level calculated at 50 feet from road centerline. dBA = A-weighted decibels; CNEL = community noise equivalent level.

Table 18. 2045 Full WLC Buildout Traffic Noise Levels – Without and With Project

Street Name	From	To	Noise Level Without Project CNEL dBA	Noise Level With Project CNEL dBA	Project Increase CNEL dBA
Allesandro BL	Kitching ST.	Laselle ST.	73.6	74.0	0.5
Allesandro BL	Laselle ST.	Morison ST.	72.8	73.3	0.6
Allesandro BL	Morison ST.	Mason ST.	72.2	72.8	0.6
Allesandro BL	Mason ST.	Moreno Beach DR.	71.3	72.1	0.8
Kitching ST	Alessandro BL	Brodiaea AV	70.7	70.8	0.1
Kitching ST	Brodiaea AV	John F. Kennedy RD	70.3	70.4	0.2
Kitching ST	John F. Kennedy RD	Gentian AVE	70.7	70.7	0.0
Kitching ST	Gentian AVE	Moreno Beach DR.	70.5	70.2	-0.3
Iris AV	Kitching ST.	Laselle ST.	72.7	73.4	0.7
Iris AV	Laselle ST.	Intersection 40	73.7	74.5	0.9
Iris AV	Intersection 40	Mason ST.	73.3	74.3	1.0
Iris AV	Mason ST.	Kaiser Hospital	72.4	72.9	0.5
Iris AV	Kaiser Hospital	Oliver ST	71.6	72.0	0.4
Moreno Beach DR	Oliver ST	John F. Kennedy RD	71.4	71.6	0.2
Moreno Beach DR	Cactus AV	John F. Kennedy RD	70.3	70.7	0.4
Moreno Beach DR	Brodiaea AV	Cactus AV	70.2	70.5	0.3
Moreno Beach DR	Alessandro BL	Brodiaea AV	70.8	71.1	0.3
Laselle ST	Alessandro BL	Brodiaea AV	70.4	71.0	0.6
Laselle ST	Brodiaea AV	Cactus AV	70.2	70.7	0.6
Laselle ST	Cactus AV	Delphinium AV	72.2	72.5	0.3

Table 18. 2045 Full WLC Buildout Traffic Noise Levels – Without and With Project

Street Name	From	To	Noise Level Without Project CNEL dBA	Noise Level With Project CNEL dBA	Project Increase CNEL dBA
Laselle ST	Delphinium AV	John F. Kennedy RD	71.6	71.9	0.3
Laselle ST	John F. Kennedy RD	Gentian AV	72.0	72.5	0.6
Laselle ST	Gentian AV	Iris AV	71.4	71.8	0.4
Mason ST	Alessandro BL	E Hospital	72.1	73.5	1.4
Mason ST	**E Hospital**	**Cactus AV**	**71.5**	**73.2**	**1.7**
Mason ST	**Cactus AV**	**Delphinium AV**	**70.1**	**72.5**	**2.4**
Mason ST	**Delphinium AV**	**Iris AV**	**69.7**	**72.1**	**2.4**
Oliver ST	Alessandro BL	Cactus AV	61.7	63.7	1.9
Oliver ST	Cactus AV	John F. Kennedy RD	63.8	66.8	3.0
Oliver ST	John F. Kennedy RD	Moreno Beach DR.	62.5	65.5	3.0
Cactus AV	Kitching ST.	Laselle ST.	72.0	73.5	1.5
Cactus AV	Laselle ST.	Mason ST.	73.3	74.6	1.3
Cactus AV	Mason ST.	Moreno Beach DR.	71.7	72.9	1.2
Brodiaea AV	Kitching ST.	Laselle ST.	62.7	62.8	0.1
Brodiaea AV	Oliver ST	Moreno Beach DR.	56.8	58.5	1.8
Delphinium AV	Kitching ST.	Laselle ST.	61.4	63.3	1.9
Delphinium AV	Intersection 20	Delphinium AV	59.8	64.7	4.9
John F Kennedy DR	Kitching ST.	Laselle ST.	69.8	71.0	1.2
John F Kennedy DR	**Intersection 12**	**PA-2**	**67.1**	**70.7**	**3.7**
John F Kennedy DR	Oliver ST	Moreno Beach DR.	63.7	66.3	2.6
Gentian AV	Kitching ST.	Laselle ST.	66.1	66.3	0.2
Gentian AV	Intersection 13	Gentian AV	61.2	62.5	1.3

Source: Appendix B **Bold entries** indicate an exceedance of applicable FICON threshold
Notes: [1] Sound level calculated at 50 feet from road centerline. dBA = A-weighted decibels; CNEL = community noise equivalent level.

Long-term traffic noise that affects sensitive land uses would be considered substantial and constitute a significant noise impact if the Project would:

- Increase noise levels by 5 dB or more where the no project noise level is less than 60 CNEL;
- Increase noise levels by 3 dB or more where the no project noise level is 60 CNEL to 65 CNEL; or
- Increase noise levels by 1.5 dB or more where the no project noise level is greater than 65 CNEL.

Refer to Table 4, Significance of Changes in Roadway Noise Exposure, describing FICON criteria.

As indicated in Table 17, Project traffic would result in traffic noise increases that exceed the FICON thresholds for seven street segments. Although the noise level increases would remain less than 3 dBA (which would not be noticeable to a typical resident), because of the already elevated ambient noise levels, an increase of 1.5 dBA or more is considered significant for these segments as a lesser increase may lead to annoyance. Thus, the project would have **potentially significant traffic noise impacts** when compared to traffic noise levels in Year 2045 under partial WLC buildout. Mitigation involving traffic calming or reduction in posted speeds for affected segments of John F Kennedy Drive, Kitching and Mason Streets is recommended to reduce these impacts. Since roadway traffic noise is a function of vehicle speed, reducing the travel speed on these roadways can effectively decrease traffic noise levels.

As indicated in Table 18, Project traffic would result in traffic noise increases that exceed the FICON thresholds for four street segments. Thus, the project would have **potentially significant traffic noise impacts** when compared to traffic noise levels in Year 2045 under full WLC buildout. Mitigation involving traffic calming or reduction in posted speeds for affected segments of John F Kennedy Drive and Mason Streets is recommended to reduce these impacts.

4.1.3 Project Operational Noise

As described under Section 3.1.3 (Operational Noise Methodology), operational noise related to HVAC equipment was modeled in the CadnaA model space, with a receiver at the closest existing residence to each of the groupings of perimeter residential structures. Figures 4A and 4B illustrate each of the multi-family residential structures modeled as sound sources for operational noise levels. Buildings G1 – G20 each represent a garden apartment building housing 40 dwelling units, with 40 two-ton (i.e., refrigeration cooling load) HVAC packaged units mounted on the building roof. Buildings H1 – H14 each represent a high-density apartment building housing 120 dwelling units, with 120 two-ton HVAC packaged units mounted on the building roof.

Table 19 presents the results of the operational noise modeling at the seven modeled receivers (refer to Figures 4A and 4B) and compares these modeled operational noise levels to limits contained in the Moreno Valley Municipal Code. Detailed information for the operational noise modeling is provided in Appendix E. Figure 4A presents the six tagged offsite residential receptors and the horizontal noise contour plane at a height of 13 feet above grade (roughly approximating a two-story receiving window or balcony); and Figure 4B presents the seventh receptor (the Hospital) and the corresponding horizontal noise contour plane at a height of 60 feet above local grade.

CadnaA calculates the noise level across the entire grid that encompasses the Project site and adjacent areas. Figures 4A and 4B graphically represent the noise model prediction results, providing noise contours extending outward from the proposed Project to illustrate the hourly noise level from operation of the Project.

As indicated in Table 19, even if all facility equipment operated ~~continuously over a 24-hour period~~simultaneously during the nighttime period (10:01 p.m. to 7:59 a.m.), the predicted operational sound level at each of the modeled residential receiver locations would fall well below the ~~zoning ordinance limit of 65 dBA CNEL~~most restrictive nighttime limit of 55 dBA L_{eq} for residential uses (Moreno Valley Municipal Code Section 11.80.030.B.1). In addition, the predicted operational noise would remain at least 10 dBA below recorded ambient noise levels in the Project vicinity; therefore, the addition of Project operational noise would not increase ambient noise levels above existing conditions. Other sources of operational noise would primarily be associated with noise generated by residents and their guests, which is not an environmental impact under CEQA. (Pub. Resources Code, § 21085). Consequently, operational noise impacts of the Project would be **less than significant.**

Table 19. Project Operational Noise Levels Compared to Municipal Code Limits

Receptor ID	Predicted Operational Noise Level (dBA Leq)	~~Noise Ordinance Limit~~Municipal Code Limit (dBA ~~CNEL~~ Leq) 1	Limit Exceeded?
Receiver 1	29.1	55	No
Receiver 2	31.7		No
Receiver 3	32.8		No
Receiver 4	30.9		No
Receiver 5	31.0		No
Receiver 6	29.1		No
Receiver 7	33.3		No

Source: Appendix E.
Notes: [1] Most restrictive residential nighttime limit. dBA = A-weighted decibels; ~~CNEL = community noise equivalent level~~L_{eq} = Average sound level.

4.1.4 Mitigation

CONSTRUCTION NOISE IMPACTS

The proposed Project would result in a significant temporary increase in ambient noise levels when construction activities are occurring along the Phase 4 and Phase 5 boundaries closest to adjacent residences. The following mitigation measures are therefore recommended to reduce potentially significant construction noise impacts.

MM N-1 Construction Noise Barrier

For construction activities in Phase 4 and Phase 5 that would occur closer than 120 feet from an off-site adjacent residence, a 10-foot-high temporary noise barrier shall be installed and maintained between the construction zone and neighboring residences. The barrier shall have an STC rating of not less than 25.

MM N-2 Construction Noise Equipment Controls

- The use of noise-producing signals, including horns, whistles, alarms, and bells, will be for safety warning purposes only.
- Construction equipment will be muffled per manufacturer's specifications. Electrically powered equipment will be used instead of pneumatic or internal combustion powered equipment, where feasible.
- All stationary construction equipment will be placed in a manner so that emitted noise is directed away or blocked from sensitive receptors nearest the Project site where possible.

Significance After Mitigation

The above mitigation measures would reduce Project construction noise impacts to less than significant levels. Tables 20 and 21 present the residual construction noise levels for Phase 4 and Phase 5 with incorporation of the above mitigation measures.

Table 20. Phase 4 Mitigated Construction Noise Levels at Nearby Noise-Sensitive Receiver

Phase	Construction Noise Level (dBA) at CR2 From Closest Construction Boundary	MITIGATED Construction Noise Level (dBA) at CR2 From Construction Acoustic Center	Above Recommended FTA Limit (80 Leq 8-hr)
	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$
(1) Site Preparation	**85**	71	No
(2) Paving	**85**	71	
(3) Residential Building Construction	79	65	
(4) Elem. School Construction	79	65	
(5) Park Construction	80	66	
(6) Architectural Coating Res. Bld.	70	56	
(7) Architectural Coating Elem. School	73	59	
(8) Architectural Coating Park	73	59	

Source: Appendix C
Note: **Bold** values exceed the recommended limit.

Table 21. Phase 5 Mitigated Construction Noise Levels at Nearby Noise-Sensitive Receiver

Phase	Construction Noise Level (dBA) at CR1 From Closest Construction Boundary	MITIGATED Construction Noise Level (dBA) at CR1 From Construction Acoustic Center	Above Recommended FTA Limit (80 Leq 8-hr) (FTA)
	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$	$L_{eq\ 8\text{-}hr}$
(1) Site Preparation	**84**	70	No
(2) Paving	**84**	70	
(3) Residential Building Construction	78	64	
(4) Park Construction	79	65	
(5) Architectural Coating Res. Bld.	69	55	
(6) Architectural Coating Park	72	58	

Source: Appendix C
Note: **Bold** values exceed the recommended limit.

Traffic Noise Impacts

The proposed Project would contribute traffic trips resulting in a significant noise increase along seven roadway segments under the 2045 With Partial WLC buildout scenario. Under the 2045 With Full WLC buildout scenario, Project trips would lead to significant traffic noise increases on four roadway segments. The roadway segments where significant traffic noise increase would occur are primarily local roadways serving the project and adjacent residential neighborhoods. The following mitigation measures are designed to limit roadway noise increases consistent with FICON thresholds.

MM N-3 Traffic Calming Measures

Prior to issuance of the first certificate of occupancy, average speeds on the impacted segments of John F Kennedy Drive, Kitching and Mason Streets shall be reduced by 5 miles per hour or more through the implementation of one or more of the following measures: posting lower speed limits, installing speed humps, or narrowing the overall lane widths with planters or dedicated bike lanes. The impacted segments of these roadways include:

- John F. Kennedy Drive from Kitching Street to Lasselle Street, Intersection 12 to PA 2, and Oliver Street to Moreno Beach Drive.
- Kitching Street from Brodiaea to Moreno Beach Drive.
- Mason Street from E. Hospital to Iris Avenue.

Significance After Mitigation

A 5-MPH speed decrease would more than offset the nominal traffic noise increases attributable to the Project along these roadways. The above mitigation would reduce Project traffic noise impacts to less than significant levels.

Table 22 illustrates the traffic noise levels after mitigation, along roadway segments that would have potentially significant noise increases absent mitigation.

Table 22. Traffic Noise Levels - Mitigated

Street Name	From	To	Noise Level Without Project CNEL dBA	Noise Level With Project CNEL dBA	Project Increase CNEL dBA
Horizon Year (2045) Partial WLC Buildout Traffic Noise Levels Without and With Project (Mitigated)					
Kitching ST	Brodiaea AV	John F. Kennedy RD	70.3	70.9	0.6
Kitching ST	John F. Kennedy RD	Gentian AVE	70.6	71.0	0.4
Kitching ST	Gentian AVE	Moreno Beach DR.	70.1	70.2	0.1
Mason ST	E Hospital	Cactus AV	71.4	71.6	0.2
Mason ST	Cactus AV	Delphinium AV	70.1	70.9	0.8
Mason ST	Delphinium AV	Iris AV	69.7	70.6	0.9
John F Kennedy DR	Intersection 12	PA-2	67.1	67.8	0.7
Horizon Year (2045) WLC Buildout Traffic Noise Levels Without and With Project (Mitigated)					
Kitching ST	Brodiaea AV	John F. Kennedy RD	70.3	68.8	- 1.5
Kitching ST	John F. Kennedy RD	Gentian AVE	70.7	69.1	- 1.6
Kitching ST	Gentian AVE	Moreno Beach DR.	70.5	68.7	- 1.8
Mason ST	E Hospital	Cactus AV	71.5	71.6	0.1

Table 22. Traffic Noise Levels - Mitigated

Street Name	From	To	Noise Level Without Project CNEL dBA	Noise Level With Project CNEL dBA	Project Increase CNEL dBA
Mason ST	Cactus AV	Delphinium AV	70.1	70.9	0.8
Mason ST	Delphinium AV	Iris AV	69.7	70.6	0.9
John F Kennedy DR	Intersection 12	PA-2	67.1	67.7	0.6

Source: Appendix H.
Notes:
1 Sound level calculated at 50 feet from road centerline with mitigated road segment speed of 35 MPH. dBA = A-weighted decibels; CNEL = community noise equivalent level.

4.2 Project Impacts – Vibration Generation

Significance Criteria 2: Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

4.2.1 Construction Vibration

As discussed in Section 3.1.3 (Vibration Methodology) groundborne vibration generated from construction equipment would be attenuated to 0.2 in/sec PPV (the threshold for human annoyance) at a distance of no greater than 60 feet from construction activity. Consequently, for construction activities that are no closer than 60 feet from vibration sensitive uses, including residences, construction-related vibration levels would remain below the significance threshold. Existing structures are no closer than approximately 70 feet from the boundary of any future Project construction zones. Therefore, the Project would have a **less than significant impact** relative to the risk of damage to structures from construction vibration.

4.2.2 Operational Vibration

The ongoing operation of residential structures, retail space, educational, open space, and commercial uses proposed by the Project would not generally involve rotational equipment or impact equipment (pile driving) that typically could result in vibration. Truck deliveries could occur in relation to the Project's commercial uses. As discussed under construction vibration, potentially significant vibration impacts from a loaded truck operation would be limited to a distance of 18 feet, which would not extend beyond the road right-of-way for roads used by the trucks to access future commercial buildings of the site. Consequently, long-term operation of the Project would not be anticipated to generated perceptible vibration levels in vicinity structures. Operational vibration levels are therefore considered **less than significant.**

4.2.3 Mitigation Measures

The Project would not result in a significant vibration impact; therefore, no mitigation is required.

Significance After Mitigation

Mitigation is not required, because impacts would be less than significant without mitigation.

4.3 Project Impacts – Airport Noise Exposure

Significance Criteria 3: For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

The closest airport to the Project site is the March Air Reserve Base (MARB) located approximately 2.5 miles to the southwest. According to the MARB 2018 Air Installations Compatible Use Zones Study (2018 AICUZ, Figure 4-2, Noise Contours) the Project site lies outside of the 60 dBA CNEL contour for airport operations. Airport operations and aircraft activity associated with MARB would not contribute to ambient noise levels in the Project vicinity, nor result in the exposure of vicinity residents or Project-related construction workers to excessive noise levels. Because the Project is not located within an airport land use plan or within two miles of a public airport or public use airport, there would be no impact.

Significance Criteria 4: For a project located within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

The closest private airstrip is Perris Valley Airport, located approximately 11.4 miles to the south of the Project site. The Project would have no effect upon the volume of aircraft activity at Perris Valley Airport, and at 11 miles distance, it is not anticipated that future residents or construction workers for the Project would be exposed to elevated noise levels associated with Perris Valley Airport. Therefore, any impacts would be less than significant.

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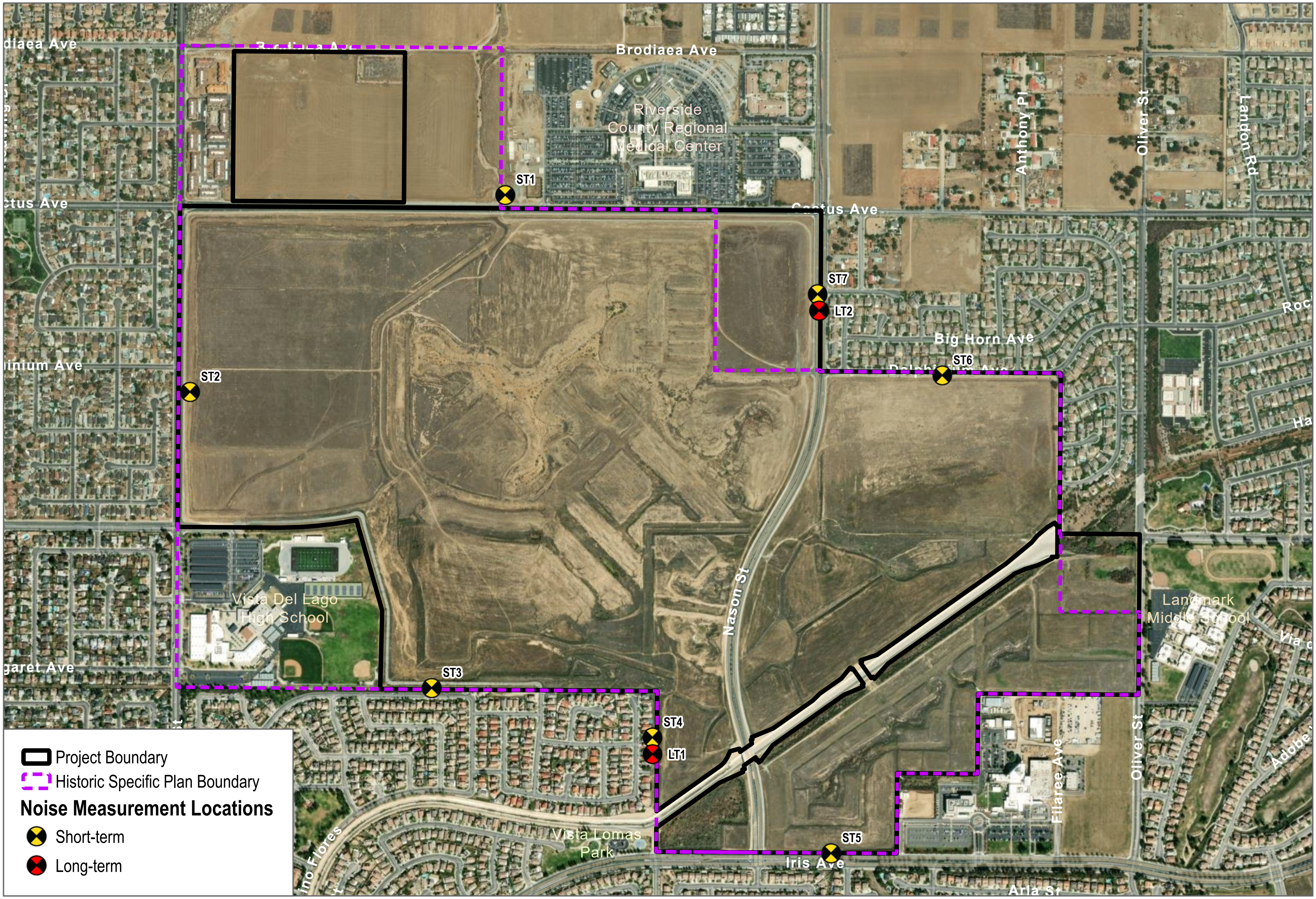

SOURCE: Maxar 2022

DUDEK

0 500 1,000 Feet

FIGURE 1

Ambient Noise Measurement Locations

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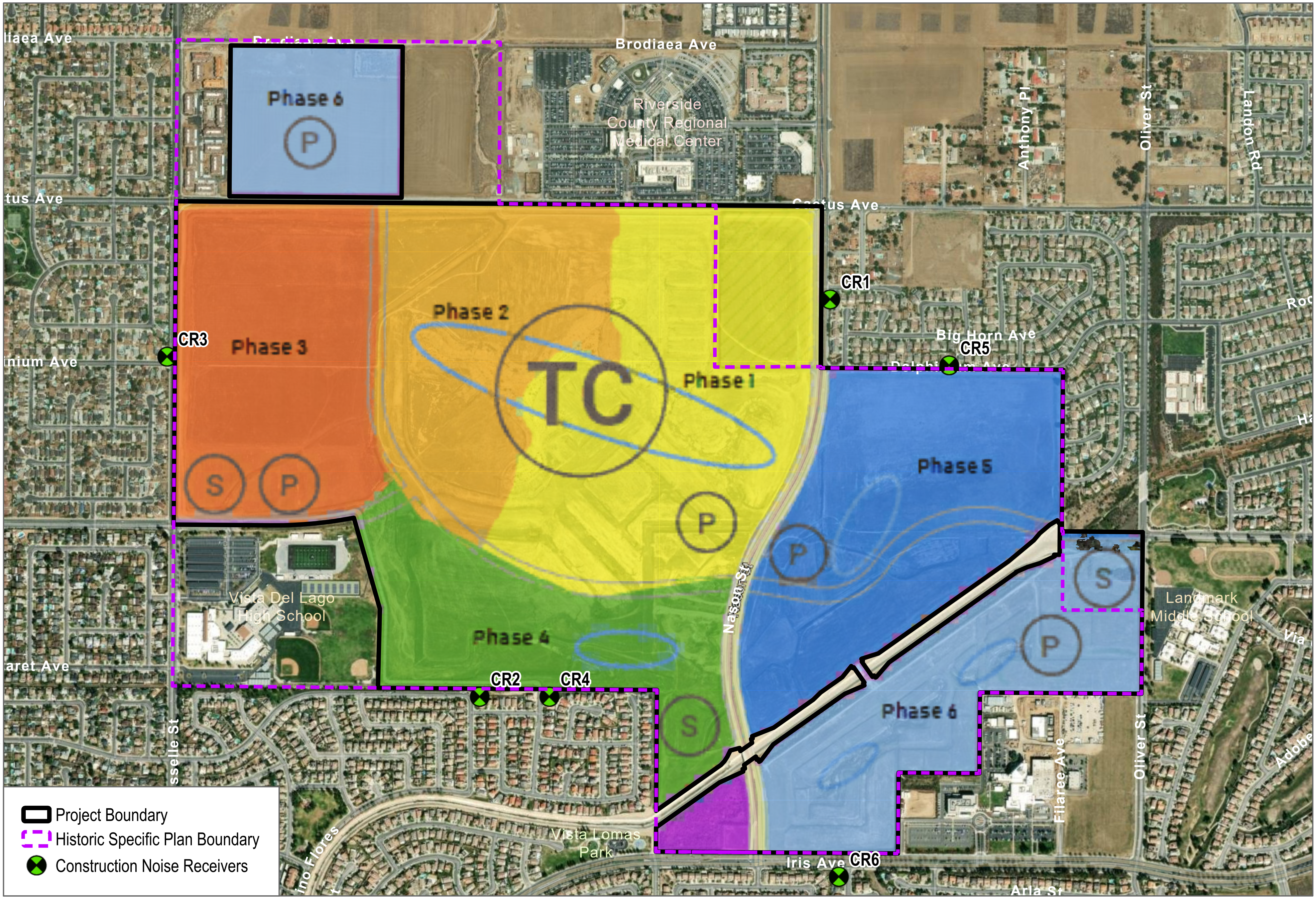

SOURCE: Maxar 2022

DUDEK

0 500 1,000 Feet

FIGURE 2

Modeled Receivers for Project Construction Noise

Aquabella Specific Plan Amendment Subsequent Environmental Impact Report

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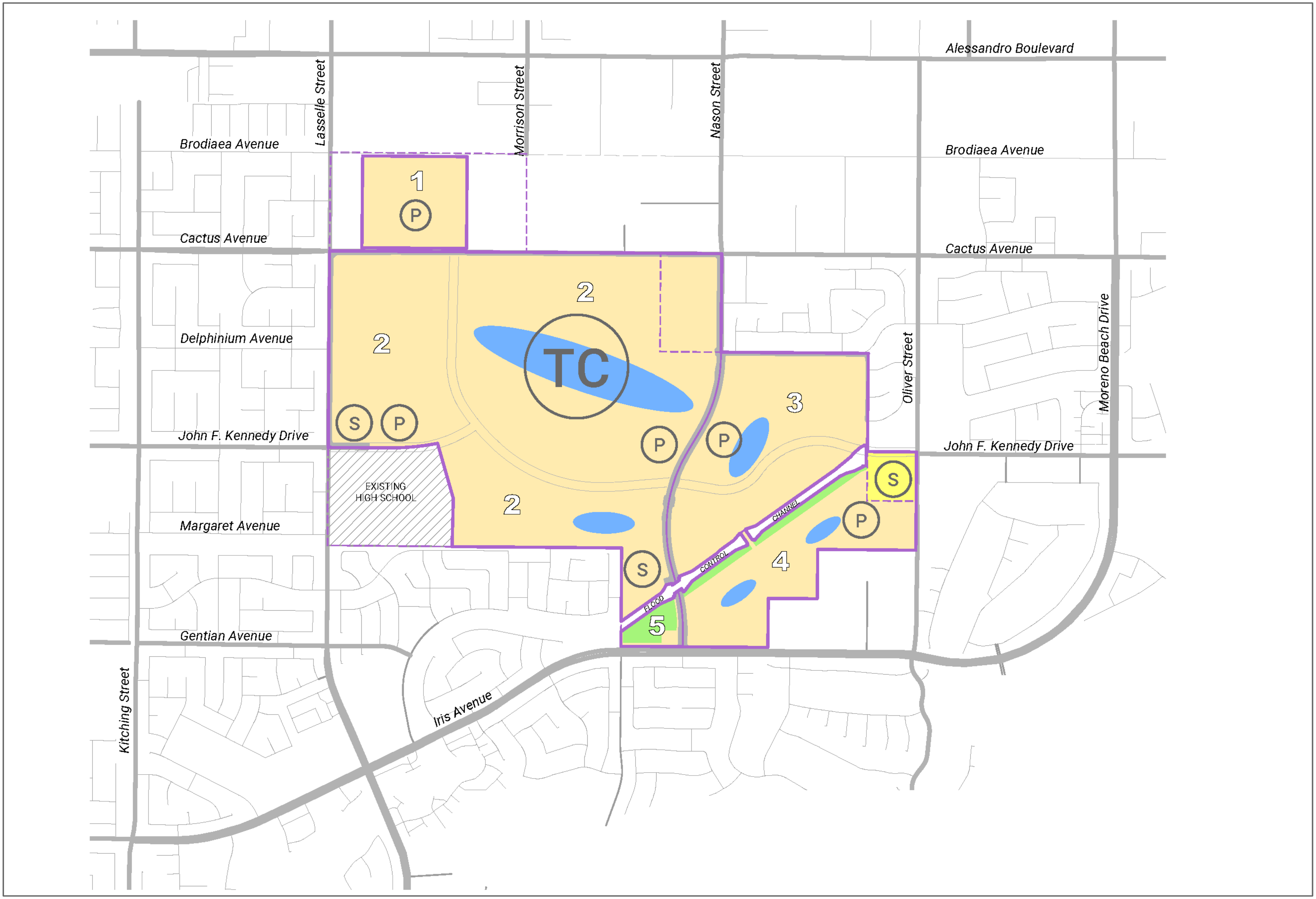

SOURCE: Urban Crossroads

DUDEK

0 500 1,000 Feet

FIGURE 3

Vicinity Roadways Analyzed for Traffic Noise

Aquabella Specific Plan Amendment Subsequent Environmental Impact Report

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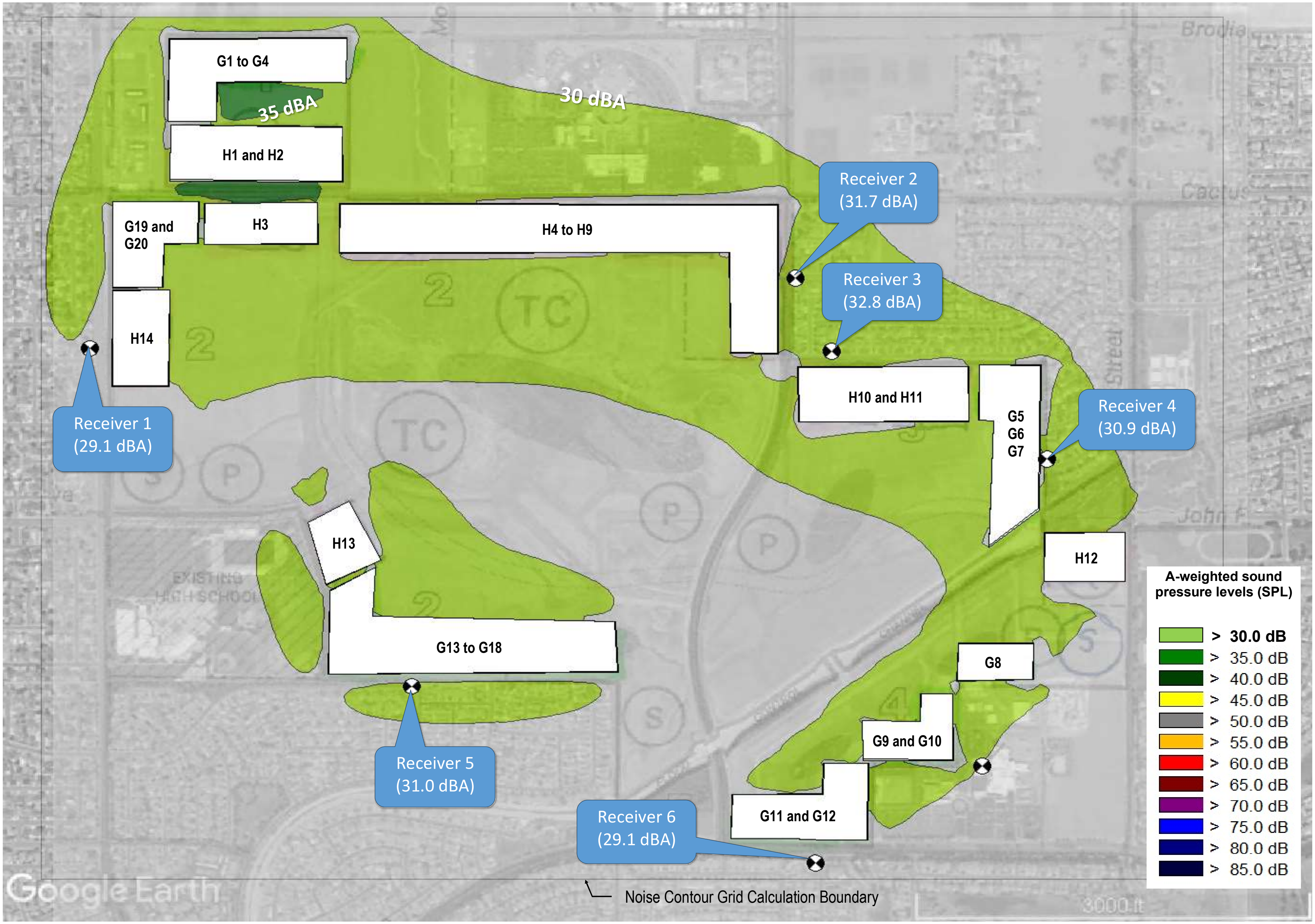

SOURCE: Dudek 2024

DUDEK

FIGURE 4A

Predicted Project Aggregate HVAC Operation Noise Emission (Noise Contour plane at 13' above local grade)

Aquabella Specific Plan (Dudek Project No. 10510)

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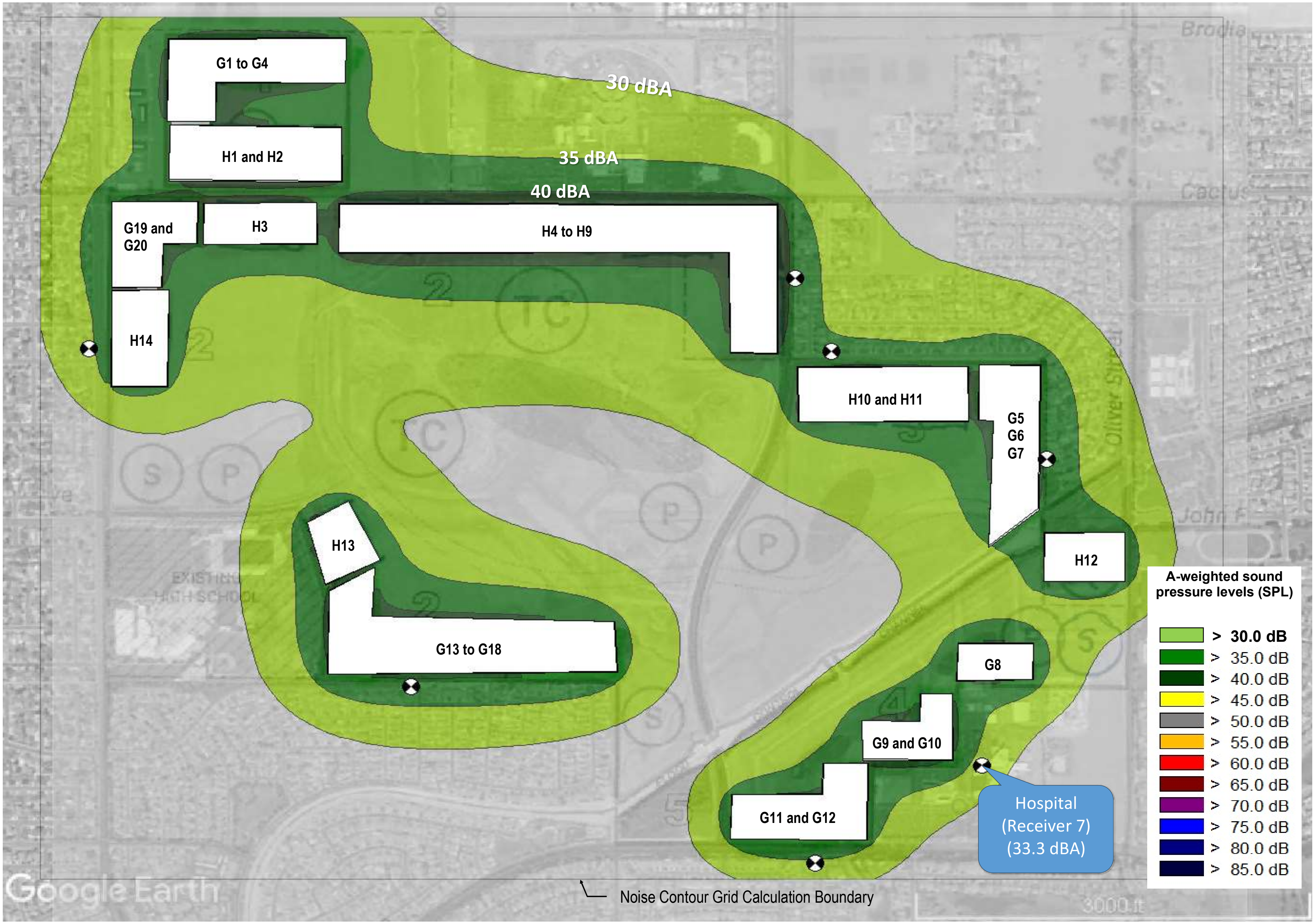

SOURCE: Dudek 2024

DUDEK

0 414 828 Feet

FIGURE 4B

Predicted Project Aggregate HVAC Operation Noise Emission (Noise Contour plane at 60' above local grade)

Aquabella Specific Plan (Dudek Project No. 10510)

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Appendix A
Jonathan Leech Resume

Jonathan Leech, AICP, INCE, PG

SENIOR PROJECT MANAGER, ENVIRONMENTAL SPECIALIST

Jonathan Leech is a senior project manager and environmental specialist with 35 years' environmental planning experience, including environmental research, hazardous materials and environmental impact assessment, condition compliance and mitigation monitoring, and land use analysis. Mr. Leech has contributed to more than 200 CEQA and NEPA environmental documents including: environmental assessments (EAs); environmental impact reports (EIRs); mitigated negative declarations (MNDs); specific plans; and policy documents for numerous local agencies within the State of California..

Mr. Leech also has more than 19 years of focused experience in noise assessments, including evaluation of noise generation from commercial, municipal, and industrial facilities, as well as large-scale evaluations of proposed subdivisions and specific plan projects, for inclusion in environmental impact reports (EIRs) or negative declarations (NDs). He has performed noise evaluation of construction and operational impacts including traffic-related noise, as well as provided noise monitoring during construction for compliance with project conditions and noise ordinance restrictions.

Education

University of California, Santa Barbara
BA, Environmental Studies/ Geology, 1984

Pennsylvania State University
Coursework in Graduate Acoustics Program, 2012

Certifications

American Institute of Certified Planners (AICP)

Professional Geologist (PG), CA

Professional Affiliations

American Planning Association

Association of Environmental Professionals

Institute of Noise Control Engineers (INCE)

Project Experience

Grapevine Specific Plan, Kern County, California. Prepared the noise technical report and noise and vibration EIR section for the Grapevine Specific Plan which includes approximately 8,010 acres, of which approximately 3,232 acres (or about 40%) would be designated for ongoing open space uses (with grazing and open space as the predominant land uses), while approximately 4,778 acres (60%) would be developed as a residential community and employment center. The overall development for the entire Specific Plan is restricted to a maximum of 12,000 residential units and 5.1 million square feet of commercial and industrial floor area. The land use plan is designed as a series of conveniently located village centers, each composed of a mix of housing, neighborhood-serving retail and office uses, schools, parks, and community services.

The Creek at Dominguez Hills, Carson, California. Prepared noise technical report and completed the noise and vibration section of the EIR . The proposed project includes a new sports, recreation, fitness, and wellness destination on a portion of the approximately 171-acre Victoria Golf Course, located at 340 Martin Luther King Jr. Street (formerly E. 192nd Street) in the City of Carson. The project site would be developed with approximately 532,500 square feet of buildings, including a multi-use indoor sports complex, youth learning experience facility, indoor skydiving facility, marketplace, clubhouse, recreation and dining center, restaurants (alternatively, a specialty grocery store may be developed in place of some of the restaurant uses), and a sports wellness center. The proposed project would also provide ziplining facilities, a community park, open space areas, a putting green, and a jogging path.

Yosemite Avenue-Gardner Avenue to Hatch Road Annexation, City of Merced, California. Performed noise and vibration assessment of this mixed-use development proposal and prepared the noise and vibration section of the EIR for the project. The approximately 70-acre annexation site was proposed to be developed with 20 multi-family structures containing a total of 540 units, a 13,700 square foot clubhouse, and a mixed use building with 66,00 square feet of ground floor retail and 30 residential units on the second floor.

Angleton Energy Storage Facility, Confidential Client, Angleton, Texas. Completed an ambient noise survey and prepared a noise technical study to quantify operational noise from transformer and inverter equipment at adjacent residential receivers. The technical memorandum compared the operational noise levels against allowable limits prescribed in the special use permit for the facility and demonstrated the facility would be in compliance with such standards.

Southern California Gas Company, Goleta Storage Field Expansion Proposal, Santa Barbara County, California. Under contract to the Energy & Minerals Division of Santa Barbara County, conducted independent verification sound level measurements, completed third party technical review of applicant submitted noise reports, and prepared the noise section for the Re-circulated Draft EIR addressing a proposal for development of new wells to access deeper natural gas storage basins.

Copper Energy Storage Facility, Confidential Client, Butte, Montana. Completed an ambient noise survey and prepared a noise technical study to quantify operational noise from transformer and inverter equipment at adjacent residential receivers. The technical memorandum compared the operational noise levels against standards prescribed in the Butte-Silver Bow County Zoning Ordinance and demonstrated the facility would be in compliance with such standards.

Central Valley Gas Storage Project, Colusa County, California. Prepared the noise assessment for the Central Valley Gas Storage Project proposed by Central Valley Gas Storage LLC (Central Valley), involving the development of a depleted underground reservoir at the Princeton Gas Field located in Colusa County, 60 miles northwest of Sacramento, California. The project involves constructing a 10-acre compressor station site, a 4-acre remote well pad site with nine injection/withdrawal wells, up to five observation wells, a 1-acre metering station site, and a 14.7-mile, 24-inch diameter pipeline to connect to PG&E's transmission system. The noise assessment was conducted pursuant to the provisions of CEQA and CPUC procedures.

North Street Energy Storage Facility, Confidential Client, Brookhaven, New York. Completed an ambient noise survey and prepared a noise technical study to quantify operational noise from transformer and inverter equipment at adjacent residential receivers. The technical memorandum compared the operational noise levels against standards prescribed in the Brookhaven municipal code and demonstrated the facility would be in compliance with such standards.

Rugged Solar Farm, Boulevard Community, San Diego County, California. Prepared a noise technical study for incorporation into an EIR addressing a proposed 80 MW solar generation facility on 765 acres. Analysis included assessment of facility equipment noise at adjacent residential property lines, calculation of construction noise levels at nearby sensitive receptors, and cumulative construction noise analysis.

Tierra Del Sol Solar Farm, Boulevard Community, San Diego County, California. Prepared a noise technical study for incorporation into an EIR addressing a proposed 60 MW solar generation facility on 420 acres. Analysis included assessment of facility equipment noise at adjacent residential property lines, calculation of construction noise levels at nearby sensitive receptors, and cumulative construction noise analysis.

Westside and Whitney Point Solar Farm, Westside Community, Fresno County, California. Project manager for permitting of two separate 20 MW solar generating facilities on two adjacent 160 acre project sites. As a condition of allowing a connection to electrical distribution infrastructure, Pacific Gas & Electric required 5 acres within the property to construct an electrical substation to serve the project and other solar electrical generating facilities.

Little Bear Solar Farm, Fresno County, California. Prepared a noise technical study for incorporation into an EIR addressing a proposed 180 MW solar generation facility on 1,288 acres. Analysis included assessment of facility equipment noise at adjacent residential property lines and calculation of construction noise levels at nearby sensitive receptors.

San Joaquin Valley Solar Farm, Confidential Client, Fresno County, California. Prepared a noise technical study for incorporation into an EIR addressing a proposed 200 MW solar generation facility on 1,700 acres. Analysis included assessment of facility equipment noise at adjacent residential property lines and calculation of construction noise levels at nearby sensitive receptors.

Sandrini Valley Solar Farm, County of Kern, Mettler, California. Under contract to Kern County, completed peer review of an applicant provided acoustic report and prepared the noise and vibration section of the EIR. The proposed facility consists of a 300 megawatt (MW) solar photovoltaic facility including a 100 MW battery energy storage system. Analysis included construction noise and assessment of facility equipment noise at adjacent residential property lines and nearby sensitive receptors.

Cascade Energy Storage Facility, Confidential Client, Stockton, California. Completed an ambient noise survey and prepared a noise technical study to quantify construction-related noise levels and operational noise from transformer and inverter equipment at adjacent residential receivers. The noise study compared the operational noise levels against standards prescribed in the San Joaquin County code of ordinances and demonstrated the facility would be in compliance with such standards.

Ceres Energy Storage Facility, Confidential Client, Stockton, California. Prepared a noise technical study to quantify operational noise from transformer and inverter equipment at adjacent residential receivers. The noise study compared the operational noise levels against standards prescribed in the City of Stockton noise ordinance and demonstrated the facility would be in compliance with such standards.

Solar Farm, Confidential Client, Champagne County, Illinois. Prepared a noise technical study for satisfaction of permit requirements and to demonstrate compliance with Illinois noise regulations addressing a proposed 150 MW solar generation facility on 1,275 acres. Analysis included measurements to characterize the ambient noise level from farming and transportation sources in the area, and assessment of facility equipment operational noise at nearby sensitive receptors (i.e., adjacent rural residences).

Avondale Energy Storage Facility, Confidential Client, Avondale, Arizona. Completed an ambient noise survey and prepared a noise technical study to quantify operational noise from transformer and inverter equipment at adjacent residential receivers. The noise study compared the operational noise levels against standards prescribed in the Avondale zoning ordinance and demonstrated the facility would be in compliance with such standards and would not generate noise levels at area residences substantially higher than ambient noise levels.

Solar Farm, Confidential Client, Culpeper County, Virginia. Prepared a noise technical study for satisfaction of permit requirements and to demonstrate compliance with Culpeper County noise regulations addressing a proposed 80 MW solar generation facility. Analysis included assessment of facility equipment noise at adjacent residential property lines and calculation of construction noise levels at nearby sensitive receptors.

Appendix B
Ambient Noise Measurement Data

Measurement ID: ST1

Start Date	Start Time	End Time	Leq	SPL Rate	Scale
5/16/2023	12:33:01 PM	12:34:00 PM	69.9	Slow	dBA
5/16/2023	12:34:01 PM	12:35:00 PM	69.7	Slow	dBA
5/16/2023	12:35:01 PM	12:36:00 PM	72.1	Slow	dBA
5/16/2023	12:36:01 PM	12:37:00 PM	71.7	Slow	dBA
5/16/2023	12:37:01 PM	12:38:00 PM	65.6	Slow	dBA
5/16/2023	12:38:01 PM	12:39:00 PM	72.4	Slow	dBA
5/16/2023	12:39:01 PM	12:40:00 PM	68.4	Slow	dBA
5/16/2023	12:40:01 PM	12:41:00 PM	68.2	Slow	dBA
5/16/2023	12:41:01 PM	12:42:00 PM	69.4	Slow	dBA
5/16/2023	12:42:01 PM	12:43:00 PM	71.2	Slow	dBA
5/16/2023	12:43:01 PM	12:44:00 PM	69.2	Slow	dBA
5/16/2023	12:44:01 PM	12:45:00 PM	70.1	Slow	dBA
5/16/2023	12:46:01 PM	12:47:00 PM	69.9	Slow	dBA

Leq Across Measurement Duration: 70.2

Measurement ID: ST2

Start Date	Start Time	End Time	Leq	SPL Rate	Scale
5/16/2023	12:14:01 PM	12:15:00 PM	80.9	Slow	dBA
5/16/2023	12:15:01 PM	12:16:00 PM	69.3	Slow	dBA
5/16/2023	12:16:01 PM	12:17:00 PM	66.4	Slow	dBA
5/16/2023	12:17:01 PM	12:18:00 PM	67.9	Slow	dBA
5/16/2023	12:18:01 PM	12:19:00 PM	67.1	Slow	dBA
5/16/2023	12:19:01 PM	12:20:00 PM	66.7	Slow	dBA
5/16/2023	12:20:01 PM	12:21:00 PM	64.6	Slow	dBA
5/16/2023	12:21:01 PM	12:22:00 PM	67.9	Slow	dBA
5/16/2023	12:22:01 PM	12:23:00 PM	67.3	Slow	dBA
5/16/2023	12:23:01 PM	12:24:00 PM	66.9	Slow	dBA
5/16/2023	12:24:01 PM	12:25:00 PM	66.6	Slow	dBA
5/16/2023	12:25:01 PM	12:26:00 PM	67.1	Slow	dBA
5/16/2023	12:26:01 PM	12:27:00 PM	70.5	Slow	dBA
5/16/2023	12:27:01 PM	12:28:00 PM	66.3	Slow	dBA

Leq Across Measurement Duration: 71.5

Measurement ID: ST3

Start Date	Start Time	End Time	Leq	SPL Rate	Scale
5/16/2023	11:55:01 AM	11:56:00 AM	45.4	Slow	dBA
5/16/2023	11:56:01 AM	11:57:00 AM	55.0	Slow	dBA
5/16/2023	11:57:01 AM	11:58:00 AM	45.9	Slow	dBA
5/16/2023	11:58:01 AM	11:59:00 AM	47.2	Slow	dBA
5/16/2023	11:59:01 AM	12:00:00 PM	55.9	Slow	dBA
5/16/2023	12:00:01 PM	12:01:00 PM	54.5	Slow	dBA
5/16/2023	12:01:00 PM	12:02:00 PM	52.2	Slow	dBA
5/16/2023	12:02:01 PM	12:03:00 PM	39.3	Slow	dBA
5/16/2023	12:03:01 PM	12:04:00 PM	41.3	Slow	dBA
5/16/2023	12:04:00 PM	12:05:00 PM	50.9	Slow	dBA
5/16/2023	12:05:01 PM	12:06:00 PM	41.1	Slow	dBA
5/16/2023	12:06:01 PM	12:07:00 PM	59.6	Slow	dBA
5/16/2023	12:07:01 PM	12:08:00 PM	53.9	Slow	dBA
5/16/2023	12:08:01 PM	12:09:00 PM	50.7	Slow	dBA

Leq Across Measurement Duration: 52.9

Measurement ID: ST4

Start Date	Start Time	End Time	Leq	SPL Rate	Scale
5/16/2023	10:28:01 AM	10:29:00 AM	43.0	Slow	dBA
5/16/2023	10:29:01 AM	10:30:00 AM	40.4	Slow	dBA
5/16/2023	10:30:01 AM	10:31:00 AM	46.3	Slow	dBA
5/16/2023	10:31:01 AM	10:32:00 AM	39.5	Slow	dBA
5/16/2023	10:32:01 AM	10:33:00 AM	40.8	Slow	dBA
5/16/2023	10:33:01 AM	10:34:00 AM	40.4	Slow	dBA
5/16/2023	10:34:01 AM	10:35:00 AM	44.4	Slow	dBA
5/16/2023	10:35:01 AM	10:36:00 AM	45.6	Slow	dBA
5/16/2023	10:36:01 AM	10:37:00 AM	42.0	Slow	dBA
5/16/2023	10:37:01 AM	10:38:00 AM	47.4	Slow	dBA
5/16/2023	10:38:01 AM	10:39:00 AM	42.9	Slow	dBA
5/16/2023	10:39:01 AM	10:40:00 AM	43.1	Slow	dBA
5/16/2023	10:40:01 AM	10:41:00 AM	50.3	Slow	dBA

Leq Across Measurement Duration: 44.7

Measurement ID: ST5

Start Date	Start Time	End Time	Leq	SPL Rate	Scale
5/16/2023	11:32:01 AM	11:33:00 AM	72.3	Slow	dBA
5/16/2023	11:33:01 AM	11:34:00 AM	69.8	Slow	dBA
5/16/2023	11:34:01 AM	11:35:00 AM	65.5	Slow	dBA
5/16/2023	11:35:01 AM	11:36:00 AM	70.0	Slow	dBA
5/16/2023	11:36:01 AM	11:37:00 AM	67.3	Slow	dBA
5/16/2023	11:37:01 AM	11:38:00 AM	80.0	Slow	dBA
5/16/2023	11:38:01 AM	11:39:00 AM	70.0	Slow	dBA
5/16/2023	11:39:01 AM	11:40:00 AM	67.3	Slow	dBA
5/16/2023	11:40:01 AM	11:40:00 AM	66.8	Slow	dBA
5/16/2023	11:41:01 AM	11:42:00 AM	67.4	Slow	dBA
5/16/2023	11:42:01 AM	11:43:00 AM	68.8	Slow	dBA
5/16/2023	11:43:01 AM	11:44:00 AM	68.8	Slow	dBA
5/16/2023	11:44:01 AM	11:45:00 AM	66.1	Slow	dBA
5/16/2023	11:45:01 AM	11:46:00 AM	66.3	Slow	dBA

Leq Across Measurement Duration: 71.5

Measurement ID: ST6

Start Date	Start Time	End Time	Leq	SPL Rate	Scale
5/16/2023	11:13:01 AM	11:14:00 AM	47.0	Slow	dBA
5/16/2023	11:14:01 AM	11:15:00 AM	43.9	Slow	dBA
5/16/2023	11:15:01 AM	11:16:00 AM	47.1	Slow	dBA
5/16/2023	11:16:01 AM	11:17:00 AM	48.5	Slow	dBA
5/16/2023	11:17:01 AM	11:18:00 AM	47.6	Slow	dBA
5/16/2023	11:18:01 AM	11:19:00 AM	53.6	Slow	dBA
5/16/2023	11:19:01 AM	11:20:00 AM	48.8	Slow	dBA
5/16/2023	11:20:01 AM	11:21:00 AM	45.4	Slow	dBA
5/16/2023	11:21:01 AM	11:22:00 AM	47.1	Slow	dBA
5/16/2023	11:22:01 AM	11:23:00 AM	50.3	Slow	dBA
5/16/2023	11:23:01 AM	11:24:00 AM	46.4	Slow	dBA
5/16/2023	11:24:01 AM	11:25:00 AM	47.5	Slow	dBA
5/16/2023	11:25:01 AM	11:26:00 AM	47.2	Slow	dBA
5/16/2023	11:26:01 AM	11:27:00 AM	49.1	Slow	dBA
5/16/2023	11:27:01 AM	11:28:00 AM	48.8	Slow	dBA

Leq Across Measurement Duration: 48.5

Measurement ID: ST7

Start Date	Start Time	End Time	Leq	SPL Rate	Scale
5/16/2023	10:55:01 AM	10:56:00 AM	63.8	Slow	dBA
5/16/2023	10:56:01 AM	10:57:00 AM	68.9	Slow	dBA
5/16/2023	10:57:01 AM	10:58:00 AM	67.9	Slow	dBA
5/16/2023	10:58:01 AM	10:59:00 AM	61.9	Slow	dBA
5/16/2023	10:59:01 AM	11:00:00 AM	64.1	Slow	dBA
5/16/2023	11:00:01 AM	11:00:59 AM	66.6	Slow	dBA
5/16/2023	11:01:00 AM	11:02:00 AM	65.6	Slow	dBA
5/16/2023	11:02:01 AM	11:03:00 AM	66.3	Slow	dBA
5/16/2023	11:03:01 AM	11:04:00 AM	63.7	Slow	dBA
5/16/2023	11:04:01 AM	11:05:00 AM	67.3	Slow	dBA
5/16/2023	11:05:01 AM	11:06:00 AM	66.8	Slow	dBA
5/16/2023	11:06:01 AM	11:07:00 AM	63.3	Slow	dBA
5/16/2023	11:07:01 AM	11:08:00 AM	59.5	Slow	dBA
5/16/2023	11:08:01 AM	11:09:00 AM	68.6	Slow	dBA

Leq Across Measurement Duration: 66.0

Start Date	Start Time	End Time	SPL Rate	Leq	Lmax	Lmin	L10	L50	L90
5/16/2023	11:00:00 AM	12:00:00 PM	Slow	55.5	77.7	37.5	59.6	52.8	43.3
5/16/2023	12:00:00 PM	1:00:00 PM	Slow	50.7	75.1	37.6	53.8	47.2	43.3
5/16/2023	1:00:00 PM	2:00:00 PM	Slow	48.2	75.8	37.0	51.7	41.9	40.1
5/16/2023	2:00:00 PM	3:00:00 PM	Slow	44.5	64.3	37.4	47.4	41.8	40.1
5/16/2023	3:00:00 PM	4:00:00 PM	Slow	52.3	76.8	38.4	56.7	45.6	41.9
5/16/2023	4:00:00 PM	5:00:00 PM	Slow	48.3	68.8	38.5	52.2	44.7	42.6
5/16/2023	5:00:00 PM	6:00:00 PM	Slow	64.7	93.7	40.4	68.3	51.0	44.1
5/16/2023	6:00:00 PM	7:00:00 PM	Slow	52.0	69.2	40.4	55.9	48.7	44.8
5/16/2023	7:00:00 PM	8:00:00 PM	Slow	56.2	80.7	39.3	60.1	51.6	44.9
5/16/2023	8:00:00 PM	9:00:00 PM	Slow	46.4	70.5	38.6	50.1	43.0	41.2
5/16/2023	9:00:00 PM	10:00:00 PM	Slow	44.8	65.2	37.6	48.2	41.2	39.6
5/16/2023	10:00:00 PM	11:00:00 PM	Slow	44.1	64.3	37.9	47.3	40.8	39.7
5/16/2023	11:00:00 PM	12:00:00 AM	Slow	43.4	66.4	37.1	46.5	39.1	38.5
5/17/2023	12:00:00 AM	1:00:00 AM	Slow	40.8	59.7	37.5	43.2	39.1	38.6
5/17/2023	1:00:00 AM	2:00:00 AM	Slow	40.5	59.3	38.2	42.3	39.3	38.9
5/17/2023	2:00:00 AM	3:00:00 AM	Slow	41.6	64.1	38.7	42.6	40.5	40.0
5/17/2023	3:00:00 AM	4:00:00 AM	Slow	45.9	67.7	38.3	49.6	41.3	40.0
5/17/2023	4:00:00 AM	5:00:00 AM	Slow	46.6	68.2	39.1	49.2	44.5	43.2
5/17/2023	5:00:00 AM	6:00:00 AM	Slow	50.5	72.2	42.4	53.9	47.7	45.9
5/17/2023	6:00:00 AM	7:00:00 AM	Slow	49.8	68.6	43.7	53.0	47.5	46.1
5/17/2023	7:00:00 AM	8:00:00 AM	Slow	50.5	70.4	42.7	54.0	46.6	44.8
5/17/2023	8:00:00 AM	9:00:00 AM	Slow	50.5	70.4	42.7	54.0	46.6	44.8
5/17/2023	9:00:00 AM	10:00:00 AM	Slow	46.7	65.8	38.6	49.7	43.4	41.9
5/17/2023	10:00:00 AM	11:00:00 AM	Slow	49.2	70.5	36.8	53.0	45.9	42.8

Daytime Leq Range	44.5 - 64.7	dBA	Daytime Leq	55.5
Evening Leq Range	44.8 - 56.2	dBA	Evening Leq	52.2
Nightime Leq Range	40.5 - 50.5	dBA	Nightime Leq	46.2
CNEL	56.0	dBA		

Start Date	Start Time	End Time	SPL Rate	Leq	Lmax	Lmin	L10	L50	L90
5/16/2023	11:00:00 AM	12:00:00 PM	Slow	66.3	93.4	41.4	69.9	59.8	49.8
5/16/2023	12:00:00 PM	1:00:00 PM	Slow	68.1	82.4	40.5	71.4	66.6	61.5
5/16/2023	1:00:00 PM	2:00:00 PM	Slow	64.5	80.4	41.6	69.0	60.0	49.8
5/16/2023	2:00:00 PM	3:00:00 PM	Slow	65.2	82.6	41.0	69.3	61.5	52.6
5/16/2023	3:00:00 PM	4:00:00 PM	Slow	65.1	85.5	43.8	68.9	62.1	52.8
5/16/2023	4:00:00 PM	5:00:00 PM	Slow	66.6	88.6	44.4	70.5	62.5	53.0
5/16/2023	5:00:00 PM	6:00:00 PM	Slow	67.8	86.6	44.3	71.9	64.9	56.6
5/16/2023	6:00:00 PM	7:00:00 PM	Slow	68.1	92.4	45.3	72.9	63.2	53.9
5/16/2023	7:00:00 PM	8:00:00 PM	Slow	65.4	84.8	45.7	69.5	61.1	52.1
5/16/2023	8:00:00 PM	9:00:00 PM	Slow	65.2	83.1	45.2	69.6	60.3	52.0
5/16/2023	9:00:00 PM	10:00:00 PM	Slow	63.2	82.2	42.1	67.3	57.6	49.6
5/16/2023	10:00:00 PM	11:00:00 PM	Slow	62.5	81.5	40.6	66.5	56.2	51.5
5/16/2023	11:00:00 PM	12:00:00 AM	Slow	62.9	82.0	42.1	66.1	58.9	56.5
5/17/2023	12:00:00 AM	1:00:00 AM	Slow	63.9	94.1	43.2	67.4	53.6	47.8
5/17/2023	1:00:00 AM	2:00:00 AM	Slow	61.0	86.5	43.7	64.5	50.7	47.0
5/17/2023	2:00:00 AM	3:00:00 AM	Slow	60.8	86.9	44.8	63.7	50.9	48.1
5/17/2023	3:00:00 AM	4:00:00 AM	Slow	62.1	81.8	45.6	66.3	53.6	49.1
5/17/2023	4:00:00 AM	5:00:00 AM	Slow	66.7	94.2	46.7	69.5	58.3	53.2
5/17/2023	5:00:00 AM	6:00:00 AM	Slow	68.8	94.3	48.2	72.7	62.3	55.0
5/17/2023	6:00:00 AM	7:00:00 AM	Slow	70.7	95.5	51.8	74.3	64.8	57.6
5/17/2023	7:00:00 AM	8:00:00 AM	Slow	68.9	90.6	51.6	72.6	65.3	58.2
5/17/2023	8:00:00 AM	9:00:00 AM	Slow	68.9	93.3	49.5	72.0	64.8	57.6
5/17/2023	9:00:00 AM	10:00:00 AM	Slow	66.4	87.3	44.8	70.7	61.3	53.4
5/17/2023	10:00:00 AM	11:00:00 AM	Slow	66.4	91.6	42.3	70.0	60.5	50.3

Daytime Leq Range	64.5 - 68.9	dBA	Daytime Leq	67.1
Evening Leq Range	63.2 - 65.4	dBA	Evening Leq	64.7
Nightime Leq Range	60.8 - 70.7	dBA	Nightime Leq	65.8
CNEL	72.5	dBA		

FORMS DUDEK FIELD DATA REPORT

Field Noise Measurement Data	
ID	**1640**
Project Name	Aquabella Short Term Ambient Noise Measurement Field Data
Observer(s)	
Date	2023-05-16
Comments	4,8,7,5,3,2,1 File starts with 0921

Meteorological Conditions	
ID	**S1640**
Temp (F)	65
Humidity % (R.H.)	76
Wind	Calm
Wind Speed (MPH)	3
Wind Direction	North East

Instrument and Calibrator Information	
ID	**S1640**
Instrument Name List	(ENC) Rion NL-52
Instrument Name	(ENC) Rion NL-52
Instrument Name Lookup Key	(ENC) Rion NL-52
Manufacturer	Rion
Model	NL-52
Serial Number	553896
Calibrator Name	(ENC) LD CAL150
Calibrator Name	(ENC) LD CAL150
Calibrator Name Lookup Key	(ENC) LD CAL150
Calibrator Manufacturer	Larson Davis
Calibrator Model	LD CAL150
Calibrator Serial #	5152
Pre-Test (dBA SPL)	94

Windscreen	Yes
Weighting?	A-WTD
Slow/Fast?	Slow

Monitoring	
ID	**S1640**
Record #	8
Site ID	St 1
Site Location Lat/Long	33.910225, -117.198762
Begin (Time)	12:33:00
End (Time)	12:48:00
Leq	70.1
Lmax	82.7
Lmin	46.7
Other Lx?	L90, L50, L10
L90	54.2

L50	65.2
L10	74.6
Other Lx (Specify Metric)	L
Primary Noise Source	Traffic
Other Noise Sources (Background)	Birds, Distant Traffic, Rustling Leaves
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Source Info and Traffic Counts

ID	S6668
Number of Lanes	0
Lane Width (feet)	10
Roadway Width (feet)	0
Roadway Width (m)	0
Distance to Roadway (feet)	0
Distance to Roadway (m)	0

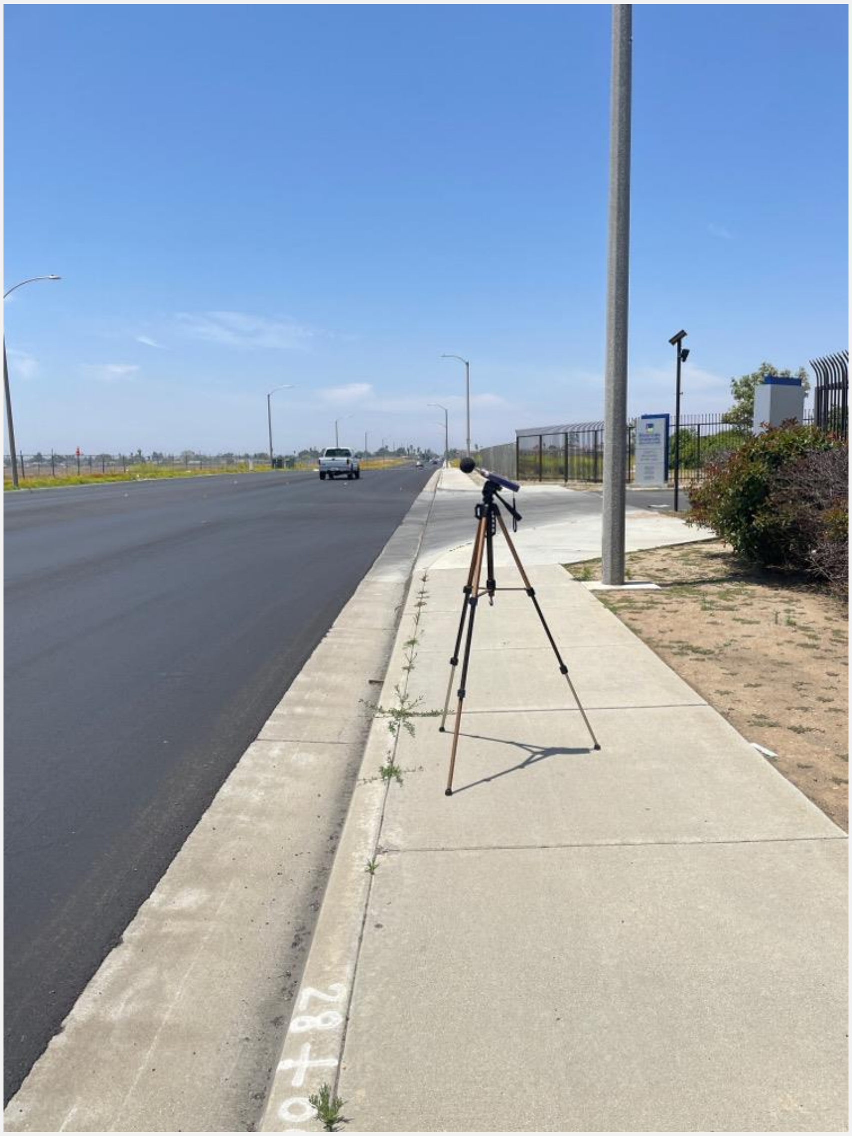
Estimated Vehicle Speed (MPH)	0

Traffic Counts

ID	S1601
Vehicle Count Summary	A 103, MT 0, HT 0, B 0, MC 0
Counting Both Directions?	Yes
Count Duration (minutes)	0
Vehicle Count Tally	
Select Method for Vehicle Counts	Enter Manually
Number of Vehicles - Autos	103
Number of Vehicles - Medium Trucks	0
Number of Vehicles - Heavy Trucks	0
Number of Vehicles - Buses	0
Number of Vehicles - Motorcyles	0

Site Photos

ID	S4985

Photo	
Comments / Description	Facing west

ID	S4985
Photo	
Comments / Description	Facing east

Monitoring	
ID	**S1640**
Record #	7
Site ID	St 2
Site Location Lat/Long	33.906616, -117.209086
Begin (Time)	12:14:00
End (Time)	12:28:00
Leq	71.3
Lmax	95.7
Lmin	44
Other Lx?	L90, L50, L10
L90	52.8
L50	62
L10	71.8
Other Lx (Specify Metric)	L

Primary Noise Source	Traffic
Other Noise Sources (Background)	Birds, Distant Aircraft, Distant Traffic, Rustling Leaves
Other Noise Sources Additional Description	
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Source Info and Traffic Counts

ID	S6665
Number of Lanes	4
Lane Width (feet)	10
Roadway Width (feet)	40
Roadway Width (m)	12.2
Distance to Roadway (feet)	0
Distance to Roadway (m)	0
Estimated Vehicle Speed (MPH)	0

Traffic Counts	
ID	**S1598**
Vehicle Count Summary	A 110, MT 0, HT 0, B 0, MC 0
Counting Both Directions?	Yes
Count Duration (minutes)	0
Vehicle Count Tally	
Select Method for Vehicle Counts	Enter Manually
Number of Vehicles - Autos	110
Number of Vehicles - Medium Trucks	0
Number of Vehicles - Heavy Trucks	0
Number of Vehicles - Buses	0
Number of Vehicles - Motorcyles	0

Description / Photos	
ID	**S6665**

Site Photos	
ID	S4982
Photo	
Comments / Description	Facing east

ID	S4982
Photo	
Comments / Description	Facing south

Monitoring	
ID	**S1640**
Record #	6
Site ID	St 3
Site Location Lat/Long	33.895278, -117.190867
Begin (Time)	11:55:00
End (Time)	12:10:00
Leq	52.8
Lmax	73.1
Lmin	37.8
Other Lx?	L90, L50, L10
L90	39.2
L50	43.4
L10	49.5
Other Lx (Specify Metric)	L

Primary Noise Source	Traffic
Other Noise Sources (Background)	Birds, Distant Dog Barking, Distant Gardener / Landscape Noise, Distant Traffic
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Description / Photos

ID	**S6662**

Site Photos	
ID	**S4979**
Photo	
Comments / Description	Facing south

ID	S4979
Photo	
Comments / Description	Facing east

ID	S4979
Photo	

Comments / Description Facing west

Monitoring	
ID	**S1640**
Record #	5
Site ID	St 5
Site Location Lat/Long	33.895278, -117.190867
Begin (Time)	11:32:00
End (Time)	11:47:00
Leq	71.2
Lmax	93.6
Lmin	43.4
Other Lx?	L90, L50, L10
L90	50.5
L50	59.7
L10	73.8
Other Lx (Specify Metric)	L

Primary Noise Source	Traffic
Other Noise Sources (Background)	Birds, Distant Conversations / Yelling, Rustling Leaves
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Source Info and Traffic Counts

ID	S6659
Number of Lanes	6
Lane Width (feet)	10
Roadway Width (feet)	60
Roadway Width (m)	18.3
Distance to Roadway (feet)	0
Distance to Roadway (m)	0
Estimated Vehicle Speed (MPH)	0

Traffic Counts	
ID	**S1595**
Vehicle Count Summary	A 103, MT 1, HT 0, B 0, MC 1
Counting Both Directions?	Yes
Count Duration (minutes)	0
Vehicle Count Tally	
Select Method for Vehicle Counts	Enter Manually
Number of Vehicles - Autos	103
Number of Vehicles - Medium Trucks	1
Number of Vehicles - Heavy Trucks	0
Number of Vehicles - Buses	0
Number of Vehicles - Motorcyles	1

Description / Photos	
ID	**S6659**

Site Photos	
ID	**S4976**
Photo	
Comments / Description	Facing west

ID	S4976
Photo	

Comments / Description	Facing north

ID	S4976
Photo	
Comments / Description	Facing east

Monitoring	
ID	**S1640**
Record #	4
Site ID	St 7
Site Location Lat/Long	33.906558, -117.190366
Begin (Time)	11:13:00
End (Time)	11:28:00
Leq	48.6
Lmax	63.8
Lmin	35.6
Other Lx?	L90, L50, L10
L90	38.8
L50	45.7
L10	51.4
Other Lx (Specify Metric)	L

Primary Noise Source	Traffic
Other Noise Sources (Background)	Birds, Distant Traffic, Rustling Leaves
Other Noise Sources Additional Description	
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Description / Photos	
ID	**S6656**

Site Photos	
ID	**S4973**
Photo	
Comments / Description	Facing north

ID	S4973
Photo	
Comments / Description	Facing east

ID	S4973
Photo	
Comments / Description	Fasting west

Monitoring	
ID	**S1640**
Record #	3
Site ID	St 8
Site Location Lat/Long	33.908154, -117.191330
Begin (Time)	10:55:00
End (Time)	11:10:00
Leq	65.9
Lmax	81
Lmin	41.4
Other Lx?	L90, L50, L10
L90	47.9
L50	59.5
L10	70.1
Other Lx (Specify Metric)	L

Primary Noise Source	Traffic
Other Noise Sources (Background)	Birds, Distant Dog Barking, Distant Gardener / Landscape Noise, Distant Traffic
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Description / Photos

ID	**S6653**

Site Photos	
ID	**S4970**
Photo	
Comments / Description	Facing north

ID	S4970
Photo	

Comments / Description	Facing aouth

Monitoring	
ID	**S1640**
Record #	2
Site Location Lat/Long	33.897937, -117.196358
Begin (Time)	10:40:00
Other Lx (Specify Metric)	L
Primary Noise Source	Traffic
Other Noise Sources (Background)	Birds, Distant Aircraft, Distant Dog Barking, Distant Traffic, Rustling Leaves
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Description / Photos	
ID	**S6650**

Site Photos	
ID	**S4967**
Photo	
Comments / Description	Facing west

ID	S4967
Photo	
Comments / Description	Facing south

ID	S4967
Photo	
Comments / Description	Facing north

Monitoring	
ID	S1640
Record #	1
Site ID	St 4
Site Location Lat/Long	33.897937, -117.196358
Begin (Time)	10:28:00
End (Time)	10:43:00
Leq	44.7
Lmax	63
Lmin	34.3
Other Lx?	L90, L50, L10
L90	37
L50	41
L10	47.1
Other Lx (Specify Metric)	L

Primary Noise Source	Traffic
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Description / Photos	
ID	**S6647**

Site Photos	
ID	S4964
Photo	
Comments / Description	Facing east

ID	S4964
Photo	
Comments / Description	Facing west

ID	S4964
Photo	
Comments / Description	Facing north

FORMS DUDEK FIELD DATA REPORT

Field Noise Measurement Data

ID	1643
Project Name	Aquabella Long-Term Ambient Measurement Field Data
Observer(s)	
Date	2023-05-16
Comments	LT1 pic 1402 LT4 pic 1403 Cal. LD150

Monitoring

ID	S1643
Record #	2
Site ID	LT 2
Site Location Lat/Long	33.908216, -117.191299
Begin (Time)	10:53:00
End (Time)	11:29:00

Other Lx (Specify Metric)	L
Primary Noise Source	Traffic
Other Noise Sources (Background)	Birds, Distant Aircraft, Distant Conversations / Yelling, Distant Dog Barking, Distant Gardener / Landscape Noise, Distant Kids Playing, Distant Traffic, Rustling Leaves
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Description / Photos

ID	S6677

Site Photos	
ID	**S5003**
Photo	
Comments / Description	Facing north

ID	S5003
Photo	
Comments / Description	Facing south

Monitoring	
ID	**S1643**
Record #	1
Site ID	LT 1
Site Location Lat/Long	33.897959, -117.196667
Begin (Time)	10:31:00
End (Time)	11:40:00
Other Lx (Specify Metric)	L
Primary Noise Source	Traffic
Is the same instrument and calibrator being used as previously noted?	Yes
Are the meteorological conditions the same as previously noted?	Yes

Description / Photos	
ID	**S6674**

Site Photos	
ID	**S5000**
Photo	
Comments / Description	Facing west

ID	S5000
Photo	
Comments / Description	Facing east

ID	S5000
Photo	
Comments / Description	Facing south

Appendix C
Construction Noise Modeling Data

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	130	72.8	6	360	68
	grader	1	40	85	85.0	130	73.8	6	360	69
	scraper	1	40	84	84.0	130	72.8	6	360	68
	dozer	1	40	82	82.0	130	70.8	6	360	66
	backhoe	1	40	78	78.0	130	66.8	6	360	62
	front end loader	2	40	79	82.0	130	70.8	6	360	66
						Total Lmax for phase:	**79.6**	**Total Leq 1hr for phase:**		**74.3**
Paving	paver	4	50	77	83.0	130	71.8	6	360	68
	All Other Equipment > 5 HP	1	50	85	85.0	130	73.8	6	360	70
	roller	3	20	80	84.8	130	73.6	6	360	65
	backhoe	2	40	78	81.0	130	69.8	6	360	65
	front end loader	1	40	79	79.0	130	67.8	6	360	63
						Total Lmax for phase:	**78.9**	**Total Leq 1hr for phase:**		**73.6**
Architectural Coating	compressor (air)	1	40	78	78.0	130	66.8	6	360	62
						Total Lmax for phase:	**66.8**	**Total Leq 1hr for phase:**		**61.6**
Building Construction Residential	crane	2	16	81	84.0	130	72.8	6	360	64
	man lift	3	20	75	79.8	130	68.6	4	240	59
	generator	3	50	72	76.8	130	65.6	6	360	61
	scraper	2	40	84	87.0	130	75.8	6	360	71
	tractor	1	40	84	84.0	130	72.8	6	360	68
	front end loader	1	40	79	79.0	130	67.8	6	360	63
	welder / torch	3	40	73	77.8	130	66.6	4	240	60
						Total Lmax for phase:	**79.9**	**Total Leq 1hr for phase:**		**73.8**
Building Construction Residential Park	crane	1	16	81	81.0	130	69.8	6	360	61
	man lift	3	20	75	79.8	130	68.6	4	240	59
	generator	2	50	72	75.0	130	63.8	6	360	60
	tractor	2	40	84	87.0	130	75.8	6	360	71
	backhoe	2	40	78	81.0	130	69.8	6	360	65
	front end loader	2	40	79	82.0	130	70.8	6	360	66
	welder / torch	2	40	73	76.0	130	64.8	4	240	58
						Total Lmax for phase:	**79.1**	**Total Leq 1hr for phase:**		**73.3**
Architectural Coating Residential	compressor (air)	3	40	78	82.8	130	71.6	6	360	66
						Total Lmax for phase:	**71.6**			**66.3**

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	1260	50.0	6	360	45
	grader	3	40	85	89.8	1260	55.8	6	360	51
	scraper	3	40	84	88.8	1260	54.8	6	360	50
	dozer	1	40	82	82.0	1260	48.0	6	360	43
	backhoe	1	40	78	78.0	1260	44.0	6	360	39
	front end loader	1	40	79	79.0	1260	45.0	6	360	40
					Total Lmax for phase:		**59.5**	**Total Leq 1hr for phase:**		**54.3**
Paving	paver	4	50	77	83.0	1260	49.0	6	360	45
	All Other Equipment > 5 HP	4	50	85	91.0	1260	57.0	6	360	53
	roller	4	20	80	86.0	1260	52.0	6	360	44
	backhoe	1	40	78	78.0	1260	44.0	6	360	39
	front end loader	1	40	79	79.0	1260	45.0	6	360	40
					Total Lmax for phase:		**59.0**	**Total Leq 1hr for phase:**		**54.1**
Architectural Coating	compressor (air)	2	40	78	81.0	1260	47.0	6	360	42
					Total Lmax for phase:		**47.0**	**Total Leq 1hr for phase:**		**41.8**
Building Construction Residential	crane	13	16	81	92.1	1260	58.1	6	360	49
	man lift	25	20	75	89.0	1260	55.0	4	240	45
	generator	25	50	72	86.0	1260	52.0	6	360	48
	tractor	6	40	84	91.8	1260	57.8	6	360	53
	front end loader	7	40	79	87.5	1260	53.5	6	360	48
	welder / torch	25	40	73	87.0	1260	53.0	4	240	46
					Total Lmax for phase:		**63.3**	**Total Leq 1hr for phase:**		**56.6**
Building Construction Residential Park	crane	1	16	81	81.0	1260	47.0	6	360	38
	man lift	3	20	75	79.8	1260	45.8	4	240	36
	generator	4	50	72	78.0	1260	44.0	6	360	40
	tractor	2	40	84	87.0	1260	53.0	6	360	48
	backhoe	2	40	78	81.0	1260	47.0	6	360	42
	front end loader	2	40	79	82.0	1260	48.0	6	360	43
	welder / torch	2	40	73	76.0	1260	42.0	4	240	35
					Total Lmax for phase:		**56.5**	**Total Leq 1hr for phase:**		**50.7**
Architectural Coating Residential	compressor (air)	13	40	78	89.1	1260	55.1	6	360	50
					Total Lmax for phase:		**55.1**			**49.9**

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	1225	50.3	6	360	45
	grader	3	40	85	89.8	1225	56.1	6	360	51
	scraper	3	40	84	88.8	1225	55.1	6	360	50
	dozer	1	40	82	82.0	1225	48.3	6	360	43
	backhoe	1	40	78	78.0	1225	44.3	6	360	39
	front end loader	1	40	79	79.0	1225	45.3	6	360	40
						Total Lmax for phase:	**59.8**	**Total Leq 1hr for phase:**		**54.6**
Paving	paver	4	50	77	83.0	1225	49.3	6	360	45
	All Other Equipment > 5 HP	4	50	85	91.0	1225	57.3	6	360	53
	roller	4	20	80	86.0	1225	52.3	6	360	44
	backhoe	1	40	78	78.0	1225	44.3	6	360	39
	front end loader	1	40	79	79.0	1225	45.3	6	360	40
						Total Lmax for phase:	**59.3**	**Total Leq 1hr for phase:**		**54.4**
Architectural Coating	compressor (air)	1	40	78	78.0	1225	44.3	6	360	39
						Total Lmax for phase:	**44.3**	**Total Leq 1hr for phase:**		**39.1**
Building Construction Residential	crane	2	16	81	84.0	1225	50.3	6	360	41
	man lift	3	20	75	79.8	1225	46.1	4	240	36
	generator	3	50	72	76.8	1225	43.1	6	360	39
	tractor	1	40	84	84.0	1225	50.3	6	360	45
	front end loader	1	40	79	79.0	1225	45.3	6	360	40
	welder / torch	3	40	73	77.8	1225	44.1	4	240	37
						Total Lmax for phase:	**55.2**	**Total Leq 1hr for phase:**		**48.6**
Building Construction hotel	crane	1	16	81	81.0	1225	47.3	6	360	38
	man lift	3	20	75	79.8	1225	46.1	4	240	36
	generator	4	50	72	78.0	1225	44.3	6	360	40
	tractor	2	40	84	87.0	1225	53.3	6	360	48
	backhoe	2	40	78	81.0	1225	47.3	6	360	42
	front end loader	1	40	79	79.0	1225	45.3	6	360	40
	welder / torch	4	40	73	79.0	1225	45.3	4	240	38
						Total Lmax for phase:	**56.6**	**Total Leq 1hr for phase:**		**50.7**
Building Construction Park	generator	1	50	72	72.0	1225	38.3	6	360	34
	tractor	2	40	84	87.0	1225	53.3	6	360	48
	front end loader	1	40	79	79.0	1225	45.3	6	360	40
	welder / torch	1	40	73	73.0	1225	39.3	4	240	32
						Total Lmax for phase:	**54.2**	**Total Leq 1hr for phase:**		**48.9**
Architectural Coating Residential	compressor (air)	2	40	78	81.0	1225	47.3	6	360	42
						Total Lmax for phase:	**47.3**			**42.1**
Architectural Coating Hotel	compressor (air)	4	40	78	84.0	1225	50.3	6	360	45
						Total Lmax for phase:	**50.3**			**45.1**

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	2400	43.2	6	360	38
	grader	3	40	85	89.8	2400	49.0	6	360	44
	scraper	3	40	84	88.8	2400	48.0	6	360	43
	dozer	1	40	82	82.0	2400	41.2	6	360	36
	backhoe	1	40	78	78.0	2400	37.2	6	360	32
	front end loader	1	40	79	79.0	2400	38.2	6	360	33
						Total Lmax for phase:	**52.7**		**Total Leq 1hr for phase:**	**47.5**
Paving	paver	4	50	77	83.0	2400	42.2	6	360	38
	All Other Equipment > 5 HP	4	50	85	91.0	2400	50.2	6	360	46
	roller	4	20	80	86.0	2400	45.2	6	360	37
	backhoe	1	40	78	78.0	2400	37.2	6	360	32
	front end loader	1	40	79	79.0	2400	38.2	6	360	33
						Total Lmax for phase:	**52.2**		**Total Leq 1hr for phase:**	**47.3**
Architectural Coating	compressor (air)	2	40	78	81.0	2400	40.2	6	360	35
						Total Lmax for phase:	**40.2**		**Total Leq 1hr for phase:**	**35.0**
Building Construction Residential	crane	13	16	81	92.1	2400	51.3	6	360	42
	man lift	25	20	75	89.0	2400	48.2	4	240	38
	generator	25	50	72	86.0	2400	45.2	6	360	41
	tractor	7	40	84	92.5	2400	51.6	6	360	46
	front end loader	6	40	79	86.8	2400	46.0	6	360	41
	welder / torch	25	40	73	87.0	2400	46.2	4	240	39
						Total Lmax for phase:	**56.6**		**Total Leq 1hr for phase:**	**50.0**
Building Construction hotel	crane	1	16	81	81.0	2400	40.2	6	360	31
	man lift	3	20	75	79.8	2400	39.0	4	240	29
	generator	4	50	72	78.0	2400	37.2	6	360	33
	tractor	2	40	84	87.0	2400	46.2	6	360	41
	backhoe	2	40	78	81.0	2400	40.2	6	360	35
	front end loader	1	40	79	79.0	2400	38.2	6	360	33
	welder / torch	4	40	73	79.0	2400	38.2	4	240	31
						Total Lmax for phase:	**49.5**		**Total Leq 1hr for phase:**	**43.6**
Building Construction Park	generator	1	50	72	72.0	2400	31.2	6	360	27
	tractor	2	40	84	87.0	2400	46.2	6	360	41
	front end loader	1	40	79	79.0	2400	38.2	6	360	33
	welder / torch	1	40	73	73.0	2400	32.2	4	240	25
						Total Lmax for phase:	**47.1**		**Total Leq 1hr for phase:**	**41.9**
Architectural Coating Residential	compressor (air)	2	40	78	81.0	2400	40.2	6	360	35
						Total Lmax for phase:	**40.2**			**35.0**
Architectural Coating hotel	compressor (air)	4	40	78	84.0	2400	43.2	6	360	38
						Total Lmax for phase:	**43.2**			**38.0**

Leq 8-hr noise level limit for construction phase at residential land use, per FTA Guidance = **80**
Hours over which Leq is to be averaged = 8

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	120	73.7	6	360	69
	grader	1	40	85	85.0	120	74.7	6	360	69
	scraper	1	40	84	84.0	120	73.7	6	360	68
	dozer	1	40	82	82.0	120	71.7	6	360	66
	backhoe	2	40	78	81.0	120	70.7	6	360	66
	front end loader	1	40	79	79.0	120	68.7	6	360	63
						Total Lmax for phase:	**80.5**		**Total Leq 1hr for phase:**	**75.2**
Paving	paver	4	50	77	83.0	120	72.7	6	360	68
	All Other Equipment > 5 HP	1	50	85	85.0	120	74.7	6	360	70
	roller	3	20	80	84.8	120	74.5	6	360	66
	backhoe	2	40	78	81.0	120	70.7	6	360	66
	front end loader	1	40	79	79.0	120	68.7	6	360	63
						Total Lmax for phase:	**79.8**		**Total Leq 1hr for phase:**	**74.5**
Building Construction Residential	crane	2	16	81	84.0	120	73.7	6	360	65
	man lift	3	20	75	79.8	120	69.5	4	240	59
	generator	3	50	72	76.8	120	66.5	6	360	62
	tractor	1	40	84	84.0	120	73.7	6	360	68
	front end loader	1	40	79	79.0	120	68.7	6	360	63
	welder / torch	3	40	73	77.8	120	67.5	4	240	61
						Total Lmax for phase:	**78.7**		**Total Leq 1hr for phase:**	**72.0**
Building Construction School (elementary)	crane	1	16	81	81.0	120	70.7	6	360	62
	man lift	3	20	75	79.8	120	69.5	4	240	59
	generator	4	50	72	78.0	120	67.7	6	360	63
	tractor	1	40	84	84.0	120	73.7	6	360	68
	backhoe	1	40	78	78.0	120	67.7	6	360	62
	front end loader	1	40	79	79.0	120	68.7	6	360	63
	welder / torch	2	40	73	76.0	120	65.7	4	240	59
						Total Lmax for phase:	**78.3**		**Total Leq 1hr for phase:**	**72.1**
Building Construction School (Middle)	crane	1	16	81	81.0	120	70.7	6	360	62
	man lift	3	20	75	79.8	120	69.5	4	240	59
	generator	4	50	72	78.0	120	67.7	6	360	63
	tractor	1	40	84	84.0	120	73.7	6	360	68
	backhoe	1	40	78	78.0	120	67.7	6	360	62
	front end loader	1	40	79	79.0	120	68.7	6	360	63
	welder / torch	2	40	73	76.0	120	65.7	4	240	59
						Total Lmax for phase:	**78.3**		**Total Leq 1hr for phase:**	**72.1**
Building Construction Park	crane	1	16	81	81.0	120	70.7	6	360	62
	man lift	3	20	75	79.8	120	69.5	6	360	61
	Generator	1	50	72	72.0	120	61.7	6	360	57
	tractor	3	40	84	88.8	120	78.5	4	240	72
	welder / torch	1	40	73	73.0	120	62.7	4	240	56
						Total Lmax for phase:	**79.8**		**Total Leq 1hr for phase:**	**72.5**
Architectural Coating Residential	compressor (air)	1	40	78	78.0	120	67.7	6	360	62
						Total Lmax for phase:	**67.7**			**62.5**
Architectural Coating school (elementary)	compressor (air)	2	40	78	81.0	120	70.7	6	360	66
						Total Lmax for phase:	**70.7**			**65.5**
Architectural Coating school (middle)	compressor (air)	2	40	78	81.0	120	70.7	6	360	66
						Total Lmax for phase:	**70.7**			**65.5**
Architectural Coating park	compressor (air)	2	40	78	81.0	120	70.7	6	360	66
						Total Lmax for phase:	**70.7**			**65.5**

Leq 8-hr noise level limit for construction phase at residential land use, per FTA Guidance = **80**

Hours over which Leq is to be averaged = 8

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	890	53.5	6	360	48
	grader	3	40	85	89.8	890	59.2	6	360	54
	scraper	3	40	84	88.8	890	58.2	6	360	53
	dozer	1	40	82	82.0	890	51.5	6	360	46
	backhoe	1	40	78	78.0	890	47.5	6	360	42
	front end loader	1	40	79	79.0	890	48.5	6	360	43
						Total Lmax for phase:	**63.0**	**Total Leq 1hr for phase:**		**57.8**
Paving	paver	4	50	77	83.0	890	52.5	6	360	48
	All Other Equipment > 5 HP	4	50	85	91.0	890	60.5	6	360	56
	roller	4	20	80	86.0	890	55.5	6	360	47
	backhoe	1	40	78	78.0	890	47.5	6	360	42
	front end loader	1	40	79	79.0	890	48.5	6	360	43
						Total Lmax for phase:	**62.5**	**Total Leq 1hr for phase:**		**57.6**
Building Construction Residential	crane	13	16	81	92.1	890	61.6	6	360	52
	man lift	25	20	75	89.0	890	58.4	4	240	48
	generator	25	50	72	86.0	890	55.4	6	360	51
	tractor	6	40	84	91.8	890	61.2	6	360	56
	front end loader	7	40	79	87.5	890	56.9	6	360	52
	welder / torch	25	40	73	87.0	890	56.4	4	240	49
						Total Lmax for phase:	**66.8**	**Total Leq 1hr for phase:**		**60.0**
Building Construction School (elementary)	crane	1	16	81	81.0	890	50.5	6	360	41
	man lift	3	20	75	79.8	890	49.2	4	240	39
	generator	1	50	72	72.0	890	41.5	6	360	37
	tractor	1	40	84	84.0	890	53.5	6	360	48
	backhoe	1	40	78	78.0	890	47.5	6	360	42
	front end loader	1	40	79	79.0	890	48.5	6	360	43
	welder / torch	2	40	73	76.0	890	45.5	4	240	38
						Total Lmax for phase:	**57.7**	**Total Leq 1hr for phase:**		**51.4**
Building Construction School (Middle)	crane	1	16	81	81.0	890	50.5	6	360	41
	man lift	3	20	75	79.8	890	49.2	4	240	39
	generator	1	50	72	72.0	890	41.5	6	360	37
	tractor	1	40	84	84.0	890	53.5	6	360	48
	backhoe	1	40	78	78.0	890	47.5	6	360	42
	front end loader	1	40	79	79.0	890	48.5	6	360	43
	welder / torch	2	40	73	76.0	890	45.5	4	240	38
						Total Lmax for phase:	**57.7**	**Total Leq 1hr for phase:**		**51.4**
Building Construction Park	crane	1	16	81	81.0	890	50.5	6	360	41
	man lift	3	20	75	79.8	890	49.2	6	360	41
	Generator	1	50	72	72.0	890	41.5	6	360	37
	tractor	3	40	84	88.8	890	58.2	4	240	51
	welder / torch	1	40	73	73.0	890	42.5	4	240	35
						Total Lmax for phase:	**59.5**	**Total Leq 1hr for phase:**		**52.2**
Architectural Coating Residential	compressor (air)	2	40	78	81.0	890	50.5	6	360	45
						Total Lmax for phase:	**50.5**			**45.2**
Architectural Coating school (elementary)	compressor (air)	4	40	78	84.0	890	53.5	6	360	48
						Total Lmax for phase:	**53.5**			**48.3**
Architectural Coating school (middle)	compressor (air)	4	40	78	84.0	890	53.5	6	360	48
						Total Lmax for phase:	**53.5**			**48.3**
Architectural Coating park	compressor (air)	4	40	78	84.0	890	53.5	6	360	48
						Total Lmax for phase:	**53.5**			**48.3**

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	70	81.0	6	360	76
	grader	3	40	85	89.8	70	86.7	6	360	81
	scraper	3	40	84	88.8	70	85.7	6	360	80
	dozer	1	40	82	82.0	70	78.9	6	360	74
	backhoe	1	40	78	78.0	70	74.9	6	360	70
	front end loader	1	40	79	79.0	70	75.9	6	360	71
						Total Lmax for phase:	**90.5**	**Total Leq 1hr for phase:**		**85.2**
Paving	paver	4	50	77	83.0	70	80.0	6	360	76
	All Other Equipment > 5 HP	4	50	85	91.0	70	88.0	6	360	84
	roller	4	20	80	86.0	70	83.0	6	360	75
	backhoe	1	40	78	78.0	70	74.9	6	360	70
	front end loader	1	40	79	79.0	70	75.9	6	360	71
						Total Lmax for phase:	**90.0**	**Total Leq 1hr for phase:**		**85.1**
Architectural Coating	compressor (air)	2	40	78	81.0	70	78.0	6	360	73
						Total Lmax for phase:	**78.0**	**Total Leq 1hr for phase:**		**72.7**
Building Construction Residential	crane	2	16	81	84.0	70	81.0	6	360	72
	man lift	3	20	75	79.8	70	76.7	4	240	67
	generator	3	50	72	76.8	70	73.7	6	360	69
	tractor	1	40	84	84.0	70	80.9	6	360	76
	front end loader	1	40	79	79.0	70	75.9	6	360	71
	welder / torch	3	40	73	77.8	70	74.7	4	240	68
						Total Lmax for phase:	**85.9**	**Total Leq 1hr for phase:**		**79.2**
Building Construction School (elementary)	crane	1	16	81	81.0	70	77.9	6	360	69
	man lift	3	20	75	79.8	70	76.7	4	240	67
	generator	1	50	72	72.0	70	68.9	6	360	65
	tractor	1	40	84	84.0	70	80.9	6	360	76
	backhoe	1	40	78	78.0	70	74.9	6	360	70
	front end loader	1	40	79	79.0	70	75.9	6	360	71
	welder / torch	2	40	73	76.0	70	73.0	4	240	66
						Total Lmax for phase:	**85.2**	**Total Leq 1hr for phase:**		**78.9**
Building Construction Park	crane	1	16	81	81.0	70	77.9	6	360	69
	man lift	3	20	75	79.8	70	76.7	6	360	68
	Generator	1	50	72	72.0	70	68.9	6	360	65
	tractor	3	40	84	88.8	70	85.7	4	240	79
	welder / torch	2	40	73	76.0	70	73.0	4	240	66
						Total Lmax for phase:	**87.1**	**Total Leq 1hr for phase:**		**79.8**
Architectural Coating Residential	compressor (air)	1	40	78	78.0	70	74.9	6	360	70
						Total Lmax for phase:	**74.9**			**69.7**
Architectural Coating school (elementary)	compressor (air)	2	40	78	81.0	70	78.0	6	360	73
						Total Lmax for phase:	**78.0**			**72.7**

Leq 8-hr noise level limit for construction phase at residential land use, per FTA Guidance = **80**
Hours over which Leq is to be averaged = 8

10 = temporary barrier (TB) of input height inserted between source and receptor

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq	Source Elevation (ft)	Receiver Elevation (ft)	Barrier Height (ft)	Source to Barr. ("A") Horiz. (ft)	Rcvr. to Barr. ("B") Horiz. (ft)	Source to Rcvr. ("C") Horiz. (ft)	"A" (ft)	"B" (ft)	"C" (ft)	Path Length Diff. "P" (ft)	Abarr (dB)	Heff (with barrier)	Heff (wout barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
Site Preparation	excavator	2	40	81	84.0	70	67.1	6	360	62	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	grader	3	40	85	89.8	70	72.9	6	360	68	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	scraper	3	40	84	88.8	70	71.9	6	360	67	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	dozer	1	40	82	82.0	70	65.1	6	360	60	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	backhoe	1	40	78	78.0	70	61.1	6	360	56	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	front end loader	1	40	79	79.0	70	62.1	6	360	57	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
					Total Lmax for phase:		**76.6**	**Total Leq 1hr for phase:**		**71.4**																
Paving	paver	4	50	77	83.0	70	66.1	6	360	62	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	All Other Equipment > 5 HP	4	50	85	91.0	70	74.1	6	360	70	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	roller	4	20	80	86.0	70	69.1	6	360	61	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	backhoe	1	40	78	78.0	70	61.1	6	360	56	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	front end loader	1	40	79	79.0	70	62.1	6	360	57	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
					Total Lmax for phase:		**76.1**	**Total Leq 1hr for phase:**		**71.3**																
Architectural Coating	compressor (air)	2	40	78	81.0	70	64.1	6	360	59	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
					Total Lmax for phase:		**64.1**	**Total Leq 1hr for phase:**		**58.9**																
Building Construction Residential	crane	2	16	81	84.0	70	67.1	6	360	58	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	man lift	3	20	75	79.8	70	62.9	4	240	53	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	generator	3	50	72	76.8	70	59.9	6	360	56	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	tractor	1	40	84	84.0	70	67.1	6	360	62	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	front end loader	1	40	79	79.0	70	62.1	6	360	57	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	welder / torch	3	40	73	77.8	70	60.9	4	240	54	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
					Total Lmax for phase:		**72.1**	**Total Leq 1hr for phase:**		**65.4**																
Building Construction School (elementary)	crane	1	16	81	81.0	70	64.1	6	360	55	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	man lift	3	20	75	79.8	70	62.9	4	240	53	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	generator	1	50	72	72.0	70	55.1	6	360	51	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	tractor	1	40	84	84.0	70	67.1	6	360	62	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	backhoe	1	40	78	78.0	70	61.1	6	360	56	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	front end loader	1	40	79	79.0	70	62.1	6	360	57	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	welder / torch	2	40	73	76.0	70	59.1	4	240	52	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
					Total Lmax for phase:		**71.4**	**Total Leq 1hr for phase:**		**65.1**																
Building Construction Park	crane	1	16	81	81.0	70	64.1	6	360	55	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	man lift	3	20	75	79.8	70	62.9	6	360	55	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	Generator	1	50	72	72.0	70	55.1	6	360	51	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	tractor	3	40	84	88.8	70	71.9	4	240	65	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
	welder / torch	2	40	73	76.0	70	59.1	4	240	52	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
					Total Lmax for phase:		**73.2**	**Total Leq 1hr for phase:**		**66.0**																
Architectural Coating Residential	compressor (air)	1	40	78	78.0	70	61.1	6	360	56	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
					Total Lmax for phase:		**61.1**			**55.9**																
Architectural Coating school (elementary)	compressor (air)	2	40	78	81.0	70	64.1	6	360	59	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
					Total Lmax for phase:		**64.1**			**58.9**																
Architectural Coating park	compressor (air)	2	40	78	81.0	70	64.1	6	360	59	6	5	10	60	10	70	60.1	11.2	70.0	1.31	14.2	15.5	5.5	0.5	0.7	13.9
					Total Lmax for phase:		**64.1**			**58.9**																

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	550	58.1	6	360	53
	grader	3	40	85	89.8	550	63.9	6	360	59
	scraper	3	40	84	88.8	550	62.9	6	360	58
	dozer	1	40	82	82.0	550	56.1	6	360	51
	backhoe	1	40	78	78.0	550	52.1	6	360	47
	front end loader	1	40	79	79.0	550	53.1	6	360	48
					Total Lmax for phase:		**67.7**	**Total Leq 1hr for phase:**		**62.4**
Paving	paver	4	50	77	83.0	550	57.2	6	360	53
	All Other Equipment > 5 HP	4	50	85	91.0	550	65.2	6	360	61
	roller	4	20	80	86.0	550	60.2	6	360	52
	backhoe	1	40	78	78.0	550	52.1	6	360	47
	front end loader	1	40	79	79.0	550	53.1	6	360	48
					Total Lmax for phase:		**67.2**	**Total Leq 1hr for phase:**		**62.3**
Architectural Coating	compressor (air)	2	40	78	81.0	550	55.1	6	360	50
					Total Lmax for phase:		**55.1**	**Total Leq 1hr for phase:**		**49.9**
Building Construction Residential	crane	13	16	81	92.1	550	66.3	6	360	57
	man lift	25	20	75	89.0	550	63.1	4	240	53
	generator	25	50	72	86.0	550	60.1	6	360	56
	tractor	6	40	84	91.8	550	65.9	6	360	61
	front end loader	7	40	79	87.5	550	61.6	6	360	56
	welder / torch	25	40	73	87.0	550	61.1	4	240	54
					Total Lmax for phase:		**71.4**	**Total Leq 1hr for phase:**		**64.7**
Building Construction School (elementary)	crane	1	16	81	81.0	550	55.1	6	360	46
	man lift	3	20	75	79.8	550	53.9	4	240	44
	generator	1	50	72	72.0	550	46.1	6	360	42
	tractor	1	40	84	84.0	550	58.1	6	360	53
	backhoe	1	40	78	78.0	550	52.1	6	360	47
	front end loader	1	40	79	79.0	550	53.1	6	360	48
	welder / torch	2	40	73	76.0	550	50.1	4	240	43
					Total Lmax for phase:		**62.4**	**Total Leq 1hr for phase:**		**56.1**
Building Construction Park	crane	1	16	81	81.0	550	55.1	6	360	46
	man lift	3	20	75	79.8	550	53.9	6	360	46
	Generator	1	50	72	72.0	550	46.1	6	360	42
	tractor	3	40	84	88.8	550	62.9	4	240	56
	welder / torch	2	40	73	76.0	550	50.1	4	240	43
					Total Lmax for phase:		**64.3**	**Total Leq 1hr for phase:**		**57.0**
Architectural Coating Residential	compressor (air)	13	40	78	89.1	550	63.3	6	360	58
					Total Lmax for phase:		**63.3**			**58.0**
Architectural Coating school (elementary)	compressor (air)	4	40	78	84.0	550	58.2	6	360	53
					Total Lmax for phase:		**58.2**			**52.9**

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	75	80.0	6	360	75
	grader	3	40	85	89.8	75	85.7	6	360	80
	scraper	3	40	84	88.8	75	84.7	6	360	79
	dozer	1	40	82	82.0	75	78.0	6	360	73
	backhoe	1	40	78	78.0	75	74.0	6	360	69
	front end loader	1	40	79	79.0	75	75.0	6	360	70
						Total Lmax for phase:	**89.5**		**Total Leq 1hr for phase:**	**84.3**
Paving	paver	4	50	77	83.0	75	79.0	6	360	75
	All Other Equipment > 5 HP	4	50	85	91.0	75	87.0	6	360	83
	roller	4	20	80	86.0	75	82.0	6	360	74
	backhoe	1	40	78	78.0	75	74.0	6	360	69
	front end loader	1	40	79	79.0	75	75.0	6	360	70
						Total Lmax for phase:	**89.0**		**Total Leq 1hr for phase:**	**84.1**
Architectural Coating	compressor (air)	2	40	78	81.0	75	77.0	6	360	72
						Total Lmax for phase:	**77.0**		**Total Leq 1hr for phase:**	**71.7**
Building Construction Residential	crane	2	16	81	84.0	75	80.0	6	360	71
	man lift	3	20	75	79.8	75	75.7	4	240	66
	generator	3	50	72	76.8	75	72.7	6	360	68
	tractor	1	40	84	84.0	75	80.0	6	360	75
	front end loader	1	40	79	79.0	75	75.0	6	360	70
	welder / torch	3	40	73	77.8	75	73.7	4	240	67
						Total Lmax for phase:	**84.9**		**Total Leq 1hr for phase:**	**78.2**
Building Construction Park	crane	1	16	81	81.0	75	77.0	6	360	68
	man lift	3	20	75	79.8	75	75.7	6	360	67
	Generator	1	50	72	72.0	75	68.0	6	360	64
	tractor	3	40	84	88.8	75	84.7	4	240	78
	welder / torch	1	40	73	73.0	75	69.0	4	240	62
						Total Lmax for phase:	**86.0**		**Total Leq 1hr for phase:**	**78.7**
Architectural Coating Residential	compressor (air)	1	40	78	78.0	75	74.0	6	360	69
						Total Lmax for phase:	**74.0**			**68.7**

Leq 8-hr noise level limit for construction phase at residential land use, per FTA Guidance = **80**
Hours over which Leq is to be averaged = 8

10 = temporary barrier (TB) of input height inserted between source and receptor

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantity of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq	Source Elevation (ft)	Receiver Elevation (ft)	Barrier Height (ft)	Source to Barr. ("A") Horiz. (ft)	Rcvr. to Barr. ("B") Horiz. (ft)	Source to Rcvr. ("C") Horiz. (ft)	"A" (ft)	"B" (ft)	"C" (ft)	Path Length Diff. "P" (ft)	Abarr (dB)	Heff (with barrier)	Heff (wout barrier)	G (with barrier)	G (without barrier)	ILbarr (dB)
Site Preparation	excavator	2	40	81	84.0	75	66.2	6	360	61	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	grader	3	40	85	89.8	75	72.0	6	360	67	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	scraper	3	40	84	88.8	75	71.0	6	360	66	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	dozer	1	40	82	82.0	75	64.2	6	360	59	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	backhoe	1	40	78	78.0	75	60.2	6	360	55	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	front end loader	1	40	79	79.0	75	61.2	6	360	56	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
					Total Lmax for phase:		**75.7**	**Total Leq 1hr for phase:**		**70.5**																
Paving	paver	4	50	77	83.0	75	65.2	6	360	61	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	All Other Equipment > 5 HP	4	50	85	91.0	75	73.2	6	360	69	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	roller	4	20	80	86.0	75	68.2	6	360	60	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	backhoe	1	40	78	78.0	75	60.2	6	360	55	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	front end loader	1	40	79	79.0	75	61.2	6	360	56	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
					Total Lmax for phase:		**75.2**	**Total Leq 1hr for phase:**		**70.4**																
Architectural Coating	compressor (air)	2	40	78	81.0	75	63.2	6	360	58	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
					Total Lmax for phase:		**63.2**	**Total Leq 1hr for phase:**		**58.0**																
Building Construction Residential	crane	2	16	81	84.0	75	66.2	6	360	57	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	man lift	3	20	75	79.8	75	62.0	4	240	52	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	generator	3	50	72	76.8	75	59.0	6	360	55	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	tractor	1	40	84	84.0	75	66.2	6	360	61	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	front end loader	1	40	79	79.0	75	61.2	6	360	56	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	welder / torch	3	40	73	77.8	75	60.0	4	240	53	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
					Total Lmax for phase:		**71.2**	**Total Leq 1hr for phase:**		**64.5**																
Building Construction Park	crane	1	16	81	81.0	75	63.2	6	360	54	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	man lift	3	20	75	79.8	75	62.0	6	360	54	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	Generator	1	50	72	72.0	75	54.2	6	360	50	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	tractor	3	40	84	88.8	75	71.0	4	240	64	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
	welder / torch	1	40	73	73.0	75	55.2	4	240	48	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
					Total Lmax for phase:		**72.3**	**Total Leq 1hr for phase:**		**65.0**																
Architectural Coating Residential	compressor (air)	1	40	78	78.0	75	60.2	6	360	55	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
					Total Lmax for phase:		**60.2**			**55.0**																
Architectural Coating park	compressor (air)	2	40	78	81.0	75	63.2	6	360	58	6	5	10	65	10	75	65.1	11.2	75.0	1.30	14.1	15.5	5.5	0.5	0.7	13.8
					Total Lmax for phase:		**63.2**			**58.0**																

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	1200	50.5	6	360	45
	grader	3	40	85	89.8	1200	56.3	6	360	51
	scraper	3	40	84	88.8	1200	55.3	6	360	50
	dozer	1	40	82	82.0	1200	48.5	6	360	43
	backhoe	1	40	78	78.0	1200	44.5	6	360	39
	front end loader	1	40	79	79.0	1200	45.5	6	360	40
					Total Lmax for phase:		**60.0**	**Total Leq 1hr for phase:**		**54.8**
Paving	paver	4	50	77	83.0	1200	49.5	6	360	45
	All Other Equipment > 5 HP	4	50	85	91.0	1200	57.5	6	360	53
	roller	4	20	80	86.0	1200	52.5	6	360	44
	backhoe	1	40	78	78.0	1200	44.5	6	360	39
	front end loader	1	40	79	79.0	1200	45.5	6	360	40
					Total Lmax for phase:		**59.5**	**Total Leq 1hr for phase:**		**54.6**
Architectural Coating	compressor (air)	2	40	78	81.0	1200	47.5	6	360	42
					Total Lmax for phase:		**47.5**	**Total Leq 1hr for phase:**		**42.3**
Building Construction Residential	crane	13	16	81	92.1	1200	58.6	6	360	49
	man lift	25	20	75	89.0	1200	55.5	4	240	45
	generator	25	50	72	86.0	1200	52.5	6	360	48
	tractor	7	40	84	92.5	1200	58.9	6	360	54
	front end loader	6	40	79	86.8	1200	53.3	6	360	48
	welder / torch	25	40	73	87.0	1200	53.5	4	240	46
					Total Lmax for phase:		**63.9**	**Total Leq 1hr for phase:**		**57.3**
Building Construction Park	crane	1	16	81	81.0	1200	47.5	6	360	38
	man lift	3	20	75	79.8	1200	46.3	6	360	38
	Generator	1	50	72	72.0	1200	38.5	6	360	34
	tractor	3	40	84	88.8	1200	55.3	4	240	48
	welder / torch	1	40	73	73.0	1200	39.5	4	240	33
					Total Lmax for phase:		**56.5**	**Total Leq 1hr for phase:**		**49.3**
Architectural Coating Residential	compressor (air)	13	40	78	89.1	1200	55.6	6	360	50
					Total Lmax for phase:		**55.6**			**50.4**

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	160	70.5	6	360	65
	grader	3	40	85	89.8	160	76.2	6	360	71
	scraper	3	40	84	88.8	160	75.2	6	360	70
	dozer	1	40	82	82.0	160	68.5	6	360	63
	backhoe	1	40	78	78.0	160	64.5	6	360	59
	front end loader	1	40	79	79.0	160	65.5	6	360	60
					Total Lmax for phase:		**80.0**	**Total Leq 1hr for phase:**		**74.8**
Paving	paver	4	50	77	83.0	160	69.5	6	360	65
	All Other Equipment > 5 HP	4	50	85	91.0	160	77.5	6	360	73
	roller	4	20	80	86.0	160	72.5	6	360	64
	backhoe	1	40	78	78.0	160	64.5	6	360	59
	front end loader	1	40	79	79.0	160	65.5	6	360	60
					Total Lmax for phase:		**79.5**	**Total Leq 1hr for phase:**		**74.6**
Architectural Coating	compressor (air)	2	40	78	81.0	160	67.5	6	360	62
					Total Lmax for phase:		**67.5**	**Total Leq 1hr for phase:**		**62.2**
Building Construction Residential	crane	2	16	81	84.0	160	70.5	6	360	61
	man lift	3	20	75	79.8	160	66.2	4	240	56
	generator	3	50	72	76.8	160	63.2	6	360	59
	tractor	1	40	84	84.0	160	70.5	6	360	65
	front end loader	1	40	79	79.0	160	65.5	6	360	60
	welder / torch	3	40	73	77.8	160	64.2	4	240	57
					Total Lmax for phase:		**75.4**	**Total Leq 1hr for phase:**		**68.7**
Building Construction School (elementary)	crane	1	16	81	81.0	160	67.5	6	360	58
	man lift	3	20	75	79.8	160	66.2	6	360	58
	Generator	1	50	72	72.0	160	58.5	6	360	54
	tractor	3	40	84	88.8	160	75.2	4	240	68
	welder / torch	2	40	73	76.0	160	62.5	4	240	55
					Total Lmax for phase:		**76.6**	**Total Leq 1hr for phase:**		**69.3**
Architectural Coating Residential	compressor (air)	2	40	78	81.0	160	67.5	6	360	62
					Total Lmax for phase:		**67.5**			**62.2**

Construction Activity	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Lmax @ 50 ft. for quantify of equipment	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	excavator	2	40	81	84.0	1400	48.9	6	360	44
	grader	3	40	85	89.8	1400	54.7	6	360	49
	scraper	3	40	84	88.8	1400	53.7	6	360	48
	dozer	1	40	82	82.0	1400	46.9	6	360	42
	backhoe	1	40	78	78.0	1400	42.9	6	360	38
	front end loader	1	40	79	79.0	1400	43.9	6	360	39
						Total Lmax for phase:	**58.5**		**Total Leq 1hr for phase:**	**53.2**
Paving	paver	4	50	77	83.0	1400	48.0	6	360	44
	All Other Equipment > 5 HP	4	50	85	91.0	1400	56.0	6	360	52
	roller	4	20	80	86.0	1400	51.0	6	360	43
	backhoe	1	40	78	78.0	1400	42.9	6	360	38
	front end loader	1	40	79	79.0	1400	43.9	6	360	39
						Total Lmax for phase:	**58.0**		**Total Leq 1hr for phase:**	**53.1**
Architectural Coating	compressor (air)	2	40	78	81.0	1400	45.9	6	360	41
						Total Lmax for phase:	**45.9**		**Total Leq 1hr for phase:**	**40.7**
Building Construction Residential	crane	13	16	81	92.1	1400	57.1	6	360	48
	man lift	25	20	75	89.0	1400	53.9	4	240	44
	generator	25	50	72	86.0	1400	50.9	6	360	47
	tractor	6	40	84	91.8	1400	56.7	6	360	51
	front end loader	7	40	79	87.5	1400	52.4	6	360	47
	welder / torch	25	40	73	87.0	1400	51.9	4	240	45
						Total Lmax for phase:	**62.2**		**Total Leq 1hr for phase:**	**55.5**
Building Construction School (elementary)	crane	1	16	81	81.0	1400	45.9	6	360	37
	man lift	3	20	75	79.8	1400	44.7	6	360	36
	Generator	1	50	72	72.0	1400	36.9	6	360	33
	tractor	3	40	84	88.8	1400	53.7	4	240	47
	welder / torch	2	40	73	76.0	1400	40.9	4	240	34
						Total Lmax for phase:	**55.1**		**Total Leq 1hr for phase:**	**47.8**
Architectural Coating Residential	compressor (air)	13	40	78	89.1	1400	54.1	6	360	49
						Total Lmax for phase:	**54.1**			**48.8**

Equipment Description	Impact Device?	Acoustical Use Factor (%)	Lesser of or available Lmax	Spec. 721 Lmax	Measured L_{max} @50ft (dBA, slow)
All Other Equipment > 5 HP	No	50	85	85	-- N/A --
Auger Drill Rig	No	20	84	85	84
Backhoe	No	40	78	80	78
Bar Bender	No	20	80	80	-- N/A --
Blasting	Yes	-- N/A --	94	94	-- N/A --
Boring Jack Power Unit	No	50	80	80	83
Chain Saw	No	20	84	85	84
Clam Shovel (dropping)	Yes	20	87	93	87
Compactor (ground)	No	20	80	80	83
Compressor (air)	No	40	78	80	78
Concrete Batch Plant	No	15	83	83	-- N/A --
Concrete Mixer Truck	No	40	79	85	79
Concrete Pump Truck	No	20	81	82	81
Concrete Saw	No	20	90	90	90
Crane	No	16	81	85	81
Dozer	No	40	82	85	82
Drill Rig Truck	No	20	79	84	79
Drum Mixer	No	50	80	80	80
Dump Truck	No	40	76	84	76
Excavator	No	40	81	85	81
Flat Bed Truck	No	40	74	84	74
Front End Loader	No	40	79	80	79
Generator	No	50	72	72	81
Generator (<25KVA, VMS signs)	No	50	70	70	73
Gradall	No	40	83	85	83
Grader	No	40	85	85	-- N/A --
Grapple (on backhoe)	No	40	85	85	87
Horizontal Boring Hydr. Jack	No	25	80	80	82
Hydra Break Ram	Yes	10	90	90	-- N/A --
Impact Pile Driver	Yes	20	95	95	101
Jackhammer	Yes	20	85	85	89
Man Lift	No	20	75	85	75
Mounted Impact Hammer (hoe ram)	Yes	20	90	90	90
Pavement Scarafier	No	20	85	85	90
Paver	No	50	77	85	77
Pickup Truck	No	40	55	55	75
Pneumatic Tools	No	50	85	85	85
Pumps	No	50	77	77	81
Refrigerator Unit	No	100	73	82	73
Rivit Buster/chipping gun	Yes	20	79	85	79
Rock Drill	No	20	81	85	81
Roller	No	20	80	85	80
Sand Blasting (Single Nozzle)	No	20	85	85	96
Scraper	No	40	84	85	84
Shears (on backhoe)	No	40	85	85	96
Slurry Plant	No	100	78	78	78
Slurry Trenching Machine	No	50	80	82	80
Soil Mix Drill Rig	No	50	80	80	-- N/A --
Tractor	No	40	84	84	-- N/A --
Vacuum Excavator (Vac-truck)	No	40	85	85	85
Vacuum Street Sweeper	No	10	80	80	82
Ventilation Fan	No	100	79	85	79
Vibrating Hopper	No	50	85	85	87
Vibratory Concrete Mixer	No	20	80	80	80
Vibratory Pile Driver	No	20	95	95	101
Warning Horn	No	5	83	85	83
Welder / Torch	No	40	73	73	74

Appendix D

Traffic Noise Modeling Data

Appendix D

Traffic Noise Modeling Calculations - Summary

Project: 15010.02Aquabella Specific Plan

Number	Name	From	To	2045 Partial WLC buildout Without Project	2045 Partial WLC buildout With Project	Δ 2045 Partial WLC buildout Without Project – 2045 Partial WLC buildout With Project	2045 Full WLC buildout Without Project	2045 Full WLC buildout With Project	Δ 2045 Full WLC buildout Without Project – 2045 Full WLC buildout With Project
	Segment Description and Location								
Summary of Net Changes									
1	Alesandro BL	Kitching ST.	Lasselle ST.	73.4	73.9	0.5	73.6	74.0	0.5
2	Alesandro BL	Lasselle ST.	Morison ST.	72.6	73.1	0.6	72.8	73.3	0.6
3	Alesandro BL	Morison ST.	Mason ST.	72.0	72.6	0.6	72.2	72.8	0.6
4	Alesandro BL	Mason ST.	Moreno Beach DR.	71.0	71.8	0.7	71.3	72.1	0.8
5	Kitching ST	Alessandro BL	Brodaea AV	70.7	70.8	0.1	70.7	70.8	0.1
6	Kitching ST	Brodaea AV	John F. Kennedy RD	70.3	72.4	2.2	70.3	70.4	0.2
7	Kitching ST	John F. Kennedy RD	Gentian AVE	70.6	72.5	2.0	70.7	70.7	0.0
8	Kitching ST	Gentian AVE	Moreno Beach DR.	70.1	71.7	1.6	70.5	70.2	-0.3
9	Iris AV	Kitching ST.	Lasselle ST.	72.7	73.4	0.7	72.7	73.4	0.7
10	Iris AV	Lasselle ST.	Intersection 40	73.6	74.5	0.9	73.7	74.5	0.9
11	Iris AV	Intersection 40	Mason ST.	73.2	74.3	1.1	73.3	74.3	1.0
12	Iris AV	Mason ST.	Kaiser Hospital	72.2	72.6	0.4	72.4	72.9	0.5
13	Iris AV	Kaiser Hospital	Oliver ST	71.4	71.7	0.3	71.6	72.0	0.4
14	Moreno Beach DR	Oliver ST	John F. Kennedy RD	71.0	71.2	0.3	71.4	71.6	0.2
15	Moreno Beach DR	Cactus AV	John F. Kennedy RD	70.1	70.4	0.3	70.3	70.7	0.4
16	Moreno Beach DR	Brodaea AV	Cactus AV	70.1	70.4	0.2	70.2	70.5	0.3
17	Moreno Beach DR	Alessandro BL	Brodaea AV	70.7	70.9	0.2	70.8	71.1	0.3
18	Lasselle ST	Alessandro BL	Brodaea AV	70.4	71.0	0.6	70.4	71.0	0.6
19	Lasselle ST	Brodaea AV	Cactus AV	70.2	70.7	0.6	70.2	70.7	0.6
20	Lasselle ST	Cactus AV	Delphinium AV	72.1	72.4	0.3	72.2	72.5	0.3
21	Lasselle ST	Delphinium AV	John F. Kennedy RD	71.5	71.9	0.4	71.6	71.9	0.3
22	Lasselle ST	John F. Kennedy RD	Gentian AV	71.9	72.5	0.6	72.0	72.5	0.6
23	Lasselle ST	Gentian AV	Iris AV	71.4	71.7	0.4	71.4	71.8	0.4
24	Mason ST	Alessandro BL	E Hospital	72.1	73.5	1.4	72.1	73.5	1.4
25	Mason ST	E Hospital	Cactus AV	71.4	73.1	1.7	71.5	73.2	1.7

Appendix D
Traffic Noise Modeling Calculations - Summary

Project: **15010.02Aquabella Specific Plan**

Number	Name	Segment Description and Location From	To	2045 Partial WLC buildout Without Project	2045 Partial WLC buildout With Proejct	Δ 2045 Partial WLC buildout Without Project - 2045 Partial WLC buildout With Project	2045 Full WLC buildout Without Project	2045 Full WLC buildout With Project	Δ 2045 Full buildout Without Project - 2045 Full WLC buildout With Project
Summary of Net Changes									
26	Mason ST	Cactus AV	Delphinium AV	70.1	72.5	2.4	70.1	72.5	2.4
27	Mason ST	Delphinium AV	Iris AV	69.7	72.1	2.4	69.7	72.1	2.4
28	Oliver ST	Alessandro BL	Cactus AV	61.7	63.7	1.9	61.7	63.7	1.9
29	Oliver ST	Cactus AV	John F. Kennedy RD	63.8	66.7	2.9	63.8	66.8	3.0
30	Oliver ST	John F. Kennedy RD	Moreno Beach DR.	62.5	65.5	3.0	62.5	65.5	3.0
31	Cactus AV	Kitching ST.	Lasselle ST.	71.8	73.4	1.6	72.0	73.5	1.5
32	Cactus AV	Lasselle ST.	Mason ST.	73.1	74.5	1.4	73.3	74.6	1.3
33	Cactus AV	Mason ST.	Moreno Beach DR.	70.5	72.5	2.0	71.7	72.9	1.2
34	Brodaea AV	Kitching ST.	Lasselle ST.	62.7	62.8	0.1	62.7	62.8	0.1
35	Brodaea AV	Oliver ST	Moreno Beach DR.	56.8	58.5	1.8	56.8	58.5	1.8
36	Delphinium AV	Kitching ST.	Laselle ST.	61.4	63.3	1.9	61.4	63.3	1.9
37	Delphinium AV	Intersection 20	Delphinium AV	59.8	59.8	0.0	59.8	64.7	4.9
38	John F Kennedy DR	Kitching ST.	Lasselle ST.	69.7	71.1	1.3	69.8	71.0	1.2
39	John F Kennedy DR	Intersection 12	PA-2	67.1	70.8	3.8	67.1	70.7	3.7
40	John F Kennedy DR	Oliver ST	Moreno Beach DR.	63.7	66.3	2.6	63.7	66.3	2.6
41	Gentian AV	Kitching ST.	Lasselle ST.	66.1	66.3	0.2	66.1	66.3	0.2
42	Gentian AV	Intersection 13	Gentian AV	61.2	62.5	1.3	61.2	62.5	1.3

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Appendix D

Traffic Noise Model Calculations

Project: **15010.02Aquabella Specific Plan**

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor: 10

	Segment Description and Location			Input										Output				
					Speed	Distance to Directional Centerline, (feet)$_4$		Traffic Distribution Characteristics						CNEL,	Distance to Contour, (feet)$_3$			
Number	Name	From	To	ADT	(mph)	Near	Far	% Auto	% Med	% Hvy	% Day	% Eve	% Night	(dBA)$_{5,6,7}$	70 dBA	65 dBA	60 dBA	55 dBA
2045 Partial WLC Buildout Without Project Conditions																		
1	Alesandro BL	Kitching ST.	Lasselle ST.	26,500	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.4	110	347	1097	3470
2	Alesandro BL	Lasselle ST.	Morison ST.	21,700	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.6	90	284	899	2842
3	Alesandro BL	Morison ST.	Mason ST.	19,200	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.0	80	251	795	2514
4	Alesandro BL	Mason ST.	Moreno Beach DR.	15,200	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	63	199	629	1990
5	Kitching ST	Alessandro BL	Brodaea AV	19,700	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.7	58	184	583	1843
6	Kitching ST	Brodaea AV	John F. Kennedy RD	17,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.3	53	167	527	1665
7	Kitching ST	John F. Kennedy RD	Gentian AVE	19,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.6	57	180	568	1796
8	Kitching ST	Gentian AVE	Moreno Beach DR.	17,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.1	51	162	512	1618
9	Iris AV	Kitching ST.	Lasselle ST.	31,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.7	92	290	917	2900
10	Iris AV	Lasselle ST.	Intersection 40	38,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.6	115	363	1148	3630
11	Iris AV	Intersection 40	Mason ST.	34,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.2	103	327	1032	3265
12	Iris AV	Mason ST.	Kaiser Hospital	28,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.2	83	262	828	2620
13	Iris AV	Kaiser Hospital	Oliver ST	23,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.4	68	215	680	2152
14	Moreno Beach DR	Oliver ST	John F. Kennedy RD	21,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	62	196	621	1965
15	Moreno Beach DR	Cactus AV	John F. Kennedy RD	17,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.1	51	161	509	1609
16	Moreno Beach DR	Brodaea AV	Cactus AV	17,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.1	51	162	512	1618
17	Moreno Beach DR	Alessandro BL	Brodaea AV	19,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.7	59	185	586	1852
18	Lasselle ST	Alessandro BL	Brodaea AV	18,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.4	55	173	547	1731
19	Lasselle ST	Brodaea AV	Cactus AV	17,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.2	52	164	518	1637
20	Lasselle ST	Cactus AV	Delphinium AV	27,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.1	81	255	808	2554
21	Lasselle ST	Delphinium AV	John F. Kennedy RD	23,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.5	70	223	704	2227
22	Lasselle ST	John F. Kennedy RD	Gentian AV	26,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.9	78	245	775	2451
23	Lasselle ST	Gentian AV	Iris AV	23,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.4	68	215	680	2152
24	Mason ST	Alessandro BL	E Hospital	27,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.1	80	254	805	2545
25	Mason ST	E Hospital	Cactus AV	23,400	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.4	69	219	692	2189
26	Mason ST	Cactus AV	Delphinium AV	17,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.1	51	160	506	1600
27	Mason ST	Delphinium AV	Iris AV	15,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.7	47	148	467	1478
28	Oliver ST	Alessandro BL	Cactus AV	2,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	61.7	7	23	74	234
29	Oliver ST	Cactus AV	John F. Kennedy RD	4,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	63.8	12	37	118	374
30	Oliver ST	John F. Kennedy RD	Moreno Beach DR.	3,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.5	9	28	89	281
31	Cactus AV	Kitching ST.	Lasselle ST.	18,200	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.8	75	238	754	2383
32	Cactus AV	Lasselle ST.	Mason ST.	24,400	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.1	101	320	1010	3195
33	Cactus AV	Mason ST.	Moreno Beach DR.	13,600	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.5	56	178	563	1781
34	Brodaea AV	Kitching ST.	Lasselle ST.	3,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.7	9	29	92	290
35	Brodaea AV	Oliver ST	Moreno Beach DR.	800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	56.8	2	7	24	75
36	Delphinium AV	Kitching ST.	Laselle ST.	2,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	61.4	7	22	68	215
37	Delphinium AV	Intersection 20	Delphinium AV	1,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	59.8	5	15	47	150
38	John F Kennedy DR	Kitching ST.	Lasselle ST.	11,300	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.7	47	148	468	1480
39	John F Kennedy DR	Intersection 12	PA-2	6,100	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	67.1	25	80	253	799
40	John F Kennedy DR	Oliver ST	Moreno Beach DR.	2,800	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	63.7	12	37	116	367
41	Gentian AV	Kitching ST.	Lasselle ST.	6,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	66.1	20	64	201	636
42	Gentian AV	Intersection 13	Gentian AV	2,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	61.2	7	21	65	206

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Appendix D

Traffic Noise Model Calculations

Project: 15010.02Aquabella Specific Plan

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor: 10

Segment Description and Location				Input										Output				
						Distance to Directional Centerline, (feet)$_4$		Traffic Distribution Characteristics						CNEL,	Distance to Contour, (feet)$_3$			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Med	% Hvy	% Day	% Eve	% Night	(dBA)$_{5,6,7}$	70 dBA	65 dBA	60 dBA	55 dBA
2045 Partial WLC Buildout With Project Conditions																		
1	Alesandro BL	Kitching ST.	Lasselle ST.	29,500	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.9	122	386	1222	3863
2	Alesandro BL	Lasselle ST.	Morison ST.	24,700	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.1	102	323	1023	3234
3	Alesandro BL	Morison ST.	Mason ST.	21,900	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.6	91	287	907	2868
4	Alesandro BL	Mason ST.	Moreno Beach DR.	18,000	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.8	75	236	745	2357
5	Kitching ST	Alessandro BL	Brodaea AV	20,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.8	59	188	595	1880
6	Kitching ST	Brodaea AV	John F. Kennedy RD	29,400	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.4	87	275	870	2751
7	Kitching ST	John F. Kennedy RD	Gentian AVE	30,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.5	89	282	890	2816
8	Kitching ST	Gentian AVE	Moreno Beach DR.	25,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.7	74	235	743	2348
9	Iris AV	Kitching ST.	Lasselle ST.	36,700	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.4	109	343	1086	3433
10	Iris AV	Lasselle ST.	Intersection 40	47,400	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	74.5	140	443	1402	4434
11	Iris AV	Intersection 40	Mason ST.	44,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	74.3	133	419	1325	4191
12	Iris AV	Mason ST.	Kaiser Hospital	30,700	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.6	91	287	908	2872
13	Iris AV	Kaiser Hospital	Oliver ST	24,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.7	74	233	737	2330
14	Moreno Beach DR	Oliver ST	John F. Kennedy RD	22,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.2	66	209	660	2086
15	Moreno Beach DR	Cactus AV	John F. Kennedy RD	18,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.4	55	173	547	1731
16	Moreno Beach DR	Brodaea AV	Cactus AV	18,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.4	54	171	541	1712
17	Moreno Beach DR	Alessandro BL	Brodaea AV	20,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.9	62	195	615	1946
18	Lasselle ST	Alessandro BL	Brodaea AV	21,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	62	197	624	1974
19	Lasselle ST	Brodaea AV	Cactus AV	19,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.7	59	186	589	1862
20	Lasselle ST	Cactus AV	Delphinium AV	29,400	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.4	87	275	870	2751
21	Lasselle ST	Delphinium AV	John F. Kennedy RD	25,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.9	77	242	766	2423
22	Lasselle ST	John F. Kennedy RD	Gentian AV	30,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.5	89	282	890	2816
23	Lasselle ST	Gentian AV	Iris AV	25,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.7	74	235	743	2348
24	Mason ST	Alessandro BL	E Hospital	37,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.5	111	352	1112	3518
25	Mason ST	E Hospital	Cactus AV	34,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.1	102	323	1021	3228
26	Mason ST	Cactus AV	Delphinium AV	29,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.5	87	276	873	2760
27	Mason ST	Delphinium AV	Iris AV	27,400	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.1	81	256	811	2563
28	Oliver ST	Alessandro BL	Cactus AV	3,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	63.7	12	36	115	365
29	Oliver ST	Cactus AV	John F. Kennedy RD	7,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	66.7	23	73	231	730
30	Oliver ST	John F. Kennedy RD	Moreno Beach DR.	6,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	65.5	18	56	178	561
31	Cactus AV	Kitching ST.	Lasselle ST.	26,400	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.4	109	346	1093	3457
32	Cactus AV	Lasselle ST.	Mason ST.	33,400	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	74.5	138	437	1383	4374
33	Cactus AV	Mason ST.	Moreno Beach DR.	21,400	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.5	89	280	886	2802
34	Brodaea AV	Kitching ST.	Lasselle ST.	3,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.8	9	30	95	299
35	Brodaea AV	Oliver ST	Moreno Beach DR.	1,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	58.5	4	11	36	112
36	Delphinium AV	Kitching ST.	Laselle ST.	3,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	63.3	11	34	107	337
37	Delphinium AV	Intersection 20	Delphinium AV	1,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	59.8	5	15	47	150
38	John F Kennedy DR	Kitching ST.	Lasselle ST.	15,300	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.1	63	200	634	2003
39	John F Kennedy DR	Intersection 12	PA-2	14,500	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.8	60	190	600	1899
40	John F Kennedy DR	Oliver ST	Moreno Beach DR.	5,100	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	66.3	21	67	211	668
41	Gentian AV	Kitching ST.	Lasselle ST.	7,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	66.3	21	67	213	674
42	Gentian AV	Intersection 13	Gentian AV	3,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.5	9	28	89	281

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Appendix D

Traffic Noise Model Calculations

Project: 15010.02Aquabella Specific Plan

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor: 10

Segment Description and Location				Input										Output				
						Distance to Directional Centerline, (feet)$_4$		Traffic Distribution Characteristics							Distance to Contour, (feet)$_3$			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Med	% Hvy	% Day	% Eve	% Night	CNEL, (dBA)$_{5,6,7}$	70 dBA	65 dBA	60 dBA	55 dBA
2045 Full WLC Buildout Without Project Conditions																		
1	Alesandro BL	Kitching ST.	Lasselle ST.	27,400	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.6	113	359	1135	3588
2	Alesandro BL	Lasselle ST.	Morison ST.	22,600	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.8	94	296	936	2959
3	Alesandro BL	Morison ST.	Mason ST.	20,100	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.2	83	263	832	2632
4	Alesandro BL	Mason ST.	Moreno Beach DR.	16,100	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.3	67	211	667	2108
5	Kitching ST	Alessandro BL	Brodaea AV	19,700	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.7	58	184	583	1843
6	Kitching ST	Brodaea AV	John F. Kennedy RD	17,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.3	53	167	527	1665
7	Kitching ST	John F. Kennedy RD	Gentian AVE	19,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.7	58	184	583	1843
8	Kitching ST	Gentian AVE	Moreno Beach DR.	17,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.5	56	178	562	1778
9	Iris AV	Kitching ST.	Lasselle ST.	31,400	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.7	93	294	929	2938
10	Iris AV	Lasselle ST.	Intersection 40	39,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.7	115	365	1154	3649
11	Iris AV	Intersection 40	Mason ST.	36,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.3	107	338	1068	3377
12	Iris AV	Mason ST.	Kaiser Hospital	29,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.4	87	274	867	2741
13	Iris AV	Kaiser Hospital	Oliver ST	24,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.6	72	229	725	2292
14	Moreno Beach DR	Oliver ST	John F. Kennedy RD	23,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.4	68	215	680	2152
15	Moreno Beach DR	Cactus AV	John F. Kennedy RD	17,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.3	53	167	527	1665
16	Moreno Beach DR	Brodaea AV	Cactus AV	17,700	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.2	52	166	524	1656
17	Moreno Beach DR	Alessandro BL	Brodaea AV	20,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.8	60	190	601	1899
18	Lasselle ST	Alessandro BL	Brodaea AV	18,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.4	55	173	547	1731
19	Lasselle ST	Brodaea AV	Cactus AV	17,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.2	52	164	518	1637
20	Lasselle ST	Cactus AV	Delphinium AV	27,700	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.2	82	259	819	2591
21	Lasselle ST	Delphinium AV	John F. Kennedy RD	24,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.6	71	225	710	2245
22	Lasselle ST	John F. Kennedy RD	Gentian AV	26,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.0	78	246	778	2460
23	Lasselle ST	Gentian AV	Iris AV	23,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.4	68	216	683	2161
24	Mason ST	Alessandro BL	E Hospital	27,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.1	80	254	805	2545
25	Mason ST	E Hospital	Cactus AV	23,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.5	70	220	695	2199
26	Mason ST	Cactus AV	Delphinium AV	17,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.1	51	161	509	1609
27	Mason ST	Delphinium AV	Iris AV	15,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.7	47	148	467	1478
28	Oliver ST	Alessandro BL	Cactus AV	2,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	61.7	7	23	74	234
29	Oliver ST	Cactus AV	John F. Kennedy RD	4,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	63.8	12	37	118	374
30	Oliver ST	John F. Kennedy RD	Moreno Beach DR.	3,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.5	9	28	89	281
31	Cactus AV	Kitching ST.	Lasselle ST.	19,100	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.0	79	250	791	2501
32	Cactus AV	Lasselle ST.	Mason ST.	25,700	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.3	106	337	1064	3365
33	Cactus AV	Mason ST.	Moreno Beach DR.	17,900	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.7	74	234	741	2344
34	Brodaea AV	Kitching ST.	Lasselle ST.	3,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.7	9	29	92	290
35	Brodaea AV	Oliver ST	Moreno Beach DR.	800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	56.8	2	7	24	75
36	Delphinium AV	Kitching ST.	Laselle ST.	2,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	61.4	7	22	68	215
37	Delphinium AV	Intersection 20	Delphinium AV	1,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	59.8	5	15	47	150
38	John F Kennedy DR	Kitching ST.	Lasselle ST.	11,400	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.8	47	149	472	1493
39	John F Kennedy DR	Intersection 12	PA-2	6,100	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	67.1	25	80	253	799
40	John F Kennedy DR	Oliver ST	Moreno Beach DR.	2,800	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	63.7	12	37	116	367
41	Gentian AV	Kitching ST.	Lasselle ST.	6,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	66.1	20	64	201	636
42	Gentian AV	Intersection 13	Gentian AV	2,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	61.2	7	21	65	206

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Appendix D

Traffic Noise Model Calculations

Project: 15010.02Aquabella Specific Plan

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor: 10

Segment Description and Location				Input										Output				
						Distance to Directional Centerline, (feet)$_4$		Traffic Distribution Characteristics							Distance to Contour, (feet)$_3$			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Med	% Hvy	% Day	% Eve	% Night	CNEL, (dBA)$_{5,6,7}$	70 dBA	65 dBA	60 dBA	55 dBA
2045 Full WLC Buildout With Project Conditions																		
1	Alesandro BL	Kitching ST.	Lasselle ST.	30,400	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	74.0	126	398	1259	3981
2	Alesandro BL	Lasselle ST.	Morison ST.	25,700	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.3	106	337	1064	3365
3	Alesandro BL	Morison ST.	Mason ST.	22,900	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.8	95	300	948	2999
4	Alesandro BL	Mason ST.	Moreno Beach DR.	19,500	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.1	81	255	807	2553
5	Kitching ST	Alessandro BL	Brodaea AV	20,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.8	59	188	595	1880
6	Kitching ST	Brodaea AV	John F. Kennedy RD	18,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.4	55	173	547	1731
7	Kitching ST	John F. Kennedy RD	Gentian AVE	19,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.7	58	182	577	1824
8	Kitching ST	Gentian AVE	Moreno Beach DR.	17,700	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.2	52	166	524	1656
9	Iris AV	Kitching ST.	Lasselle ST.	36,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.4	108	341	1080	3415
10	Iris AV	Lasselle ST.	Intersection 40	47,700	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	74.5	141	446	1411	4463
11	Iris AV	Intersection 40	Mason ST.	45,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	74.3	135	426	1346	4257
12	Iris AV	Mason ST.	Kaiser Hospital	32,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.9	96	305	964	3050
13	Iris AV	Kaiser Hospital	Oliver ST	26,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.0	79	251	793	2507
14	Moreno Beach DR	Oliver ST	John F. Kennedy RD	24,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.6	72	226	716	2264
15	Moreno Beach DR	Cactus AV	John F. Kennedy RD	19,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.7	58	183	580	1834
16	Moreno Beach DR	Brodaea AV	Cactus AV	19,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.5	56	178	562	1778
17	Moreno Beach DR	Alessandro BL	Brodaea AV	21,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.1	64	202	639	2021
18	Lasselle ST	Alessandro BL	Brodaea AV	21,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	62	197	624	1974
19	Lasselle ST	Brodaea AV	Cactus AV	19,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.7	59	186	589	1862
20	Lasselle ST	Cactus AV	Delphinium AV	29,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.5	88	277	876	2769
21	Lasselle ST	Delphinium AV	John F. Kennedy RD	26,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.9	77	243	769	2432
22	Lasselle ST	John F. Kennedy RD	Gentian AV	30,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.5	89	282	890	2816
23	Lasselle ST	Gentian AV	Iris AV	25,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.8	75	236	746	2358
24	Mason ST	Alessandro BL	E Hospital	37,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.5	111	352	1112	3518
25	Mason ST	E Hospital	Cactus AV	34,700	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.2	103	325	1027	3246
26	Mason ST	Cactus AV	Delphinium AV	29,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.5	88	277	876	2769
27	Mason ST	Delphinium AV	Iris AV	27,400	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.1	81	256	811	2563
28	Oliver ST	Alessandro BL	Cactus AV	3,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	63.7	12	36	115	365
29	Oliver ST	Cactus AV	John F. Kennedy RD	8,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	66.8	24	75	237	748
30	Oliver ST	John F. Kennedy RD	Moreno Beach DR.	6,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	65.5	18	56	178	561
31	Cactus AV	Kitching ST.	Lasselle ST.	26,700	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	73.5	111	350	1106	3496
32	Cactus AV	Lasselle ST.	Mason ST.	34,300	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	74.6	142	449	1420	4491
33	Cactus AV	Mason ST.	Moreno Beach DR.	23,400	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.9	97	306	969	3064
34	Brodaea AV	Kitching ST.	Lasselle ST.	3,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.8	9	30	95	299
35	Brodaea AV	Oliver ST	Moreno Beach DR.	1,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	58.5	4	11	36	112
36	Delphinium AV	Kitching ST.	Laselle ST.	3,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	63.3	11	34	107	337
37	Delphinium AV	Intersection 20	Delphinium AV	5,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	64.7	15	47	148	468
38	John F Kennedy DR	Kitching ST.	Lasselle ST.	15,100	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	63	198	625	1977
39	John F Kennedy DR	Intersection 12	PA-2	14,200	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.7	59	186	588	1859
40	John F Kennedy DR	Oliver ST	Moreno Beach DR.	5,100	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	66.3	21	67	211	668
41	Gentian AV	Kitching ST.	Lasselle ST.	7,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	66.3	21	67	213	674
42	Gentian AV	Intersection 13	Gentian AV	3,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.5	9	28	89	281

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Appendix D

Traffic Noise Model Calculations

Project: **15010.02Aquabella Specific Plan**

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor: 10

Number	Segment Description and Location: Name	From	To	Input: ADT	Speed (mph)	Distance to Directional Centerline, (feet)$_4$: Near	Far	Traffic Distribution Characteristics: % Auto	% Med	% Hvy	% Day	% Eve	% Night	Output: CNEL, (dBA)$_{5,6,7}$	Distance to Contour, (feet)$_3$: 70 dBA	65 dBA	60 dBA	55 dBA
Existing Conditions																		
1	Alesandro BL	Kitching ST.	Lasselle ST.	14,500	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.8	60	190	600	1899
2	Alesandro BL	Lasselle ST.	Morison ST.	11,400	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.8	47	149	472	1493
3	Alesandro BL	Morison ST.	Mason ST.	10,800	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.5	45	141	447	1414
4	Alesandro BL	Mason ST.	Moreno Beach DR.	9,300	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	68.9	39	122	385	1218
5	Kitching ST	Alessandro BL	Brodaea AV	11,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	68.2	33	105	331	1048
6	Kitching ST	Brodaea AV	John F. Kennedy RD	8,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	67.2	26	83	263	833
7	Kitching ST	John F. Kennedy RD	Gentian AVE	10,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	67.8	30	94	299	945
8	Kitching ST	Gentian AVE	Moreno Beach DR.	7,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	66.6	22	71	225	711
9	Iris AV	Kitching ST.	Lasselle ST.	22,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.4	68	214	677	2142
10	Iris AV	Lasselle ST.	Intersection 40	29,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	72.4	86	271	858	2713
11	Iris AV	Intersection 40	Mason ST.	25,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.7	74	234	740	2339
12	Iris AV	Mason ST.	Kaiser Hospital	20,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	62	196	618	1955
13	Iris AV	Kaiser Hospital	Oliver ST	17,400	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.2	51	163	515	1628
14	Moreno Beach DR	Oliver ST	John F. Kennedy RD	15,100	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.5	45	141	447	1413
15	Moreno Beach DR	Cactus AV	John F. Kennedy RD	16,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.8	47	150	473	1497
16	Moreno Beach DR	Brodaea AV	Cactus AV	16,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.0	50	157	497	1572
17	Moreno Beach DR	Alessandro BL	Brodaea AV	17,400	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.2	51	163	515	1628
18	Lasselle ST	Alessandro BL	Brodaea AV	16,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.0	50	158	500	1581
19	Lasselle ST	Brodaea AV	Cactus AV	16,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.8	48	152	479	1516
20	Lasselle ST	Cactus AV	Delphinium AV	21,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	63	199	630	1993
21	Lasselle ST	Delphinium AV	John F. Kennedy RD	21,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	62	196	621	1965
22	Lasselle ST	John F. Kennedy RD	Gentian AV	20,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.9	61	193	609	1927
23	Lasselle ST	Gentian AV	Iris AV	21,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	63	198	627	1983
24	Mason ST	Alessandro BL	E Hospital	21,300	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	63	199	630	1993
25	Mason ST	E Hospital	Cactus AV	18,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.4	55	173	547	1731
26	Mason ST	Cactus AV	Delphinium AV	13,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.2	41	130	411	1300
27	Mason ST	Delphinium AV	Iris AV	12,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	68.7	37	117	370	1169
28	Oliver ST	Alessandro BL	Cactus AV	1,600	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	59.8	5	15	47	150
29	Oliver ST	Cactus AV	John F. Kennedy RD	4,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	64.3	13	42	133	421
30	Oliver ST	John F. Kennedy RD	Moreno Beach DR.	2,900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.4	9	27	86	271
31	Cactus AV	Kitching ST.	Lasselle ST.	13,500	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.5	56	177	559	1768
32	Cactus AV	Lasselle ST.	Mason ST.	15,800	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.2	65	207	654	2069
33	Cactus AV	Mason ST.	Moreno Beach DR.	11,400	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.8	47	149	472	1493
34	Brodaea AV	Kitching ST.	Lasselle ST.	2,800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.2	8	26	83	262
35	Brodaea AV	Oliver ST	Moreno Beach DR.	900	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	57.3	3	8	27	84
36	Delphinium AV	Kitching ST.	Laselle ST.	1,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	58.5	4	11	36	112
37	Delphinium AV	Intersection 20	Delphinium AV	800	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	56.8	2	7	24	75
38	John F Kennedy DR	Kitching ST.	Lasselle ST.	6,600	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	67.4	27	86	273	864
39	John F Kennedy DR	Intersection 12	PA-2	3,100	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	64.1	13	41	128	406
40	John F Kennedy DR	Oliver ST	Moreno Beach DR.	2,000	45	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	62.2	8	26	83	262
41	Gentian AV	Kitching ST.	Lasselle ST.	2,400	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	61.6	7	22	71	225
42	Gentian AV	Intersection 13	Gentian AV	2,000	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	60.8	6	19	59	187

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Appendix D

Traffic Noise Model Calculations

Project: 15010.02Aquabella Specific Plan

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor: 10

Segment Description and Location				Input											Output				
						Distance to Directional Centerline, (feet)4		Traffic Distribution Characteristics								Distance to Contour, (feet)3			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Med	% Hvy	% Day	% Eve	% Night	CNEL, (dBA)5,6,7	70 dBA	65 dBA	60 dBA	55 dBA
2045 Partial WLC Buildout With Project Conditions Mitigated Segments																			
6	Kitching ST	Brodaea AV	John F. Kennedy RD	29,400	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.9	60	191	605	1912
7	Kitching ST	John F. Kennedy RD	Gentian AVE	30,100	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.0	62	196	619	1958
8	Kitching ST	Gentian AVE	Moreno Beach DR.	25,100	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.2	52	163	516	1633
25	Mason ST	E Hospital	Cactus AV	34,500	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.6	71	224	710	2244
26	Mason ST	Cactus AV	Delphinium AV	29,500	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.9	61	192	607	1919
27	Mason ST	Delphinium AV	Iris AV	27,400	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.6	56	178	564	1782
39	John F Kennedy DR	Intersection 12	PA-2	14,500	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.4	43	136	429	1357

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Appendix D

Traffic Noise Model Calculations

Project: 15010.02Aquabella Specific Plan

Noise Level Descriptor: CNEL
Site Conditions: Hard
Traffic Input: ADT
Traffic K-Factor: 10

Segment Description and Location				Input										Output				
						Distance to Directional Centerline, (feet)[4]		Traffic Distribution Characteristics						CNEL,	Distance to Contour, (feet)[3]			
Number	Name	From	To	ADT	Speed (mph)	Near	Far	% Auto	% Med	% Hvy	% Day	% Eve	% Night	(dBA)[5,6,7]	70 dBA	65 dBA	60 dBA	55 dBA
2045 WLC Buildout With Project Conditions Mitigated Segments																		
6	Kitching ST	Brodaea AV	John F. Kennedy RD	18,500	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	68.8	38	120	380	1203
7	Kitching ST	John F. Kennedy RD	Gentian AVE	19,500	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.1	40	127	401	1268
8	Kitching ST	Gentian AVE	Moreno Beach DR.	17,700	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	68.7	36	115	364	1151
25	Mason ST	E Hospital	Cactus AV	34,700	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	71.6	71	226	714	2257
26	Mason ST	Cactus AV	Delphinium AV	29,600	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.9	61	193	609	1925
27	Mason ST	Delphinium AV	Iris AV	27,400	35	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	70.6	56	178	564	1782
39	John F Kennedy DR	Intersection 12	PA-2	14,200	40	44	56	97.0%	2.0%	1.0%	80.0%	5.0%	15.0%	69.3	42	133	420	1328

*All modeling assumes average pavement, level roadways (less than 1.5% grade), constant traffic flow and does not account for shielding of any type or finite roadway adjustments. All levels are reported as A-weighted noise levels.

Appendix D

Traffic Noise Modeling Calculations - References

Citation	Reference
1	Caltrans Technical Noise Supplement. 2009 (November). Table (5-11), Pg 5-60.
2	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-26), Pg 5-60.
3	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-16), Pg 2-32.
4	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-11), Pg 5-47, 48.
5	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-26), Pg 2-55, 56.
6	Caltrans Technical Noise Supplement. 2009 (November). Equation (2-27), Pg 2-57.
7	Caltrans Technical Noise Supplement. 2009 (November). Pg 2-53.
8	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-7), Pg 5-45.
9	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-8), Pg 5-45.
10	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-9), Pg 5-45.
11	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-13), Pg 5-49.
12	Caltrans Technical Noise Supplement. 2009 (November). Equation (5-14), Pg 5-49.
13	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (16), Pg 67
14	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (20), Pg 69
15	Federal Highway Administration Traffic Noise Model Technical Manual. Report No. FHWA-PD-96-010. 1998 (January). Equation (18), Pg 69

Appendix E

Operations Noise Modeling Data

AHUs (plenum-type return fan only, no condenser units [see separate worksheet]):

Building Minimum Ventilation

			63	125	250	500	1000	2000	4000	8000
	A-weighting adjustments		26	13	9	3	0	-1	-1	1
average of values for the two fan diameter ranges, per Guyer (Table 12)		plug	40	40	38	34	29	23	19	16
average of values for the two fan diameter ranges, per Guyer (Table 12)		tube	47	44	46	47	44	45	38	35
per Guyer (Table 12, presumed based on Bies & Hansen ENC)		prop	46	48	55	53	52	48	43	38

average gross square feet (GSF) per dwelling unit: 1000

percent GSF actually occupied (and need ventilation): 90%

Phase	Building Tag	Dwelling Units (DU)	GSF	Avail. SF	Height (ft)	Avg. minutes to change air*	Volume (ft3)	CFM	m^2	comparable facility function	Pressure (iwg)	Pressure (Pa)	Q (m^3/s)	fantype = plug, tube, or prop	A-weighted PWL (for CadnaA inputs) 63	125	250	500	1000	2000	4000	8000	OA dB
return air fans in building rooftop AHUs:																							
1	Building HDM-6	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
1	Building HDM-7	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
1	Building HDM-8	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
1	Building HDM-9	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
2	Building HDM-4	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
2	Building HDM-5	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
3	Building HDM-3	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
3	Building HDM-14	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
3	Building GRDN-19	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
3	Building GRDN-20	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
4	Building HDM-13	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
4	Building GRDN-13	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
4	Building GRDN-14	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
4	Building GRDN-15	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
4	Building GRDN-16	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
4	Building GRDN-17	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
4	Building GRDN-18	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
5	Building HDM-10	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
5	Building HDM-11	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
5	Building GRDN-5	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
5	Building GRDN-6	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
5	Building GRDN-7	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
6	Building HDM-1	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
6	Building HDM-2	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
6	Building HDM-12	120	120000	108000	8.5	3.5	918000	262285.7	10039	residences	2	500	124	plug	69	81	82	83	80	73	67	62	**88**
6	Building GRDN-1	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
6	Building GRDN-2	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
6	Building GRDN-3	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
6	Building GRDN-4	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
6	Building GRDN-8	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
6	Building GRDN-9	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
6	Building GRDN-10	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
6	Building GRDN-11	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
6	Building GRDN-12	40	40000	36000	8.5	3.5	306000	87428.6	3346	residences	2	500	41	plug	64	76	77	78	75	68	62	57	**83**
														fan or AHU cabinet liner/interior attenuation (excludes inlet/outlet PWL split, already in calcs above:	2	3	4	5	6	8	10	10	

*from 3-10 minute range for "retail stores", 2-5 minute range for "residences" per Loren Cook's "Engineering Cookbook", 1999 edition, p. 41

ACCs (air-cooled chillers on rooftops):

Building Interior Comfort

with or without sound insulation? (enter Y/N): y

	tons	LWA	63	125	250	500	1000	2000	4000	8000
			unweighted PWL (dB) per OCBF (Hz) at full load (100%)							
Bryant BH16-018 (no sound blanket)	1.5	67	66.2	66.2	63.9	63.8	62.3	58.4	56.4	50.3
Bryant BH16-024 (no sound blanket)	2	71	65	65	63.7	63.4	68.5	64.7	58.7	52.8
Bryant BH16-036 (no sound blanket)	3	71	68.2	68.2	66.4	67.5	68.4	59.6	58.2	52.4
Bryant BH16-048 (no sound blanket)	4	71	68.4	68.4	67.7	69.7	67.6	59.4	56.4	50
Bryant BH16-060 (no sound blanket)	5	69	63.7	63.7	65.4	67.3	64.9	58.3	56.2	51.9
Daikin AGZ-E 30 (w/out sound insulation)	30	85	84	84	83	84	77	75	74	70
Daikin AGZ-E 40 (w/out sound insulation)	40	85	84	84	83	84	77	75	74	70
Daikin AGZ-E 50 (w/out sound insulation)	50	87	85	85	85	86	80	77	75	70
Daikin AGZ-E 60 (w/out sound insulation)	60	87	85	85	85	86	80	77	75	70
Daikin AGZ-E 70 (w/out sound insulation)	70	87	85	85	85	86	80	77	75	70
Daikin AGZ-E 80 (w/out sound insulation)	80	88	88	85	87	86	81	81	77	71
Daikin AGZ-E 90 (w/out sound insulation)	90	88	88	87	87	86	83	80	77	71
Daikin AGZ-E 120 (w/out sound insulation)	120	89	91	85	88	86	82	81	79	72
Daikin AGZ-E 240 (w/out sound insulation)	241	94	94	88	91	90	91	84	82	75

average gross square feet (GSF) per dwelling unit: 1000
percent GSF actually occupied (and need ventilation): 90%

Phase	Building Tag	Dwelling Units (DU)	GSF	Avail. SF	comparable facility function	Avg. GSF per ton*	tons of refrig.	Approx. Qty. of ACCs	tons per ACC	Approx. Total PWL (dBA)	63	125	250	500	1000	2000	4000	8000
											unweighted PWL (dB) per OCBF (Hz) at full load (100%)							
1	Building HDM-6	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
1	Building HDM-7	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
1	Building HDM-8	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
1	Building HDM-9	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
2	Building HDM-4	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
2	Building HDM-5	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
3	Building HDM-3	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
3	Building HDM-14	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
3	Building GRDN-19	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
3	Building GRDN-20	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
4	Building HDM-13	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
4	Building GRDN-13	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
4	Building GRDN-14	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
4	Building GRDN-15	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
4	Building GRDN-16	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
4	Building GRDN-17	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
4	Building GRDN-18	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
5	Building HDM-10	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
5	Building HDM-11	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
5	Building GRDN-5	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
5	Building GRDN-6	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
5	Building GRDN-7	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
6	Building HDM-1	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
6	Building HDM-2	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
6	Building HDM-12	120	120000	108000	Residential - large	600	180.0	120	2	**88**	87	87	85	85	83	79	77	71
6	Building GRDN-1	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
6	Building GRDN-2	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
6	Building GRDN-3	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
6	Building GRDN-4	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
6	Building GRDN-8	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
6	Building GRDN-9	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
6	Building GRDN-10	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
6	Building GRDN-11	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66
6	Building GRDN-12	40	40000	36000	Residential - large	600	60.0	40	2	**83**	82	82	80	80	78	74	72	66

*based upon "lo" value per Loren Cook's "Engineering Cookbook", 1999 edition, pp. 59-60

Sound Levels (local)

Name	ID	Type	Oktave Spectrum (dB)												Source
			Weight.	31.5	63	125	250	500	1000	2000	4000	8000	A	lin	
Building_AHU_HDM	AHUHDM	Lw	A	69	69	81	82	83	80	73	67	62	88	109	
Building_AHU_GRDN	AHUGRDN	Lw	A	64	64	76	77	78	75	68	62	57	83	104	
Building_AC_HDM	ACHDM	Lw		87	87	87	85	85	83	79	77	71	87.7	93.9	
Building_AC_GRDN	ACGRDN	Lw		82	82	82	80	80	78	74	72	66	82.7	88.9	

Area Sources

Name	M.	ID	Result. PWL			Result. PWL''			Lw / Li			Correction			Sound Reduction		Attenuatic	Operating Time			K0	Freq.	Direct.	Moving Pt. Src		
			Day	Evening	Night	Day	Evening	Night	Type	Value	norm.	Day	Evening	Night	R	Area		Day	Special	Night				Number		
			(dBA)	(dBA)	(dBA)	(dBA)	(dBA)	(dBA)			dB(A)	dB(A)	dB(A)	dB(A)		(ft²)		(min)	(min)	(min)	(dB)	(Hz)		Day	Evening	Night
GRDN (G1 to G4)		G1G4AHU	89	89	89	42.4	42.4	42.4	Lw	AHUGRDN		0	0	0			-6				0		(none)			
GRDN (G5 to G7)		G5G7AHU	87.8	87.8	87.8	42.7	42.7	42.7	Lw	AHUGRDN		0	0	0			-4.8				0		(none)			
GRDN (G8)		G8AHU	83	83	83	42.4	42.4	42.4	Lw	AHUGRDN		0	0	0							0		(none)			
GRDN (G9 and G10)		G9G10AHU	86	86	86	43.5	43.5	43.5	Lw	AHUGRDN		0	0	0			-3				0		(none)			
GRDN (G11 and G12)		G11G12AH	86	86	86	41.1	41.1	41.1	Lw	AHUGRDN		0	0	0			-3				0		(none)			
GRDN (G13 to G18)		G13G18AH	90.8	90.8	90.8	42	42	42	Lw	AHUGRDN		0	0	0			-7.8				0		(none)			
GRDN (G19 and G20)		G19G20AH	86	86	86	41.9	41.9	41.9	Lw	AHUGRDN		0	0	0			-3				0		(none)			
HDM (H1 and H2)		H1H2AHU	91	91	91	44.5	44.5	44.5	Lw	AHUHDM		0	0	0			-3				0		(none)			
HDM (H3)		H3AHU	88	88	88	44.4	44.4	44.4	Lw	AHUHDM		0	0	0							0		(none)			
HDM (H4 to H9)		H4H9AHU	95.8	95.8	95.8	45	45	45	Lw	AHUHDM		0	0	0			-7.8				0		(none)			
HDM (H10 and H11)		H10H11AH	91	91	91	44.7	44.7	44.7	Lw	AHUHDM		0	0	0			-3				0		(none)			
HDM (H12)		H12AHU	88	88	88	45.9	45.9	45.9	Lw	AHUHDM		0	0	0							0		(none)			
HDM (H13)		H13AHU	88	88	88	46.5	46.5	46.5	Lw	AHUHDM		0	0	0							0		(none)			
HDM (H14)		H14AHU	88	88	88	44.1	44.1	44.1	Lw	AHUHDM		0	0	0							0		(none)			
GRDN (G1 to G4)		G1G4ACC	88.7	88.7	88.7	42.2	42.2	42.2	Lw	ACGRDN		0	0	0			-6				0		(none)			
GRDN (G5 to G7)		G5G7ACC	87.5	87.5	87.5	42.4	42.4	42.4	Lw	ACGRDN		0	0	0			-4.8				0		(none)			
GRDN (G8)		G8ACC	82.7	82.7	82.7	42.1	42.1	42.1	Lw	ACGRDN		0	0	0							0		(none)			
GRDN (G9 and G10)		G9G10ACC	85.7	85.7	85.7	43.2	43.2	43.2	Lw	ACGRDN		0	0	0			-3				0		(none)			
GRDN (G11 and G12)		G11G12AC	85.7	85.7	85.7	40.8	40.8	40.8	Lw	ACGRDN		0	0	0			-3				0		(none)			
GRDN (G13 to G18)		G13G18AC	90.5	90.5	90.5	41.7	41.7	41.7	Lw	ACGRDN		0	0	0			-7.8				0		(none)			
GRDN (G19 and G20)		G19G20AC	85.7	85.7	85.7	41.6	41.6	41.6	Lw	ACGRDN		0	0	0			-3				0		(none)			
HDM (H1 and H2)		H1H2ACC	90.7	90.7	90.7	44.2	44.2	44.2	Lw	ACHDM		0	0	0			-3				0		(none)			
HDM (H3)		H3ACC	87.7	87.7	87.7	44.1	44.1	44.1	Lw	ACHDM		0	0	0							0		(none)			
HDM (H4 to H9)		H4H9ACC	95.5	95.5	95.5	44.7	44.7	44.7	Lw	ACHDM		0	0	0			-7.8				0		(none)			
HDM (H10 and H11)		H10H11AC	90.7	90.7	90.7	44.4	44.4	44.4	Lw	ACHDM		0	0	0			-3				0		(none)			
HDM (H12)		H12ACC	87.7	87.7	87.7	45.6	45.6	45.6	Lw	ACHDM		0	0	0							0		(none)			
HDM (H13)		H13ACC	87.7	87.7	87.7	46.2	46.2	46.2	Lw	ACHDM		0	0	0							0		(none)			
HDM (H14)		H14ACC	87.7	87.7	87.7	43.8	43.8	43.8	Lw	ACHDM		0	0	0							0		(none)			

Buildings

Name	M.	ID	RB	Residents	Absorptior	Height	
						Begin	
						(ft)	
GRDN (G1 to G4)	+	G1G4	x	0	0.1	33	r
GRDN (G5 to G7)	+	G5G7	x	0	0.1	33	r
GRDN (G8)	+	G8	x	0	0.1	33	r
GRDN (G9 and G10)	+	G9G10	x	0	0.1	33	r
GRDN (G11 and G12)	+	G11G12	x	0	0.1	33	r
GRDN (G13 to G18)	+	G13G18	x	0	0.1	33	r
GRDN (G19 and G20)	+	G19G20	x	0	0.1	33	r
HDM (H1 and H2)	+	H1H2	x	0	0.1	55	r
HDM (H3)	+	H3	x	0	0.1	55	r
HDM (H4 to H9)	+	H4H9	x	0	0.1	55	r
HDM (H10 and H11)	+	H10H11	x	0	0.1	55	r
HDM (H12)	+	H12	x	0	0.1	55	r
HDM (H13)	+	H13	x	0	0.1	55	r
HDM (H14)	+	H14	x	0	0.1	55	r