Appendix I

Noise Report

Noise Technical Report for the Pacific Project

Prepared for:

City of San Marcos
1 Civic Center Drive
San Marcos, California 92069

Prepared by:

DUDEK
605 Third Street
Encinitas, California 92024
Contacts: Connor Burke, INCE; Mark Storm, INCE Bd. Cert.

NOVEMBER 2022

Printed on 30% post-consumer recycled material.

Table of Contents

APPENDICES

FIGURES

TABLES

INTENTIONALLY LEFT BLANK

Acronyms and Abbreviations

Acronym/Abbreviation	Definition
a.k.a.	Also known as
APN	Assessor parcel number
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
City	City of San Marco
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	A-weighted decibel
DOT	Department of Transportation
Pacific General Plan Amendment/Rezone Project	proposed project
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
ips	inches per second
Ldn	day–night average noise level
Leq	equivalent noise level
Lmax	maximum sound level
Lmin	minimum sound level
OPR	Office of Planning and Research
PPV	peak particle velocity
RCNM	Roadway Construction Noise Model
SLM	Sound level meter
SPL	Sound pressure level
ST	Short-term
STC	Sound transmission class
TL	Transmission loss

INTENTIONALLY LEFT BLANK

1 Introduction and Background

This technical noise report evaluates the potential noise impacts during construction and operation of the Pacific General Plan Amendment/Rezone Project (project). This assessment utilizes City of San Marcos (City) significance thresholds that are comparable to those relating to noise and vibration assessment in Appendix G of the California Environmental Quality Act Guidelines (14 CCR 15000 et seq.).

Project Description

The approximately 33.2-acre project site is located in the western portion of the City, at the northwest corner of Las Posas Road and Linda Vista Drive. The project location and project site boundary are shown in Figure 1 (Project Location) and Figure 2 (Conceptual Site Plan).

The Pacific Project (project) proposes a General Plan Amendment and Rezone (GPA/Rezone) to change the land use from Industrial (I) to Specific Plan Area (SPA). The project would allow for the development of 449 residential units, including a mix of five-story podium apartments, three-story rowhomes, three-story villas, and four-story affordable flats on approximately 15.09 acres within the 33.2-acre project site. The project would consist of 101 rowhomes, 108 villas, 172 apartments, and 68 affordable flats. 68 of the 449 total units (15 percent of the total) would be designated as deed-restricted affordable units.

The project would also include a total of 927 parking spaces and an 134,985 square feet of common open space area. The proposed project also includes landscaping, bio-retention areas and circulation improvements. The remaining 17.94 acres of the 33.2-acre project site would be preserved and restored open space and habitat area.

Noise Characteristics

Sound is mechanical energy transmitted by pressure waves in a compressible medium, such as air. Noise is defined as sound that is loud, unpleasant, unexpected, or undesired. The sound pressure level (SPL) has become the most common descriptor used to characterize the loudness of an ambient sound level. The unit of measurement of sound pressure is a decibel (dB). Under controlled conditions in an acoustics laboratory, the trained, healthy human ear is able to discern changes in sound levels of 1 dB when exposed to steady, single-frequency signals in the mid-frequency range. Outside such controlled conditions, the trained ear can detect changes of 2 dB in normal environmental noise. It is widely accepted that the average healthy ear, however, can barely perceive noise level changes of 3 dB. A change of 5 dB is readily perceptible, and a change of 10 dB is perceived as twice or half as loud (Caltrans 2013). A doubling of sound energy results in a 3 dB increase in sound, which means that a doubling of sound energy (e.g., doubling the number of daily trips along a given road) would result in a barely perceptible change in sound level.

Sound may be described in terms of level or amplitude (measured in dB), frequency or pitch (measured in hertz or cycles per second), and duration (measured in seconds or minutes). Because the human ear is not equally sensitive to sound at all frequencies, a special frequency-dependent rating scale is used to relate noise to human sensitivity. The A-weighted decibel (dBA) scale performs this compensation by discriminating against low and very high frequencies in a manner approximating the sensitivity of the human ear.

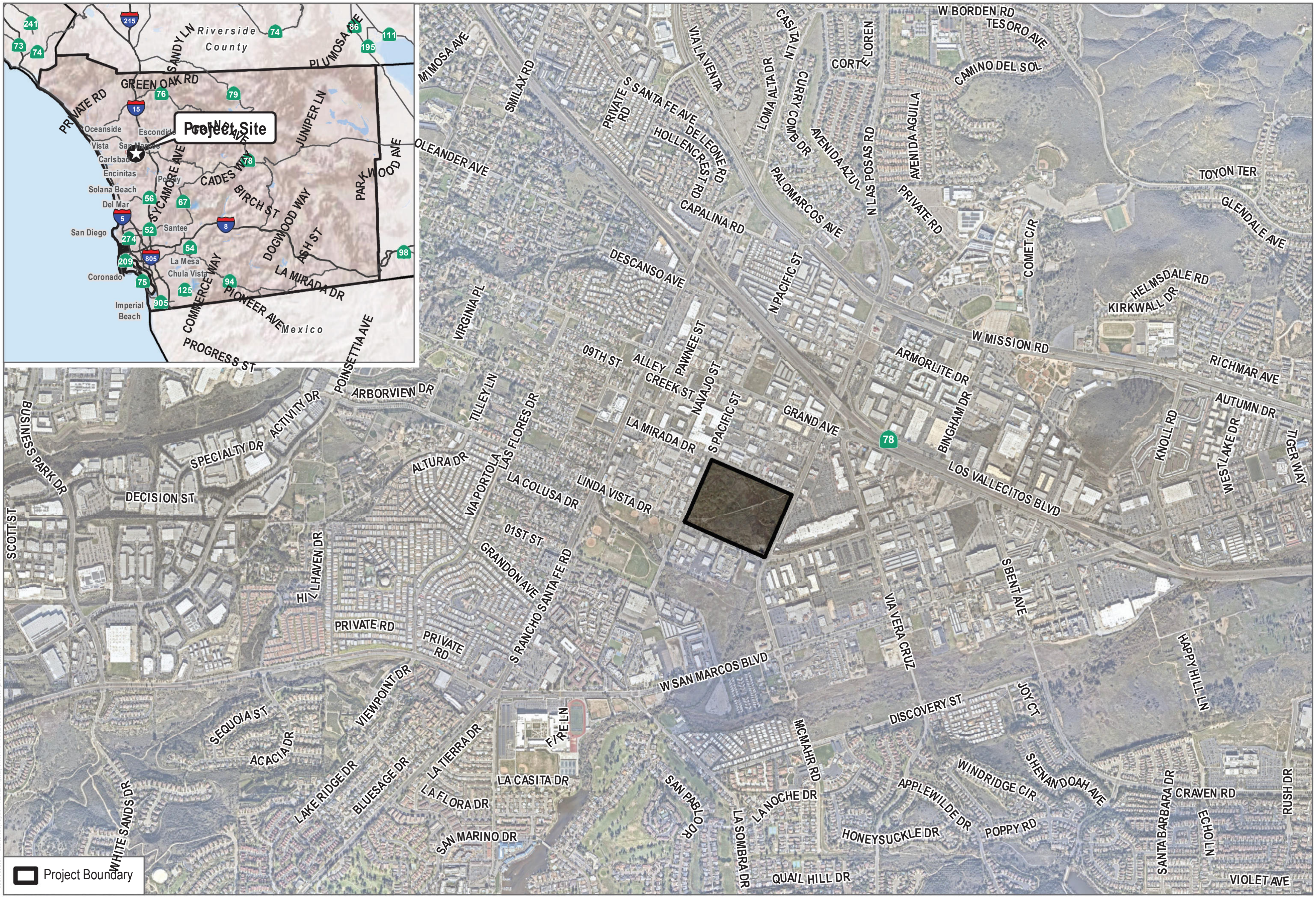
Several descriptors of noise (a.k.a., noise metrics) exist to help predict average community reactions to the adverse effects of environmental noise, including traffic-generated noise. These descriptors include the equivalent noise level over a given period (L_{eq}), the day–night average noise level (L_{dn}), and the community noise equivalent level (CNEL). Each of these descriptors uses units of dBA.

L_{eq} is a decibel quantity that represents the constant or energy-averaged value equivalent to the amount of variable sound energy received by a receptor during a time interval. For example, a 1-hour L_{eq} measurement of 60 dBA would represent the average amount of energy contained in all the noise that occurred in that hour. L_{eq} is an effective noise descriptor because of its ability to assess the total time-varying effects of noise on sensitive receptors, which can then be compared to an established L_{eq} standard or threshold of the same duration. Another descriptor is maximum sound level (L_{max}), which is the greatest sound level measured during a designated time interval or event. The minimum sound level (L_{min}) is often called the *floor* of a measurement period.

Unlike the L_{eq}, L_{max}, and L_{min} metrics, L_{dn} and CNEL descriptors always represent 24-hour periods and differ from a 24-hour L_{eq} value because they apply a time-weighted factor designed to emphasize noise events that occur during the non-daytime hours (when speech and sleep disturbance is of more concern). *Time weighted* refers to the fact that L_{dn} and CNEL penalize noise that occurs during certain sensitive periods. In the case of CNEL, noise occurring during the daytime (7:00 a.m. to 7:00 p.m.) receives no penalty. Noise during the evening (7:00 p.m. to 10:00 p.m.) is penalized by adding 5 dB to the actual levels, and nighttime (10:00 p.m. to 7:00 a.m.) noise is penalized by adding 10 dB to the actual levels. L_{dn} differs from CNEL in that the daytime period is longer (defined instead as 7:00 a.m. to 10:00 p.m.), thus eliminating the dB adjustment for the evening period. L_{dn} and CNEL are the predominant criteria used to measure roadway noise affecting residential receptors. These two metrics generally differ from one another by no more than 0.5–1 dB, and are often considered or actually defined as being essentially equivalent by many jurisdictions.

Vibration Fundamentals

Vibration is oscillatory movement of mass (typically a solid) over time. It is described in terms of frequency and amplitude and, unlike sound, can be expressed as displacement, velocity, or acceleration. For environmental studies, vibration is often studied as a velocity that, akin to the discussion of sound pressure levels, can also be expressed in dB as a way to cast a large range of quantities into a more convenient scale and with respect to a reference quantity. Vibration impacts to buildings are generally discussed in terms of inches per second (ips) peak particle velocity (PPV), which will be used herein to discuss vibration levels for ease of reading and comparison with relevant standards. Vibration can also be annoying and thereby impact occupants of structures, and vibration of sufficient amplitude can disrupt sensitive equipment and processes (Caltrans 2020), such as those involving the use of electron microscopes and lithography equipment. Common sources of vibration within communities include construction activities and railroads. Groundborne vibration generated by construction projects is usually highest during pile driving, rock blasting, soil compacting, jack hammering, and demolition-related activities where sudden releases of subterranean energy or powerful impacts of tools on hard materials occur. Depending on their distances to a sensitive receptor, operation of large bulldozers, graders, loaded dump trucks, or other heavy construction equipment and vehicles on a construction site also have the potential to cause high vibration amplitudes.



SOURCE: SANGIS 2020

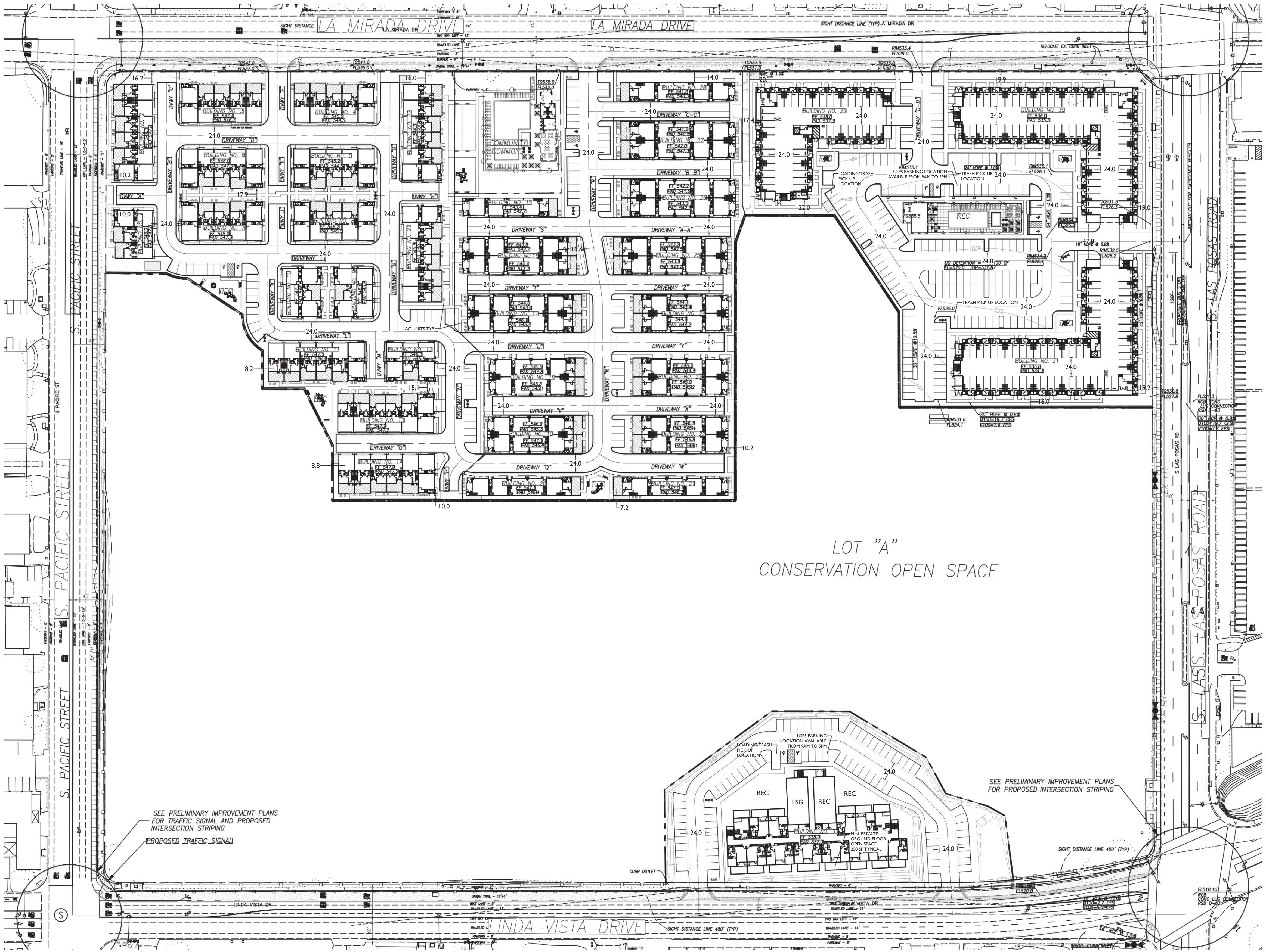
0 1,000 2,000 Feet

FIGURE 1

Project Location

Pacific GPA/Rezone EIR

INTENTIONALLY LEFT BLANK



RESIDENCES		449 HOMES
GROSS SITE AREA		33.229 ACRES (15.091 ACRES NET)
GROSS DENSITY		13.51 DU/AC (29.75 DU/AC NET)

ROWHOMES - LOT 1

23	2BD/2BA	1,200 SF
23	3BD/3BA	1,310 SF
28	3BD/3.5BA	1,736 SF
27	4BD/3.5BA	1,890 SF
101	4.419 AC =	22.86 DU/AC

PARKING SUMMARY PER CA 65915		
2&3 BD	74 X 1.5 =	111 SPACES
4 BD	27 X 2.5 =	68 SPACES
TOTAL REQUIRED		179 SPACES
TOTAL PROVIDED		234 SPACES* (32 OPEN/202 GARAGES)
FUTURE EV REQUIRED		23 SPACES (10%X234)

*NOTE: RECIPROCAL ACCESS & PARKING AGREEMENT BETWEEN LOT 1 & 2

PRIVATE OPEN SPACE	REQUIRED	PROVIDED
101 X 50 SF	5,050 SF	6,959 SF
COMMON OPEN SPACE	REQUIRED	PROVIDED
GROUND FLOOR SF X 30%	12,945 SF	
TOT LOT (1:25 DU) 4X400 SF	1,600 SF	
PLAYGROUND	800 SF	
TOTAL	15,345 SF	40,876 SF

VILLAS - LOT 2

60	2BD/2BA	1,272 SF
24	3BD/2.5BA	1,486 SF
24	3BD/3BA	1,832 SF
108	4.583 AC =	23.57 DU/AC

PARKING SUMMARY PER CA 65915		
2&3 BD	108 X 1.5 =	162 SPACES
TOTAL REQUIRED		162 SPACES
TOTAL PROVIDED		254 SPACES* (38 OPEN/216 GARAGES)
FUTURE EV REQUIRED		25 SPACES (10%X254)

*NOTE: RECIPROCAL ACCESS & PARKING AGREEMENT BETWEEN LOT 1 & 2

PRIVATE OPEN SPACE	REQUIRED	PROVIDED
108 X 50 SF	5,400 SF	6,180 SF
COMMON OPEN SPACE	REQUIRED	PROVIDED
GROUND FLOOR SF X 30%	16,204 SF	
TOT LOT (1:25 DU) 5X400 SF	2,000 SF	
PLAYGROUND	800 SF	
TOTAL	19,004 SF	29,899 SF

APARTMENTS - LOT 3

86	1B/1BA	740 SF
62	2BD/2.5BA	1,256 SF
24	3BD/2.5BA	1,579 SF
172	4.308 AC =	39.93 DU/AC

PARKING SUMMARY PER CA 65915		
1BD	86 X 1.0 =	86 SPACES
2&3BD	86 X 1.5 =	129 SPACES
TOTAL REQUIRED		215 SPACES
PROVIDED COVERED (1:1)		172 GARAGES
PROVIDED OPEN		187 SPACES
TOTAL PROVIDED		359 SPACES
FUTURE EV REQUIRED		36 SPACES (10%X359)

PRIVATE OPEN SPACE	REQUIRED	PROVIDED
172 X 50 SF	8,600 SF	11,180 SF
COMMON OPEN SPACE	REQUIRED	PROVIDED
GROUND FLOOR SF X 30%	15,606 SF	
TOT LOT (1:25 DU) 6X400 SF	2,400 SF	
PLAYGROUND	800 SF	
TOTAL	18,806 SF	47,870 SF

AFFORDABLE - LOT 4

UNIT MIX

8	STUDIO/1BA	512 SF
42	1BD/1BA	625 SF
18	2BD/2BA	924 SF
68	1.781 AC =	38.18 DU/AC

PARKING PROVIDED PER CA 65915	
50 X 1.0 SP/DU =	50 SPACES
18 X 1.5 SP/DU =	27 SPACES
TOTAL REQUIRED	77 SPACES
TOTAL PROVIDED	80 SPACES
FUTURE EV INCLUDED	8 SPACES (10%X80)

PRIVATE OPEN SPACE	REQUIRED	PROVIDED
68 X 50 SF	3,400 SF	3,111 SF
COMMON OPEN SPACE	REQUIRED	PROVIDED
GROUND FLOOR SF X 30%	2,828 SF	
TOT LOT (1:25 DU) 3X400 SF	1,200 SF	
TOTAL	4,028 SF	16,340 SF

SOURCE: Summa Architecture, 2022

FIGURE 2

Conceptual Site Plan

INTENTIONALLY LEFT BLANK

2 Regulatory Setting

Regulatory Setting

Federal

<u>Federal Transit Administration</u>

In its Transit Noise and Vibration Impact Assessment guidance manual, the Federal Transit Administration (FTA) recommends a daytime construction noise level threshold of 80 dBA L_{eq} over an 8-hour period (FTA 2018) when detailed construction noise assessments are performed to evaluate potential impacts to community residences surrounding a project. 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.

State

<u>California Code of Regulations, Title 24</u>

Title 24 of the California Code of Regulations sets standards that new development in California must meet. According to Title 24, interior noise levels are not to exceed 45 dBA CNEL in any habitable room (International Construction Code 2019).

<u>California Department of Health Services Guidelines</u>

The California Department of Health Services has developed guidelines of community noise acceptability for use by local agencies (OPR 2003). Selected relevant levels are listed here:

- Below 60 dBA CNEL: normally acceptable for low-density residential use
- 50 to 70 dBA: conditionally acceptable for low-density residential use
- Below 65 dBA CNEL: normally acceptable for high-density residential use and transient lodging
- 60 to 70 dBA CNEL: conditionally acceptable for high-density residential, transient lodging, churches, educational, and medical facilities

<u>California Department of Transportation</u>

In its Transportation and Construction Vibration Guidance Manual (Caltrans 2020), the California Department of Transportation (Caltrans) recommends 0.5 inches per second (ips) peak particle velocity (PPV) as a threshold for the avoidance of structural damage risk to typical newer residential buildings exposed to continuous or frequent intermittent sources of groundborne vibration. For transient vibration events, such as blasting, the damage risk threshold would be 1.0 ips PPV (Caltrans 2020) at the same type of newer residential structures. For older structures, these guidance thresholds would be more stringent: 0.3 ips PPV for continuous/intermittent vibration sources, and 0.5 ips PPV for transient vibration events. With respect to human annoyance, Caltrans guidance indicates that building occupants exposed to groundborne vibration of 0.10 ips PPV from continuous or frequently intermittent sources may find it "strongly perceptible" (Caltrans 2020) and on such basis would thus be considered a significant groundborne vibration impact for purposes of this assessment. Although these Caltrans guidance thresholds are not regulations, they can serve as quantified standards in the absence of such limits at the local jurisdictional level.

Local

The following are summarized or reproduced portions of relevant City regulations and General Plan policies.

San Marcos

City of San Marcos Municipal Code

The City of San Marcos Municipal Code Chapter 10.24: Noise (San Marcos 2017) addresses construction noise. Erection and demolition of buildings is exempt between 7:00 a.m. and 6:00 p.m. Monday through Friday and on Saturdays from 8:00 a.m. to 5:00 p.m. The Municipal Codes does not set noise limits on construction activities. Commonly, the City has utilized the County of San Diego's Noise Ordinance noise limit of 75 dBA (8-hour average) for construction activities.

Chapter 20.300 (Site Planning and General Development Standards) of the City's Municipal Code includes noise regulations in the form of noise standards by zone (Section 20.300.070, Performance Standards). It should be noted that Municipal Code noise standards typically pertain to stationary (i.e., non-transportation-related) noise sources. The relevant portions of these noise standards are provided below:

1. Noise shall be measured with a sound-level meter that meets the standards of the American National Standards Institute (ANSI) (Section S1.4-1979, Type 1 or Type 2). Noise levels shall be measured in decibels at the property line of the receptor property, and at least five (5) feet above the ground and ten (10) feet from the nearest structure or wall. The unit of measure shall be designated as an A-weighted decibel (dBA) Leq standard. A calibration check shall be made of the instrument at the time any noise measurement is made (Ord. No. 2017-1446, 7-25-2017)

2. No person shall create or allow the creation of exterior noise that causes the noise level to exceed the noise standards established by Table 20.300-4 [shown in this report as Table 1]. Increases in allowable noise levels listed in Table 20.300-4 may be permitted in accordance with the standards outlined in Table 20.300-5 [shown in this report as Table 2].

Table 1. Exterior Noise Standards by Zone

Zone	Allowable Noise Level (dBA L_{eq}) Measured from the Property Line
Single-Family Residential (A, R-1, R-2) [1, 2]	
7 a.m. to 10 p.m. (daytime)	60
10 p.m. to 7 a.m. (overnight)	50
Multifamily Residential (R-3) 1, 2	
7 a.m. to 10 p.m. (daytime)	65
10 p.m. to 7 a.m. (overnight)	55
Commercial (C, O-P, SR) [3]	
7 a.m. to 10 p.m. (daytime)	65
10 p.m. to 7 a.m. (overnight)	55

Table 1. Exterior Noise Standards by Zone

Zone	Allowable Noise Level (dBA L_{eq}) Measured from the Property Line
Industrial	
7 a.m. to 10 p.m. (daytime)	65
10 p.m. to 7 a.m. (overnight)	60

Source: City of San Marcos 2017 (Table 20.300-4)

Notes:

1 For single-family detached dwelling units, the "exterior noise level" is defined as the noise level measured at an outdoor living area which adjoins and is on the same lot as the dwelling, and which contains at least the following minimum net lot area: (i) for lots less than 4,000 square feet in area, the exterior area shall include 400 square feet, (ii) for lots between 4,000 square feet to 10 acres in area, the exterior area shall include 10 percent of the lot area; (iii) for lots over 10 acres in area, the exterior area shall include 1 acre.

2 For all other residential land uses, "exterior noise level" is defined as noise measured at exterior areas which are provided for private or group usable open space purposes. "Private Usable Open Space" is defined as usable open space intended for use of occupants of one dwelling unit, normally including yards, decks, and balconies. When the noise limit for Private Usable Open Space cannot be met, then a Group Usable Open Space that meets the exterior noise level standard shall be provided. "Group Usable Open Space" is defined as usable open space intended for common use by occupants of a development, either privately owned and maintained or dedicated to a public agency, normally including swimming pools, recreation courts, patios, open landscaped areas, and greenbelts with pedestrian walkways and equestrian and bicycle trails, but not including off-street parking and loading areas or driveways.

3 For non-residential noise sensitive land uses, exterior noise level is defined as noise measured at the exterior area provided for public use.

3. No person shall create nor allow the creation of noise that causes the interior noise level when measured within a dwelling unit to exceed forty-five (45) dBA at any time, except as permitted by Table 20.300-6 [shown in this report as Table 3].

4. Use of compressors or other equipment, including vents, ducts, and conduits, but excluding window or wall-mounted air conditioners, that are located outside of the exterior walls of any building, shall be enclosed within a permanent, non-combustible, view-obscuring enclosure to ensure that the equipment does not emit noise in excess of the ANSI standards.

Table 2. Permitted Increase in Noise Levels

Permitted Increase (dBA)	Duration (cumulative minutes per hour)
5	15
10	5
15	1
20	Less than 1 minute

Source: City of San Marcos 2017 (Table 20.300-5)

Table 3. Permitted Increase in Interior Noise Levels

Permitted Increase (dBA)	Duration (cumulative minutes per hour)
5	1
10	Less than 1 minute

Source: City of San Marcos 2017 (Table 20.300-6)

City of San Marcos General Plan

To control transportation related noise sources such as arterial roads, freeways, airports, and railroads, the City of San Marcos has established guidelines for acceptable community noise levels in the Noise Element of the General Plan (City of San Marcos 2012). For noise-sensitive rural and single-family residential uses, schools, libraries, parks, and recreational areas the City Noise Element requires an exterior noise levels of less than 60 dBA CNEL for outdoor usable area. For multi-family developments the standard is 65 dBA CNEL and a standard of 70 dBA CNEL is typically applied to commercial uses. The City has also established an interior noise limit of 45 dBA CNEL for all residential uses.

3 Existing Conditions

Sound pressure level (SPL) measurements were conducted near the proposed project site on March 10, 2021, to quantify and characterize the existing outdoor ambient sound levels. Table 4 provides the location, date, and time period at which these baseline noise level measurements were performed by an attending Dudek field investigator using a Rion-branded Model NL-52 sound level meter (SLM) equipped with a 0.5-inch, pre-polarized condenser microphone with pre-amplifier. The SLM meets the current American National Standards Institute standard for a Type 1 (Precision Grade) sound level meter. The accuracy of the SLM 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.

Four (4) short-term (ST) noise level measurement locations (ST1 – ST4) intended to be representative of the outdoor ambient sound environment for existing or potential future noise-sensitive receivers in the vicinity of the proposed project were selected near the proposed project site. These locations are depicted as receivers ST1 – ST4 on Figure 3, Noise Measurement and Modeled Receptor Locations. The measured L_{eq} and L_{max} noise levels at these surveyed locations are provided in Table 4. The primary noise sources at the sites identified in Table 4 consisted of traffic along adjacent roadways, the sounds of leaves rustling, and birdsong. As shown in Table 4, the measured SPL ranged from 66.9 dBA L_{eq} at ST1 to 60.5 dBA L_{eq} at ST3. Beyond the summarized information presented in Table 4, detailed noise measurement data is included in Appendix A, Baseline Noise Measurement Field Data.

Table 4. Measured Baseline Outdoor Ambient Noise Levels

Site	Location/Address	Date/Time	L_{eq}	L_{max}
ST1	Perpendicular to project site, East of S Las Posas Rd.	2021-03-10, 11:50 AM to 12:00 PM	66.9	75.9
ST2	Perpendicular to project site, North of La Mirada Dr.	2021-03-10, 12:10 PM to 12:20 PM	61.0	71.8
ST3	Perpendicular to project site, West of S Pacific St.	2021-03-10, 12:30 PM to 12:40 PM	60.5	71.1
ST4	Perpendicular to project site, South of Linda Vista Dr,	2021-03-10, 12:45 PM to 12:55 PM	64.7	74.9

Source: Dudek 2022 (Appendix A)
Notes: L_{eq} = equivalent continuous sound level (time-averaged sound level); L_{max} = maximum sound level during the measurement interval; dBA = A-weighted decibels; ST = short-term noise measurement locations.

Generally, the measured samples of daytime L_{eq} agree with expectations: ST1 is near 67 dBA L_{eq} due largely to its proximity to Las Posas Road, a major roadway and thus a fairly continuous acoustical contributor to the measured outdoor ambient sound environment. Surrounding land uses include industrial to the north and west, light industrial to the south, and commercial to the east. Although the nearest single-family home is located approximately 1,420 feet away, due to the City of San Marcos adopting the County of San Diego's Noise Ordinance, a distance of 150 feet to nearest occupied building was used for noise analysis and modeling.

INTENTIONALLY LEFT BLANK

SOURCE: SANGIS 2020

DUDEK

0 150 300 Feet

FIGURE 3

Noise Measurement Locations

Pacific GPA/Rezone EIR

INTENTIONALLY LEFT BLANK

4 Thresholds of Significance

The following significance criteria are based on Appendix G of the California Environmental Quality Act Guidelines (14 CCR 15000 et seq.) and will be used to determine the significance of potential noise impacts. Impacts to noise would be significant if the proposed project would result in the following:

a. 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;
b. Generation of excessive groundborne vibration or groundborne noise levels; and
c. Expose people residing or working in the project area to excessive noise levels (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).

In light of these above significance criteria, this analysis uses the following standards to evaluate potential noise and vibration impacts.

- Construction noise – The City of San Marcos Municipal Code Chapter 10.24: Noise (San Marcos 2017) addresses construction noise. Erection and demolition of buildings is exempt between 7:00 a.m. and 6:00 p.m. Monday through Friday and on Saturdays from 8:00 a.m. to 5:00 p.m. The Municipal Code does not set noise limits on construction activities. Through adherence to the limitation of allowable construction times provided in the City of San Marcos Municipal Code, the construction-related noise levels would not exceed local standards. However, were the City to consider adoption of the County of San Diego's Noise Ordinance noise limit of 75 dBA (8-hour L_{eq}) for construction activities, then for information purposes this assessment will compare predicted construction noise against the County's 75 dBA 8-hour L_{eq} threshold. The analysis assumes that the 8-hour period over which the County's 75 dBA L_{eq} could apply would be within the aforementioned exempt hours as allowed by the City of San Marcos.
- Off-site project-attributed transportation noise – For purposes for this analysis, a direct roadway noise impact would be considered significant if increases in roadway traffic noise levels attributed to future residential development as a result of the proposed project were greater than 3 dBA CNEL at an existing noise-sensitive land use.
- Off-site project-attributed stationary noise – For purposes for this analysis, a noise impact would be considered significant if noise from typical operation of heating, ventilation, and air conditioning and other electro-mechanical systems associated with future residential development as a result of the proposed project exceeded 65 dBA hourly L_{eq} for multi-family homes and 60 dBA hourly L_{eq} for single-family homes at the property line from 7:00 a.m. to 9:59 p.m., and 55 dBA hourly L_{eq} for multi-family homes and 50 dBA hourly L_{eq} for single-family homes from 10:00 p.m. to 6:59 a.m.
- Construction vibration – Guidance from Caltrans indicates that a vibration velocity level of 0.2 ips PPV received at a structure would be considered annoying by occupants within (Caltrans 2013b). As for the receiving structure itself, aforementioned Caltrans guidance from Section 2 recommends that a vibration level of 0.3 ips PPV would represent the threshold for building damage risk.

For purposes of disclosure, since current CEQA noise criteria listed above do not consider it, this analysis also evaluates compatibility of on-site traffic noise exposure levels with the City of San Marcos exterior and interior noise standards of 65 dBA CNEL for multi-family homes, 60 dBA CNEL for single-family homes and 45 dBA CNEL, respectively.

INTENTIONALLY LEFT BLANK

5 Impact Discussion

a) ***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 standard of other agencies?***

Short-Term Construction

Construction noise and vibration are temporary phenomena. Construction noise and vibration levels vary from hour to hour and day to day, depending on the equipment in use, the operations performed, and the distance between the source and receptor.

Construction assumptions, including timing, phasing, and equipment type and quantity, as well as worker and vendor truck trips, were based on information provided by the applicant. Default values provided by the California Emissions Estimator Model (CalEEMod) were used since detailed project site-specific information is not currently available. Equipment that could be in use during construction would include, in part, graders, backhoes, concrete saws, excavators, dump trucks, loaders, cranes, manlifts, cement mixers, pavers, rollers, welders, and air compressors. The typical maximum noise levels for various pieces of construction equipment at a distance of 50 feet are presented in Table 5. Usually, construction equipment operates in alternating cycles of full power and low power, producing average noise levels over time that are less than the listed 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 5. Typical Construction Equipment Maximum Noise Levels

Equipment Type	Typical Equipment (L_{max}, dBA at 50 Feet)
Air compressor	78
Backhoe	78
Concrete pump truck	81
Grader	85
Crane	81
Roller	80
Manlift	75
Generator	72
Front End Loader	79
Paver	77
Scraper	84
Welder	74

Source: DOT 2006.
Note: L_{max} = maximum sound level; dBA = A-weighted decibels.

Aggregate noise emission from assumed construction activities, broken down by sequential phase, was predicted at two distances to the nearest apparent existing noise-sensitive receptor: 1) from the nearest position of the construction site boundary and 2) from the geographic center of the construction site, which serves as the time-averaged location or geographic *acoustical centroid* of active construction equipment for the phase under study. The intent of the former distance is to help evaluate anticipated construction noise from a limited quantity of equipment or vehicle activity expected to be at the boundary for some period of time, which would be most appropriate for phases such as site preparation, grading, and paving. The latter distance is used in a manner similar to the general assessment technique as described in Federal Transit Administration (FTA) guidance for construction noise assessment (FTA 2018), when the location of individual equipment for a given construction phase is uncertain over some extent of (or the entirety of) the construction site area. Because of this uncertainty, all the equipment for a construction phase is assumed to operate—on average—from the acoustical centroid. Table 6 summarizes these two distances to the apparent closest noise-sensitive receptor for each of the five sequential construction phases. Adoption of the County's noise ordinance threshold would mean that an "occupied property", which could be a residence or any occupied building, would be the nearest noise-sensitive receptor in this context. At the site boundary, this analysis assumes that the equipment may be operating up to all of eight (8) hours per day (i.e., comparable to a typical on-site work shift).

Table 6. Estimated Distances between Construction Activities and the Nearest Noise-Sensitive Receptors

Construction Phase (and Equipment Types Involved)	Distance from Nearest Noise-Sensitive Receptor to Construction Site Boundary (Feet)	Distance from Nearest Noise-Sensitive Receptor to Acoustical Centroid of Site (Feet)
Site Preparation (Backhoe, Dozer)	150	520
Grading (Excavator, Grader, Dozer, Scraper, Backhoe)	150	520
Building Construction (Crane, Forklift, Backhoe, Welder, Generator)	150	520
Architectural Finishes (Air Compressor)	150	520
Paving (Roller, Paver, Mixer Truck)	150	520

A Microsoft Excel–based noise prediction model emulating and using reference data from the Federal Highway Administration Roadway Construction Noise Model (RCNM) (FHWA 2008) was used to estimate construction noise levels at the nearest occupied noise-sensitive land use. (Although the RCNM was funded and promulgated by the Federal Highway Administration, it is often used for non-roadway projects, because the same types of construction equipment used for roadway projects are often used for other types of construction.) Input variables for the predictive modeling consist of the equipment type and number of each (e.g., two graders, a loader, a tractor), the duty cycle for each piece of equipment (e.g., percentage of time within a specific time period, such as an hour, when the equipment is expected to operate at full power or capacity and thus make noise at a level comparable to what is presented in Table 5, Typical Construction Equipment Maximum Noise Levels), and the distance from the noise-sensitive receiver. The predictive model also considers how many hours that equipment may be on site and operating (or idling) within an established work shift. Conservatively, no topographical or structural shielding was assumed in the modeling. The RCNM has default duty-cycle values for the various pieces of equipment, which were derived from an extensive study of typical construction activity patterns. Those default duty-cycle values were used for this noise analysis, which is detailed in Appendix B, Construction Noise Modeling Input and Output, and produce the predicted results displayed in Table 7.

Table 7. Predicted Construction Noise Levels per Activity Phase

Construction Phase (and Equipment Types Involved)	8-Hour L_{eq} at Nearest Noise-Sensitive Receptor to Construction Site Boundary (dBA)	8-Hour L_{eq} at Nearest Noise-Sensitive Receptor to Acoustical Centroid of Site (dBA)
Site Preparation (Backhoe, Dozer)	70.5	59.7
Grading (Excavator, Grader, Dozer, Scraper, Backhoe)	70.5	59.7
Building Construction (Crane, Forklift, Backhoe, Welder, Generator)	71.2	60.4
Architectural Finishes (Air Compressor)	63.2	52.1
Paving (Roller, Paver, Mixer Truck)	72.3	61.5

Notes: L_{eq} = equivalent noise level; dBA = A-weighted decibels.

As presented in Table 7, the estimated construction noise levels are predicted to be less than 75 dBA L_{eq} over an 8-hour period when activities take place near the north-western project boundaries. Note that these estimated noise levels at a source-to-receiver distance of 150 feet occur when noted pieces of heavy equipment would each operate for a cumulative period of 8 hours a day. Under these conditions, predicted operation of construction equipment and processes do not exceed noise levels of 75 dBA L_{eq}.

Compared to measurements of the daytime outdoor ambient sound level at representative sample locations as shown in Table 4, predicted construction noise levels ranging in the lower to middle seventies of A-weighted decibels as appearing in Table 7 are considerably higher and would be clearly perceptible to an average listener having healthy human hearing. However, at nearby off-site residences exposed to such construction-related noise, the increased noise levels would typically be relatively short term and temporary—lasting only as long as construction occurs during allowable hours. And because it is anticipated that construction activities associated with future development as a result of the proposed project would take place within the hours of 7:00 a.m. and 6:00 p.m. Monday through Friday and on Saturdays from 8:00 a.m. to 5:00 p.m., the noise-producing activity would thus be in compliance with the City's Municipal Code with respect to allowable hours, and less than the County's 75 dBA 8-hour L_{eq} limit; thus, construction noise impacts would be considered **less than significant.**

Long-Term Operational

Roadway Traffic Noise

Potential future development as a result of the proposed project would result in the creation of additional vehicle trips on local arterial roadways (i.e., Las Posas Road, La Mirada Drive, Linda Vista Drive, and S Pacific Street), which could result in increased traffic noise levels at adjacent offsite existing noise-sensitive land uses. Appendix C, Traffic Noise Modeling Input and Output, contains a spreadsheet with traffic volume data (average daily traffic) for surrounding arterial roadways. In particular, potential future residential development as a result of the proposed project is estimated to add 2,694 average daily trips to local roadways.

Potential noise effects from vehicular traffic were assessed using the Federal Highway Administration's Traffic Noise Model version 2.5 (FHWA 2004). Information used in the model included the roadway geometry, posted traffic speeds, and traffic volumes for the following scenarios: existing (year 2021), existing plus project, near-term (2025), near-term plus project, horizon year (2050) and horizon year plus project. Noise levels were modeled at representative noise-sensitive receivers ST1 -ST4, as shown in Figure 3, and modeled to be 5 feet above the local ground elevation. The traffic noise prediction model results for the existing (year 2021), existing plus project, near-term (2025), near-term plus project, horizon year (2050) and horizon year plus project scenarios at these four assessment positions, and the arithmetic dB differences, are summarized in Table 8.

The predicted traffic noise levels, expressed as CNEL values, for the Existing (2021) scenario appearing in Table 8 are within 2 dB (an imperceptible difference) of the measured daytime sample L_{eq} values appearing in Table 4 for the same studied positions. While the metrics are dissimilar, the good agreement is consistent with what would be anticipated between daytime L_{eq} and day-night level (L_{dn}) per Federal Transit Administration (FTA) guidance (FTA 2018) and helps validate the Traffic Noise Model (TNM) prediction technique to evaluate the plus-Project and additional studied future scenarios appearing in Table 8. In particular, outdoor ambient sound level estimation techniques appearing in the afore-cited FTA's Transit Noise and Vibration Impact Assessment Manual include guidance indicating that in proximity to dominant roadway or rail traffic noise, a daytime L_{eq} can be considered comparable to the L_{dn} value.

The City's Noise Element establishes a policy for exterior sensitive areas to be protected from high noise levels. The Noise Element sets 65 dBA CNEL for the outdoor areas and 45 dBA CNEL for interior areas as the normally acceptable levels. For the purposes of this noise analysis, such impacts are considered significant when they cause an increase of 3 dB from existing noise levels. An increase or decrease in noise level of at least 3 dB is required before any noticeable change in community response would be expected (Caltrans 2013a).

Table 8. Roadway Traffic Noise Modeling Results

Modeled Receiver # – Description	Existing (2021) Noise Level (dBA CNEL)	Existing (2021) Plus Project Noise Level (dBA CNEL)	Near-term (2025) Noise level (dBA CNEL)	Near-term (2025) Plus Project Noise level (dBA CNEL)	Horizon year (2050) Noise Level (dBA CNEL)	Horizon year (2050) plus Project Noise Level (dBA CNEL	Maximum Project-Related Noise Level Increase (dB)
ST1	67.7	68.1	67.8	68.2	68.6	69	0.4
ST2	61.2	63.6	61.2	63.6	61.6	63.9	2.4
ST3	61.7	62.1	62.4	62.6	63.9	64.1	0.4
ST4	66.2	66.3	66.3	66.5	67	67	0.2

Notes: dBA = A-weighted decibel; CNEL = Community Noise Equivalent Level; dB = decibel; ST = short-term;

Table 8 shows that at all four listed representative receivers, the addition of traffic to the roadway network as a result of potential future residential development would result in a CNEL increase of less than 3 dB at sensitive receptors, which is below the discernible level of change for the average healthy human ear. Thus, a **less-than-significant impact** is expected for proposed project-related off-site traffic noise increases affecting existing residences in the vicinity.

Traffic Noise Exposure to Future Project Occupants

Aside from exposure to aviation traffic noise, current CEQA noise-related guidelines at the state level do not require an assessment of exterior-to-interior noise intrusion, environmental noise exposure to occupants of newly-created project residences, or environmental noise exposure to exterior non-residential uses attributed to the potential future development at the proposed project site. Nevertheless, the City's CEQA guidelines and the California Building Code requires that interior background noise levels not exceed a CNEL of 45 dB within habitable rooms. Hence, the following predictive analysis of traffic noise exposure at the exteriors of occupied residences and outdoor living areas is provided below.

The ambient noise levels found in Table 8 were used to predict the existing-plus-project scenario traffic noise levels at multiple on-site exterior areas. Exterior sound levels presented in Table 8 that are higher than 65 dBA CNEL indicate potential locations where an exterior-to-interior noise analysis should be performed for the approximate future occupied residential unit on the project site.

The results from Table 8 indicate that ambient traffic noise levels could reach as high as 67.7 dBA CNEL in acoustically equivalent locations to ST1 along Las Posas Road. With the 45 dBA CNEL interior background sound level limit, this means the minimum composite sound transmission class (STC) rating for the exterior shell separating the habitable interior space from the outdoor sound level should be at least 22. The composite STC rating for the portion of a building shell that separates an interior space from the outdoors is calculated from the area-dependent contributions of its elements: windows, wall assemblies, and doors.

There is a potential for newly built residential units on the project site to feature balconies as part of the design, for which access would likely be provided by single-panel, out-swing fiberglass French doors (comparable to a Milgard Essence series model or similar from another manufacturer) or alternately sliding-type doors. For purposes of this analysis, either of these patio/balcony door design styles are assumed to feature a dual-pane glazing system similar to a standard residential window assembly (i.e., two 1/8"-thick glass panes separated by a 3/8" wide airgap) in narrow-perimeter frames compatible with modern thermal insulation (and thus energy conserving) design. The analysis also assumes that these door products feature good seals and related hardware, so that when closed, the effective sound insulating performance is represented by the glass. Viracon data indicates that such glazing should demonstrate an STC rating of 31 (Viracon 2019).

This study further assumes an exterior wall assembly that includes and is typical of modern residential building construction: one layer of 5/8" gypsum wallboard (GWB) on the interior-facing side, 2"x4" wood studs, glass fiber batt insulation in the stud cavities, and a dual-layer of 5/8" GWB on the exterior-facing side. Acoustical transmission loss (TL) data is available on this representative assembly (Halliwell 1998), and is used as part of estimating the composite STC ratings reported herein. For purposes of this analysis, the dual-layer GWB on the exterior surface approximates the mass and solidity of what may be other approved material options as determined by the Project architect, such as cement fiber siding panels, brick masonry veneer, or cement plaster attached to layers of fiberglass mat sheathing and plywood sheathing.

Table 9 summarizes the calculated net STC ratings for a set of hypothetical example occupied room facades that, if so designed and built, would be anticipated to be exposed to predicted exterior noise levels greater than 60 dBA CNEL. Details of these calculations that account for the façade surface area and its composite areas of exterior wall assembly and windows appear in Appendix D.

Clearly, an open window or open door to an adjoining patio or balcony greatly compromises the sound insulation performance of the façade wall assembly, as presented for the sample units appearing in Table 9. However, when such windows and doors are closed, all facades are anticipated to exhibit a predicted STC rating of at least 36, and thus would provide sufficient exterior-to-interior sound insulation from outdoor traffic noise to yield interior background sound levels that are less than 45 dBA CNEL and thus compliant with the City and state standards. Recall that none of the predicted exterior traffic noise levels at the studied receptor locations exceeded 67.7 dBA CNEL; thus, the STC rating value (for closed windows and doors) subtracted from these exterior noise values must result in interior noise levels of less than 45 dBA CNEL (e.g., 67 – 36 = 31 dBA CNEL, which is less than 45). This apparent requirement for closed windows and doors means that the design of these habitable rooms should feature mechanical ventilation or an air-conditioning system to provide interior comfort of the occupants. Detailed transmission loss data is included in Appendix D, Transmission Loss Predictions. Thus, the City's threshold of 45 dB CNEL within habitable rooms would not be exceeded and considered **less than significant.**

Table 9. Predicted Net Sound Transmission Class of Occupied Room façade

Occupied Room Facade	Predicted Net Sound Transmission Class (STC) for Scenario	
	*Closed Window(s) and Door **	*Open Window(s) & Closed French Door**
1st floor Bedroom, eastern façade	37	8
2nd floor Bedroom w/ balcony, eastern façade	36	11
3rd floor Bedroom, eastern façade	38	11

Source: Dudek 2022
Notes: n/a = not applicable
* Doors are only modeled for scenarios that contain the balcony door.

Stationary Operations Noise

Future residential development on the project site will add a variety of noise-producing mechanical equipment that include those presented and discussed in the following paragraphs. Most of these noise-producing equipment or sound sources would be considered stationary, or limited in mobility to a defined area.

Facility Unit Heating, Ventilation, and Air Conditioning Noise

According to the site plan future residential development would likely include cooling by rooftop-mounted air-cooled condensing [ACC] units, could expose nearby industrial-zoned land uses to aggregate stationary electro-mechanical noise emission representing the following scenario: for potential new residential buildings onsite, a cooling load of up to 40 tons of refrigeration, based on oft-used industry reference data for interior occupied building spaces of similar usage, with each potential future residential unit needing approximately two tons of refrigeration (Loren Cook Company, 2015).

For purposes of this analysis, each of the potential new occupied residential units in the first bulleted scenario would be expected to feature its own 2-ton ACC unit. Each of these ACC units would have an SPL of 68 dBA at 3 feet based on available data from a likely manufacturer (Carrier 2012). At the closest existing offsite noise-sensitive residential receptor to the west of the project site's northwestern-most potential structure in the residential-emphasizing project scenario, the predicted sound emission level from the combination of 20 operating ACC would be lower than 41 dBA L_{eq} and thus be compliant with the City's nighttime threshold of 60 dBA hourly L_{eq} for industrial-zoned land uses. Under such conditions, the operation of residential air-conditioning units would result in a less-than-significant noise impact. Details for this hypothetical stationary noise prediction scenario appear in Appendix E.

Because the measured samples of existing outdoor ambient sound levels are already in excess of 60 dBA L_{eq} during the daytime, as shown in Table 4, then FTA guidance suggests that average nighttime ambient noise levels would be at least 50 dBA L_{eq}. This is because Table 4-17 (Estimating Existing Noise Exposure for General Noise Assessment) from the aforementioned FTA guidance document shows a 10-dB difference between daytime and nighttime noise levels regardless of the type of "dominant existing noise source." On this basis, and because the predicted stationary operations noise received by the closest offsite residential receptor would be less than 50 dBA as presented in the preceding paragraphs, the potential increase in outdoor ambient noise level due to the introduction of new stationary sound sources would be no greater than a barely-perceptible three decibels and consequently considered a **less-than-significant noise impact.**

Cumulative Noise Assessment

Transportation Sources

Table 8 and its contextual discussion already addresses cumulative acoustical contribution to the outdoor sound environment that is attributed to ongoing development (and corresponding changes to proximate roadway traffic) in the project area through the near-term and horizon timeframes. With predicted changes in roadway traffic noise attributed to the proposed project shown to be less than significant in the cumulative analysis scenarios, the proposed project would not be expected to have a cumulatively considerable effect..

Construction Activities

Temporary changes to the outdoor sound environment could also occur not only due to project construction noise that has already been presented herein, but as a cumulative result of potential concurrent project construction activity noise and the noise emission from construction of other projects in the vicinity.

Due to the decrease in noise levels with distance and the presence of physical barriers (i.e., intervening buildings and topography), noise due to construction of other projects would not meaningfully combine with that of the proposed project and produce a cumulative noise effect during construction. By way of illustration, if there are two concurrent construction projects of comparable sound emission intensity, and the activity nearest to a common studied noise-sensitive receptor is compliant with the aforementioned 75 dBA 8-hour L_{eq}, then the other activity could be no closer than three times the distance of the receptor to the nearest activity and not make a cumulatively measurable contribution to the total noise exposure level. If, on the other hand, two concurrent projects were comparably close to a receptor, the cumulative noise would be one of the following:

- The louder (in dBA) of the two concurrent activities; or

- a logarithmic sum of the two activity noise levels that, per acoustic principles, cannot be more than 3 dBA greater than the louder of the two individual noise-producing activities.

In sum, cumulative construction noise is likely to be dominated by the closest or loudest activity to the receptor, and the combination will be no more than a barely perceptible difference (i.e., up to a 3 dBA change). On the basis of such a barely perceptible cumulative construction noise level occurring due to the proposed project and what may be a nearby concurrent construction activity, the impact would be considered less than significant.

Stationary Operational Sources

Akin to the preceding discussion of cumulative construction noise, operation noise from stationary equipment attributed to the proposed project (as already presented herein) and any others potentially operating in the future and in the vicinity of a common offsite noise-sensitive receptor would need to be compliant with the City's applicable standards. Cumulative contribution of the proposed project to this future aggregate noise level from multiple established projects or facilities assumed to have comparable individual noise emission from stationary sources would be bounded by the same potential outcomes as follows:

- The louder (in dBA) of the two concurrently operating projects or facilities; or
- a logarithmic sum of the two operation noise levels that, per acoustic principles, cannot be more than 3 dBA greater than the louder of the two individual levels.

In sum, cumulative operation noise is likely to be dominated by the closest or loudest project to the receptor, and the combination will be no more than a barely perceptible difference (i.e., up to a 3 dBA change). On the basis of such a barely perceptible cumulative operation noise level occurring due to the proposed project and what may be nearby and concurrent operation of offsite stationary noise sources, the impact would be considered less than significant.

b) Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

Conventional Construction Activity Vibration

Construction activities may expose persons to excessive groundborne vibration or groundborne noise, causing a potentially significant impact. Caltrans has collected groundborne vibration information related to construction activities (Caltrans 2020). Information from Caltrans indicates that continuous vibrations with a PPV of approximately 0.1 inch per second (ips) could be considered annoying on the basis of it being "strongly perceptible" by building occupants. For context, heavier pieces of construction equipment, such as a bulldozer that may be expected on the project site, have peak particle velocities of approximately 0.089 ips PPV or less at a reference distance of 25 feet (FTA 2018).

Groundborne vibration attenuates rapidly, even over short distances. The attenuation of groundborne vibration as it propagates from source to receptor through intervening soils and rock strata can be estimated with expressions found in FTA and Caltrans guidance. By way of example, for a bulldozer operating on site and as close as the northern project boundary (i.e., 150 feet from the nearest occupied property) the estimated vibration velocity level would be 0.006 ips PPV per the equation as follows (FTA 2018):

$$PPV_{rcvr} = PPV_{ref} * (25/D)^{1.5} = 0.006 = 0.089 * (25/150)^{1.5}$$

In the above equation, PPV_{rcvr} is the predicted vibration velocity at the receiver position, PPV_{ref} is the reference value at 25 feet from the vibration source (the bulldozer), and D is the actual horizontal distance to the receiver. Therefore, at this predicted PPV, the impact of vibration-induced annoyance to occupants of nearby existing homes would be less than 0.1 ips PPV and therefore less than significant.

Construction vibration, at sufficiently high levels, can also present a building damage risk. However, anticipated construction vibration associated with future development on-site would yield levels of 0.006 ips, which do not surpass the guidance limit of 0.2 to 0.3 ips PPV for preventing damage to residential structures (Caltrans 2020). Because the predicted vibration level at 150 feet is less than this guidance limit, the risk of vibration damage to nearby structures is considered **less than significant.**

c) ***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 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?***

There are no private airstrips within the vicinity of the project site. The closest airport to the project site is the McClellan Palomar Airport approximately 4.4 miles west of the site; the project site is not located within the boundaries of the land use plan adopted for this airport. Impacts from aviation overflight noise exposure would be considered **less than significant.**

INTENTIONALLY LEFT BLANK

6 Mitigation Measures

The results indicate that potential impacts during construction and operation would be less than significant. No mitigation is required.

INTENTIONALLY LEFT BLANK

7 Summary of Findings

This noise report was conducted for potential future development associated with the approval of the proposed project. The results indicate that potential impacts during construction would be less than significant. Noise impacts due to operation of the proposed project (including traffic noise) would be less than significant. No mitigation is required.

INTENTIONALLY LEFT BLANK

8 References Cited

Caltrans (California Department of Transportation). 2013. Technical Noise Supplement to the Traffic Noise Analysis Protocol. September.

Caltrans. 2020. Transportation and Construction Vibration Guidance Manual. Division of Environmental Analysis, Environmental Engineering, Hazardous Waste, Air, Noise, Paleontology Office. Sacramento, California. April.

Carrier. 2012. CA16NA 018-061 Single-Stage Air Conditioner w/ Puron Refrigerant. Catalog No: CA16NA-06PD. https://resource.carrierenterprise.com/is/content/Watscocom/carrier_ca16na03600g_article_1404816230548_en_ss?_ga=2.123164302.489492439.1570570581-792571132.1570570581

DOT (U.S. Department of Transportation). 2006. FHWA Roadway Construction Noise Model: User's Guide. Final Report. FHWA-HEP-06-015. DOT-VNTSC-FHWA-06-02. Cambridge, Massachusetts: DOT, Research and Innovative Technology Administration. Final Report. August.

Federal Highway Administration (FHWA). 2004. Traffic Noise Model (version 2.5).

FHWA. December 8, 2008. Roadway Construction Noise Model (RCNM), Software Version 1.1. U.S. Department of Transportation, Research and Innovative Technology Administration, John A. Volpe National Transportation Systems Center, Environmental Measurement and Modeling Division. Washington, D.C.

FTA (Federal Transit Administration). 2018. Transit Noise and Vibration Impact Assessment. FTA Report No. 0123. September.

Halliwell, R.E., Nightingale, T.R.T., Warnock, A.C.C., Birta, J.A. 1998. "Gypsum Board Walls: Transmission Loss Data". Internal Report IRC-IR-761. NRC-CNRC. March.

Loren Cook Company. (2015). A Handbook for The Mechanical Designer. Retrieved February 18, 2021, from https://www.lorencook.com/PDFs/Catalogs/Cookbook_Catalog.pdf

OPR (Governor's Office of Planning and Research). 2003. State of California General Plan Guidelines. October.

San Marcos, City of. 2017. City of San Marcos Municipal Code.

San Marcos, City of. 2012. City of San Marcos General Plan. Chapter 7.0, Noise Element. February 2012.

Viracon. 2019. http://www.viracon.com/pdf/ViraconAcousticPerfDataTables.pdf.

INTENTIONALLY LEFT BLANK

Appendix A

Baseline Noise Measurement Field Data

FORMS FIELD DATA REPORT

Field Noise Measurement Data

Record: 1341	
Project Name	Upham
Observer(s)	Connor Burke
Date	2021-03-10

Instrument and Calibrator Information	
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
Post-Test (dBA SPL)	94
Windscreen	Yes
Weighting?	A-WTD
Slow/Fast?	Slow
ANSI?	Yes

Monitoring	
Record #	1
Site ID	ST1
Site Location Lat/Long	33.138570, -117.193705
Begin (Time)	11:50:00
End (Time)	12:00:00
Leq	66.9
Lmax	75.9
Lmin	48.2
Other Lx?	L90, L50, L10
L90	52
L50	63.6
L10	71.2
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

FORMS FIELD DATA REPORT

Source Info and Traffic Counts

Number of Lanes	*4*
Lane Width (feet)	*10*
Roadway Width (feet)	*40*
Roadway Width (m)	*12.2*
Distance to Roadway (feet)	*20*
Distance to Roadway (m)	*6.1*
Distance Measured to Centerline or Edge of Pavement?	*Edge of Pavement*
Estimated Vehicle Speed (MPH)	*45*

Traffic Counts

Vehicle Count Summary	*A 105, MT 1, HT 2, B 0, MC 0*
Select Method for Recording Count Duration	*Enter Manually*
Counting Both Directions?	*Yes*
Count Duration (minutes)	*10*
Vehicle Count Tally	
Select Method for Vehicle Counts	*Enter Manually*
Number of Vehicles - Autos	*105*
Number of Vehicles - Medium Trucks	*1*
Number of Vehicles - Heavy Trucks	*2*
Number of Vehicles - Buses	*0*
Number of Vehicles - Motorcyles	*0*

Description / Photos

Site Photos

Photo

FORMS DUDEK FIELD DATA REPORT

Monitoring

Record #	*2*
Site ID	*ST2*
Site Location Lat/Long	*33.141330, -117.196065*
Begin (Time)	*12:10:00*
End (Time)	*12:20:00*
Leq	*61*
Lmax	*71.8*
Lmin	*45.5*
Other Lx?	*L90, L50, L10*
L90	*48.4*
L50	*53*
L10	*66.1*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Traffic*
Other Noise Sources (Background)	*Birds, 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

Site Photos

Photo

FORMS FIELD DATA REPORT

Monitoring

Record #	*3*
Site ID	*ST3*
Site Location Lat/Long	*33.140546, -117.198140*
Begin (Time)	*12:30:00*
End (Time)	*12:40:00*
Leq	*60.5*
Lmax	*71.1*
Lmin	*47.3*
Other Lx?	*L90, L50, L10*
L90	*49*
L50	*53.8*
L10	*65.6*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Traffic*
Other Noise Sources (Background)	*Birds, Distant Aircraft, Distant Industrial, Distant Traffic, Rustling Leaves*
Other Noise Sources Additional Description	*Grinder saws to the south.*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

Description / Photos

Site Photos

Photo	

FORMS DUDEK FIELD DATA REPORT

Monitoring

Record #	*4*
Site ID	*ST4*
Site Location Lat/Long	*33.138496, -117.198374*
Begin (Time)	*12:45:00*
End (Time)	*12:55:00*
Leq	*64.7*
Lmax	*74.9*
Lmin	*54.9*
Other Lx?	*L90, L50, L10*
L90	*56.2*
L50	*60.2*
L10	*68.3*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Traffic*
Other Noise Sources (Background)	*Birds, Distant Aircraft, Rustling Leaves*
Other Noise Sources Additional Description	*Pumps to the East.*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

Description / Photos

Site Photos

Photo

Appendix B

Construction Noise Modeling Input and Output

To User: bordered cells are inputs, unbordered cells have formulae

noise level limit for construction phase, per County = 75
allowable hours over which Leq is to be averaged (FTA guidance) = 8

Construction Phase	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	backhoe	4	40	78		150	68.5	8	480	70
	Dozer	3	40	82		150	72.5	8	480	73
							Total for Site Preparation Phase:			**70.5**
Grading	Excavator	2	40	81		150	71.5	8	480	70
	Grader	1	40	85		150	75.5	8	480	71
	dozer	1	40	82		150	72.5	8	480	68
	scraper	2	40	84		150	74.5	8	480	73
	backhoe	2	40	78		150	68.5	8	480	67
							Total for Grading Phase:			**70.5**
Building Construction	Crane	1	16	81		150	71.5	7	420	63
	Man lift	3	20	75		150	65.5	8	480	63
	Generator	1	50	72		150	62.5	8	480	59
	Backhoe	3	40	78		150	68.5	7	420	69
	Welder / Torch	1	40	73		150	63.5	8	480	59
							Total for Building Construction Phase:			**71.2**
Paving	Concrete Mixer Truck	2	40	79		150	69.5	8	480	68
	Roller	2	20	80		150	70.5	8	480	66
	Paver	2	50	77		150	67.5	8	480	67
							Total for Paving Phase:			**72.3**

To User: bordered cells are inputs, unbordered cells have formulae

noise level limit for construction phase, per County = 75
allowable hours over which Leq is to be averaged (FTA guidance) = 8

Construction Phase	Equipment	Total Equipment Qty	AUF % (from FHWA RCNM)	Reference Lmax @ 50 ft. from FHWA RCNM	Client Equipment Description, Data Source and/or Notes	Source to NSR Distance (ft.)	Distance-Adjusted Lmax	Allowable Operation Time (hours)	Allowable Operation Time (minutes)	Predicted 8-hour Leq
Site Preparation	backhoe	4	40	78		520	57.7	8	480	60
	Dozer	3	40	82		520	61.7	8	480	62
							Total for Site Preparation Phase:			**59.7**
Grading	Excavator	2	40	81		520	60.7	8	480	60
	Grader	1	40	85		520	64.7	8	480	61
	dozer	1	40	82		520	61.7	8	480	58
	scraper	2	40	84		520	63.7	8	480	63
	backhoe	2	40	78		520	57.7	8	480	57
							Total for Grading Phase:			**59.7**
Building Construction	Crane	1	16	81		520	60.7	7	420	52
	Man lift	3	20	75		520	54.7	8	480	52
	Generator	1	50	72		520	51.7	8	480	49
	Backhoe	3	40	78		520	57.7	7	420	58
	Welder / Torch	1	40	73		520	52.7	8	480	49
							Total for Building Construction Phase:			**60.4**
Paving	Concrete Mixer Truck	2	40	79		520	58.7	8	480	58
	Roller	2	20	80		520	59.7	8	480	56

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 C

Traffic Noise Modeling Input and Output

dudek				**29 March 2021**							
cb				**TNM 2.5**							
INPUT: ROADWAYS							**Average pavement type shall be used unless**				
PROJECT/CONTRACT:	**upham**						**a State highway agency substantiates the use**				
RUN:	**Existing**						**of a different type with the approval of FHWA**				
Roadway		**Points**									
Name	**Width**	**Name**	**No.**	**Coordinates (pavement)**			**Flow Control**			**Segment**	
				X	**Y**	**Z**	**Control Device**	**Speed Constraint**	**Percent Vehicles Affected**	**Pvmt Type**	**On Struct?**
	ft			ft	ft	ft		mph	%		
Roadway7	65.0	point19	19	1,579,981.8	12,030,832.0	0.00				Average	
		point20	20	1,579,212.1	12,031,163.0	0.00					
Roadway9	65.0	point23	23	1,579,995.4	12,030,832.0	0.00				Average	
		point24	24	1,580,198.5	12,031,306.0	0.00					
Roadway10	65.0	point25	25	1,581,324.9	12,030,265.0	0.00				Average	
		point26	26	1,581,485.1	12,030,644.0	0.00					
S Pacific St	65.0	point27	27	1,579,545.4	12,029,790.0	0.00				Average	
		point28	28	1,579,987.0	12,030,811.0	0.00					
Las Posas	65.0	point29	29	1,580,809.2	12,028,567.0	0.00				Average	
		point30	30	1,580,753.5	12,028,877.0	0.00				Average	
		point31	31	1,581,327.1	12,030,267.0	0.00					
Roadway13	65.0	point32	32	1,578,870.2	12,030,069.0	0.00				Average	
		point33	33	1,579,535.2	12,029,775.0	0.00					
Linda Vista	65.0	point34	34	1,579,549.5	12,029,765.0	0.00				Average	
		point35	35	1,580,865.1	12,029,222.0	0.00					
Roadway15	65.0	point36	36	1,580,915.9	12,029,227.0	0.00				Average	
		point37	37	1,581,129.1	12,029,247.0	0.00				Average	
		point38	38	1,581,768.8	12,029,445.0	0.00					
Roadway16	65.0	point39	39	1,579,413.2	12,029,489.0	0.00				Average	
		point40	40	1,579,538.5	12,029,773.0	0.00					
La Mirada	65.0	point43	43	1,580,001.5	12,030,822.0	0.00				Average	
		point44	44	1,581,300.1	12,030,267.0	0.00					

dudek 29 March 2021
cb TNM 2.5

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: upham
RUN: Existing

Roadway Name	Points Name	No.	Segment Autos V veh/hr	Autos S mph	MTrucks V veh/hr	MTrucks S mph	HTrucks V veh/hr	HTrucks S mph	Buses V veh/hr	Buses S mph	Motorcycles V veh/hr	Motorcycles S mph
Roadway7	point19	19	0	0	0	0	0	0	0	0	0	0
	point20	20										
Roadway9	point23	23	0	0	0	0	0	0	0	0	0	0
	point24	24										
Roadway10	point25	25	0	0	0	0	0	0	0	0	0	0
	point26	26										
S Pacific St	point27	27	465	35	9	35	4	35	0	0	0	0
	point28	28										
Las Posas	point29	29	1193	45	24	45	12	45	0	0	0	0
	point30	30	1193	45	24	45	12	45	0	0	0	0
	point31	31										
Roadway13	point32	32	0	0	0	0	0	0	0	0	0	0
	point33	33										
Linda Vista	point34	34	892	45	18	45	9	45	0	0	0	0
	point35	35										
Roadway15	point36	36	0	0	0	0	0	0	0	0	0	0
	point37	37	0	0	0	0	0	0	0	0	0	0
	point38	38										
Roadway16	point39	39	0	0	0	0	0	0	0	0	0	0
	point40	40										
La Mirada	point43	43	339	35	7	35	3	35	0	0	0	0
	point44	44										

dudek							29 March 2021					
cb							TNM 2.5					
INPUT: RECEIVERS												
PROJECT/CONTRACT:	upham											
RUN:	Existing											
Receiver												
Name	No.	#DUs	Coordinates (ground)			Height	Input Sound Levels and Criteria					Active
			X	Y	Z	above	Existing	Impact Criteria		NR		in
						Ground	LAeq1h	LAeq1h	Sub'l	Goal		Calc.
			ft	ft	ft	ft	dBA	dBA	dB	dB		
ST3	1	1	1,579,789.1	12,030,466.0	0.00	4.92	60.50	66	10.0	8.0		Y
ST4	2	1	1,580,427.0	12,029,338.0	0.00	4.92	64.70	66	10.0	8.0		Y
ST1	3	1	1,581,199.6	12,029,810.0	0.00	4.92	66.90	66	10.0	8.0		Y
ST2	4	1	1,580,433.8	12,030,680.0	0.00	4.92	61.00	66	10.0	8.0		Y

dudek
cb

29 March 2021
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT:	upham
RUN:	Existing
BARRIER DESIGN:	INPUT HEIGHTS
ATMOSPHERICS:	68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
ST3	1	1	60.5	61.7	66	1.2	10	----	61.7	0.0	8	-8.0
ST4	2	1	64.7	66.2	66	1.5	10	Snd Lvl	66.2	0.0	8	-8.0
ST1	3	1	66.9	67.7	66	0.8	10	Snd Lvl	67.7	0.0	8	-8.0
ST2	4	1	61.0	61.2	66	0.2	10	----	61.2	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

dudek
cb

29 March 2021
TNM 2.5

INPUT: ROADWAYS
PROJECT/CONTRACT: upham
RUN: Existing + Project

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Roadway		Points					Flow Control			Segment	
Name	Width	Name	No.	Coordinates (pavement) X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	ft			ft	ft	ft		mph	%		
Roadway7	65.0	point19	19	1,579,981.8	12,030,832.0	0.00				Average	
		point20	20	1,579,212.1	12,031,163.0	0.00					
Roadway9	65.0	point23	23	1,579,995.4	12,030,832.0	0.00				Average	
		point24	24	1,580,198.5	12,031,306.0	0.00					
Roadway10	65.0	point25	25	1,581,324.9	12,030,265.0	0.00				Average	
		point26	26	1,581,485.1	12,030,644.0	0.00					
S Pacific St	65.0	point27	27	1,579,545.4	12,029,790.0	0.00				Average	
		point28	28	1,579,987.0	12,030,811.0	0.00					
Las Posas	65.0	point29	29	1,580,809.2	12,028,567.0	0.00				Average	
		point30	30	1,580,753.5	12,028,877.0	0.00				Average	
		point31	31	1,581,327.1	12,030,267.0	0.00					
Roadway13	65.0	point32	32	1,578,870.2	12,030,069.0	0.00				Average	
		point33	33	1,579,535.2	12,029,775.0	0.00					
Linda Vista	65.0	point34	34	1,579,549.5	12,029,765.0	0.00				Average	
		point35	35	1,580,865.1	12,029,222.0	0.00					
Roadway15	65.0	point36	36	1,580,915.9	12,029,227.0	0.00				Average	
		point37	37	1,581,129.1	12,029,247.0	0.00				Average	
		point38	38	1,581,768.8	12,029,445.0	0.00					
Roadway16	65.0	point39	39	1,579,413.2	12,029,489.0	0.00				Average	
		point40	40	1,579,538.5	12,029,773.0	0.00					
La Mirada	65.0	point43	43	1,580,001.5	12,030,822.0	0.00				Average	
		point44	44	1,581,300.1	12,030,267.0	0.00					

dudek
cb

29 March 2021
TNM 2.5

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: upham
RUN: Existing + Project

Roadway	Points												
Name	Name	No.	Segment										
			Autos		MTrucks		HTrucks		Buses		Motorcycles	
			V	S	V	S	V	S	V	S	V	S
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph
Roadway7	point19	19	0	0	0	0	0	0	0	0	0	0
	point20	20										
Roadway9	point23	23	0	0	0	0	0	0	0	0	0	0
	point24	24										
Roadway10	point25	25	0	0	0	0	0	0	0	0	0	0
	point26	26										
S Pacific St	point27	27	494	35	10	35	5	35	0	0	0	0
	point28	28										
Las Posas	point29	29	1308	45	26	45	13	45	0	0	0	0
	point30	30	1308	45	26	45	13	45	0	0	0	0
	point31	31										
Roadway13	point32	32	0	0	0	0	0	0	0	0	0	0
	point33	33										
Linda Vista	point34	34	892	45	18	45	9	45	0	0	0	0
	point35	35										
Roadway15	point36	36	0	0	0	0	0	0	0	0	0	0
	point37	37	0	0	0	0	0	0	0	0	0	0
	point38	38										
Roadway16	point39	39	0	0	0	0	0	0	0	0	0	0
	point40	40										
La Mirada	point43	43	584	35	12	35	6	35	0	0	0	0
	point44	44										

dudek							**29 March 2021**					
cb							**TNM 2.5**					
INPUT: RECEIVERS												
PROJECT/CONTRACT:	**upham**											
RUN:	**Existing + Project**											
Receiver												
Name	**No.**	**#DUs**	**Coordinates (ground)**				**Height**	**Input Sound Levels and Criteria**				**Active**
			X	**Y**	**Z**		**above**	**Existing**	**Impact Criteria**		**NR**	**in**
							Ground	**LAeq1h**	**LAeq1h**	**Sub'l**	**Goal**	**Calc.**
			ft	ft	ft		ft	dBA	dBA	dB	dB	
ST3	1	1	1,579,789.1	12,030,466.0	0.00		4.92	60.50	66	10.0	8.0	Y
ST4	2	1	1,580,427.0	12,029,338.0	0.00		4.92	64.70	66	10.0	8.0	Y
ST1	3	1	1,581,199.6	12,029,810.0	0.00		4.92	66.90	66	10.0	8.0	Y
ST2	4	1	1,580,433.8	12,030,680.0	0.00		4.92	61.00	66	10.0	8.0	Y

RESULTS: SOUND LEVELS upham

dudek 29 March 2021
cb TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: upham
RUN: Existing + Project
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
ST3	1	1	60.5	62.1	66	1.6	10	----	62.1	0.0	8	-8.0
ST4	2	1	64.7	66.3	66	1.6	10	Snd Lvl	66.3	0.0	8	-8.0
ST1	3	1	66.9	68.1	66	1.2	10	Snd Lvl	68.1	0.0	8	-8.0
ST2	4	1	61.0	63.6	66	2.6	10	----	63.6	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

dudek 29 March 2021
cb TNM 2.5

INPUT: ROADWAYS
PROJECT/CONTRACT: upham
RUN: Near Term

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Roadway		Points					Flow Control			Segment	
Name	Width	Name	No.	Coordinates (pavement)							
				X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	ft			ft	ft	ft		mph	%		
Roadway7	65.0	point19	19	1,579,981.8	12,030,832.0	0.00				Average	
		point20	20	1,579,212.1	12,031,163.0	0.00					
Roadway9	65.0	point23	23	1,579,995.4	12,030,832.0	0.00				Average	
		point24	24	1,580,198.5	12,031,306.0	0.00					
Roadway10	65.0	point25	25	1,581,324.9	12,030,265.0	0.00				Average	
		point26	26	1,581,485.1	12,030,644.0	0.00					
S Pacific St	65.0	point27	27	1,579,545.4	12,029,790.0	0.00				Average	
		point28	28	1,579,987.0	12,030,811.0	0.00					
Las Posas	65.0	point29	29	1,580,809.2	12,028,567.0	0.00				Average	
		point30	30	1,580,753.5	12,028,877.0	0.00				Average	
		point31	31	1,581,327.1	12,030,267.0	0.00					
Roadway13	65.0	point32	32	1,578,870.2	12,030,069.0	0.00				Average	
		point33	33	1,579,535.2	12,029,775.0	0.00					
Linda Vista	65.0	point34	34	1,579,549.5	12,029,765.0	0.00				Average	
		point35	35	1,580,865.1	12,029,222.0	0.00					
Roadway15	65.0	point36	36	1,580,915.9	12,029,227.0	0.00				Average	
		point37	37	1,581,129.1	12,029,247.0	0.00				Average	
		point38	38	1,581,768.8	12,029,445.0	0.00					
Roadway16	65.0	point39	39	1,579,413.2	12,029,489.0	0.00				Average	
		point40	40	1,579,538.5	12,029,773.0	0.00					
La Mirada	65.0	point43	43	1,580,001.5	12,030,822.0	0.00				Average	
		point44	44	1,581,300.1	12,030,267.0	0.00					

dudek **29 March 2021**
cb **TNM 2.5**

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: **upham**
RUN: **Near Term**

Roadway Name	Points Name	No.	Segment Autos V veh/hr	Autos S mph	MTrucks V veh/hr	MTrucks S mph	HTrucks V veh/hr	HTrucks S mph	Buses V veh/hr	Buses S mph	Motorcycles V veh/hr	Motorcycles S mph
Roadway7	point19	19	0	0	0	0	0	0	0	0	0	0
	point20	20										
Roadway9	point23	23	0	0	0	0	0	0	0	0	0	0
	point24	24										
Roadway10	point25	25	0	0	0	0	0	0	0	0	0	0
	point26	26										
S Pacific St	point27	27	539	35	11	35	5	35	0	0	0	0
	point28	28										
Las Posas	point29	29	1228	45	25	45	12	45	0	0	0	0
	point30	30	1228	45	25	45	12	45	0	0	0	0
	point31	31										
Roadway13	point32	32	0	0	0	0	0	0	0	0	0	0
	point33	33										
Linda Vista	point34	34	918	45	18	45	9	45	0	0	0	0
	point35	35										
Roadway15	point36	36	0	0	0	0	0	0	0	0	0	0
	point37	37	0	0	0	0	0	0	0	0	0	0
	point38	38										
Roadway16	point39	39	0	0	0	0	0	0	0	0	0	0
	point40	40										
La Mirada	point43	43	339	35	7	35	3	35	0	0	0	0
	point44	44										

dudek
cb

29 March 2021
TNM 2.5

INPUT: RECEIVERS
PROJECT/CONTRACT: upham
RUN: Near Term

Receiver Name	No.	#DUs	Coordinates (ground) X	Y	Z	Height above Ground	Input Sound Levels and Criteria Existing LAeq1h	Impact Criteria LAeq1h	Sub'l	NR Goal	Active in Calc.
			ft	ft	ft	ft	dBA	dBA	dB	dB	
ST3	1	1	1,579,789.1	12,030,466.0	0.00	4.92	60.50	66	10.0	8.0	Y
ST4	2	1	1,580,427.0	12,029,338.0	0.00	4.92	64.70	66	10.0	8.0	Y
ST1	3	1	1,581,199.6	12,029,810.0	0.00	4.92	66.90	66	10.0	8.0	Y
ST2	4	1	1,580,433.8	12,030,680.0	0.00	4.92	61.00	66	10.0	8.0	Y

dudek
cb

29 March 2021
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: upham
RUN: Near Term
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
ST3	1	1	60.5	62.4	66	1.9	10	----	62.4	0.0	8	-8.0
ST4	2	1	64.7	66.3	66	1.6	10	Snd Lvl	66.3	0.0	8	-8.0
ST1	3	1	66.9	67.8	66	0.9	10	Snd Lvl	67.8	0.0	8	-8.0
ST2	4	1	61.0	61.2	66	0.2	10	----	61.2	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

dudek
cb

29 March 2021
TNM 2.5

INPUT: ROADWAYS
PROJECT/CONTRACT: upham
RUN: Near term + Project

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Roadway		Points					Flow Control			Segment	
Name	Width	Name	No.	Coordinates (pavement) X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	ft			ft	ft	ft		mph	%		
Roadway7	65.0	point19	19	1,579,981.8	12,030,832.0	0.00				Average	
		point20	20	1,579,212.1	12,031,163.0	0.00					
Roadway9	65.0	point23	23	1,579,995.4	12,030,832.0	0.00				Average	
		point24	24	1,580,198.5	12,031,306.0	0.00					
Roadway10	65.0	point25	25	1,581,324.9	12,030,265.0	0.00				Average	
		point26	26	1,581,485.1	12,030,644.0	0.00					
S Pacific St	65.0	point27	27	1,579,545.4	12,029,790.0	0.00				Average	
		point28	28	1,579,987.0	12,030,811.0	0.00					
Las Posas	65.0	point29	29	1,580,809.2	12,028,567.0	0.00				Average	
		point30	30	1,580,753.5	12,028,877.0	0.00				Average	
		point31	31	1,581,327.1	12,030,267.0	0.00					
Roadway13	65.0	point32	32	1,578,870.2	12,030,069.0	0.00				Average	
		point33	33	1,579,535.2	12,029,775.0	0.00					
Linda Vista	65.0	point34	34	1,579,549.5	12,029,765.0	0.00				Average	
		point35	35	1,580,865.1	12,029,222.0	0.00					
Roadway15	65.0	point36	36	1,580,915.9	12,029,227.0	0.00				Average	
		point37	37	1,581,129.1	12,029,247.0	0.00				Average	
		point38	38	1,581,768.8	12,029,445.0	0.00					
Roadway16	65.0	point39	39	1,579,413.2	12,029,489.0	0.00				Average	
		point40	40	1,579,538.5	12,029,773.0	0.00					
La Mirada	65.0	point43	43	1,580,001.5	12,030,822.0	0.00				Average	
		point44	44	1,581,300.1	12,030,267.0	0.00					

dudek **29 March 2021**
cb **TNM 2.5**

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: **upham**
RUN: **Near term + Project**

Roadway	Points		Segment									
Name	Name	No.	Autos		MTrucks		HTrucks		Buses		Motorcycles	
			V	S	V	S	V	S	V	S	V	S
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph
Roadway7	point19	19	0	0	0	0	0	0	0	0	0	0
	point20	20										
Roadway9	point23	23	0	0	0	0	0	0	0	0	0	0
	point24	24										
Roadway10	point25	25	0	0	0	0	0	0	0	0	0	0
	point26	26										
S Pacific St	point27	27	568	35	11	35	5	35	0	0	0	0
	point28	28										
Las Posas	point29	29	1343	45	27	45	13	45	0	0	0	0
	point30	30	1343	45	27	45	13	45	0	0	0	0
	point31	31										
Roadway13	point32	32	0	0	0	0	0	0	0	0	0	0
	point33	33										
Linda Vista	point34	34	944	45	19	45	9	45	0	0	0	0
	point35	35										
Roadway15	point36	36	0	0	0	0	0	0	0	0	0	0
	point37	37	0	0	0	0	0	0	0	0	0	0
	point38	38										
Roadway16	point39	39	0	0	0	0	0	0	0	0	0	0
	point40	40										
La Mirada	point43	43	584	35	12	35	6	35	0	0	0	0
	point44	44										

dudek 29 March 2021
cb TNM 2.5

INPUT: RECEIVERS
PROJECT/CONTRACT: upham
RUN: Near term + Project

Receiver											
Name	No.	#DUs	Coordinates (ground)			Height	Input Sound Levels and Criteria				Active
			X	Y	Z	above Ground	Existing LAeq1h	Impact Criteria LAeq1h	Sub'l	NR Goal	in Calc.
			ft	ft	ft	ft	dBA	dBA	dB	dB	
ST3	1	1	1,579,789.1	12,030,466.0	0.00	4.92	60.50	66	10.0	8.0	Y
ST4	2	1	1,580,427.0	12,029,338.0	0.00	4.92	64.70	66	10.0	8.0	Y
ST1	3	1	1,581,199.6	12,029,810.0	0.00	4.92	66.90	66	10.0	8.0	Y
ST2	4	1	1,580,433.8	12,030,680.0	0.00	4.92	61.00	66	10.0	8.0	Y

dudek
cb

29 March 2021
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT:	upham
RUN:	Near term + Project
BARRIER DESIGN:	INPUT HEIGHTS
ATMOSPHERICS:	68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type	With Barrier Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	Impact	LAeq1h	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
ST3	1	1	60.5	62.6	66	2.1	10	----	62.6	0.0	8	-8.0
ST4	2	1	64.7	66.5	66	1.8	10	Snd Lvl	66.5	0.0	8	-8.0
ST1	3	1	66.9	68.2	66	1.3	10	Snd Lvl	68.2	0.0	8	-8.0
ST2	4	1	61.0	63.6	66	2.6	10	----	63.6	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

dudek **29 March 2021**
cb **TNM 2.5**

INPUT: ROADWAYS
PROJECT/CONTRACT: **upham**
RUN: **Future**

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Roadway		Points					Flow Control			Segment	
Name	Width	Name	No.	Coordinates (pavement)							
				X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	ft			ft	ft	ft		mph	%		
Roadway7	65.0	point19	19	1,579,981.8	12,030,832.0	0.00				Average	
		point20	20	1,579,212.1	12,031,163.0	0.00					
Roadway9	65.0	point23	23	1,579,995.4	12,030,832.0	0.00				Average	
		point24	24	1,580,198.5	12,031,306.0	0.00					
Roadway10	65.0	point25	25	1,581,324.9	12,030,265.0	0.00				Average	
		point26	26	1,581,485.1	12,030,644.0	0.00					
S Pacific St	65.0	point27	27	1,579,545.4	12,029,790.0	0.00				Average	
		point28	28	1,579,987.0	12,030,811.0	0.00					
Las Posas	65.0	point29	29	1,580,809.2	12,028,567.0	0.00				Average	
		point30	30	1,580,753.5	12,028,877.0	0.00				Average	
		point31	31	1,581,327.1	12,030,267.0	0.00					
Roadway13	65.0	point32	32	1,578,870.2	12,030,069.0	0.00				Average	
		point33	33	1,579,535.2	12,029,775.0	0.00					
Linda Vista	65.0	point34	34	1,579,549.5	12,029,765.0	0.00				Average	
		point35	35	1,580,865.1	12,029,222.0	0.00					
Roadway15	65.0	point36	36	1,580,915.9	12,029,227.0	0.00				Average	
		point37	37	1,581,129.1	12,029,247.0	0.00				Average	
		point38	38	1,581,768.8	12,029,445.0	0.00					
Roadway16	65.0	point39	39	1,579,413.2	12,029,489.0	0.00				Average	
		point40	40	1,579,538.5	12,029,773.0	0.00					
La Mirada	65.0	point43	43	1,580,001.5	12,030,822.0	0.00				Average	
		point44	44	1,581,300.1	12,030,267.0	0.00					

dudek 29 March 2021
cb TNM 2.5

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: upham
RUN: Future

Roadway	Points											
Name	Name	No.	Segment									
			Autos		MTrucks		HTrucks		Buses		Motorcycles	
			V	S	V	S	V	S	V	S	V	S
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph
Roadway7	point19	19	0	0	0	0	0	0	0	0	0	0
	point20	20										
Roadway9	point23	23	0	0	0	0	0	0	0	0	0	0
	point24	24										
Roadway10	point25	25	0	0	0	0	0	0	0	0	0	0
	point26	26										
S Pacific St	point27	27	755	35	15	35	7	35	0	0	0	0
	point28	28										
Las Posas	point29	29	1483	45	30	45	15	45	0	0	0	0
	point30	30	1483	45	30	45	15	45	0	0	0	0
	point31	31										
Roadway13	point32	32	0	0	0	0	0	0	0	0	0	0
	point33	33										
Linda Vista	point34	34	1066	45	21	45	10	45	0	0	0	0
	point35	35										
Roadway15	point36	36	0	0	0	0	0	0	0	0	0	0
	point37	37	0	0	0	0	0	0	0	0	0	0
	point38	38										
Roadway16	point39	39	0	0	0	0	0	0	0	0	0	0
	point40	40										
La Mirada	point43	43	381	35	7	35	3	35	0	0	0	0
	point44	44										

dudek 29 March 2021
cb TNM 2.5

INPUT: RECEIVERS
PROJECT/CONTRACT: upham
RUN: Future

Receiver Name	No.	#DUs	Coordinates (ground) X	Y	Z	Height above Ground	Input Sound Levels and Criteria Existing LAeq1h	Impact Criteria LAeq1h	Sub'l	NR Goal	Active in Calc.
			ft	ft	ft	ft	dBA	dBA	dB	dB	
ST3	1	1	1,579,789.1	12,030,466.0	0.00	4.92	60.50	66	10.0	8.0	Y
ST4	2	1	1,580,427.0	12,029,338.0	0.00	4.92	64.70	66	10.0	8.0	Y
ST1	3	1	1,581,199.6	12,029,810.0	0.00	4.92	66.90	66	10.0	8.0	Y
ST2	4	1	1,580,433.8	12,030,680.0	0.00	4.92	61.00	66	10.0	8.0	Y

dudek
cb

29 March 2021
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT:	upham
RUN:	Future
BARRIER DESIGN:	INPUT HEIGHTS
ATMOSPHERICS:	68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver												
Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
ST3	1	1	60.5	63.9	66	3.4	10	----	63.9	0.0	8	-8.0
ST4	2	1	64.7	67.0	66	2.3	10	Snd Lvl	67.0	0.0	8	-8.0
ST1	3	1	66.9	68.6	66	1.7	10	Snd Lvl	68.6	0.0	8	-8.0
ST2	4	1	61.0	61.6	66	0.6	10	----	61.6	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

dudek 29 March 2021
cb TNM 2.5

INPUT: ROADWAYS
PROJECT/CONTRACT: upham
RUN: Future + Project

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Roadway		Points					Flow Control			Segment	
Name	Width	Name	No.	Coordinates (pavement)			Control	Speed	Percent	Pvmt	On
				X	Y	Z	Device	Constraint	Vehicles Affected	Type	Struct?
	ft			ft	ft	ft		mph	%		
Roadway7	65.0	point19	19	1,579,981.8	12,030,832.0	0.00				Average	
		point20	20	1,579,212.1	12,031,163.0	0.00					
Roadway9	65.0	point23	23	1,579,995.4	12,030,832.0	0.00				Average	
		point24	24	1,580,198.5	12,031,306.0	0.00					
Roadway10	65.0	point25	25	1,581,324.9	12,030,265.0	0.00				Average	
		point26	26	1,581,485.1	12,030,644.0	0.00					
S Pacific St	65.0	point27	27	1,579,545.4	12,029,790.0	0.00				Average	
		point28	28	1,579,987.0	12,030,811.0	0.00					
Las Posas	65.0	point29	29	1,580,809.2	12,028,567.0	0.00				Average	
		point30	30	1,580,753.5	12,028,877.0	0.00				Average	
		point31	31	1,581,327.1	12,030,267.0	0.00					
Roadway13	65.0	point32	32	1,578,870.2	12,030,069.0	0.00				Average	
		point33	33	1,579,535.2	12,029,775.0	0.00					
Linda Vista	65.0	point34	34	1,579,549.5	12,029,765.0	0.00				Average	
		point35	35	1,580,865.1	12,029,222.0	0.00					
Roadway15	65.0	point36	36	1,580,915.9	12,029,227.0	0.00				Average	
		point37	37	1,581,129.1	12,029,247.0	0.00				Average	
		point38	38	1,581,768.8	12,029,445.0	0.00					
Roadway16	65.0	point39	39	1,579,413.2	12,029,489.0	0.00				Average	
		point40	40	1,579,538.5	12,029,773.0	0.00					
La Mirada	65.0	point43	43	1,580,001.5	12,030,822.0	0.00				Average	
		point44	44	1,581,300.1	12,030,267.0	0.00					

dudek **29 March 2021**
cb **TNM 2.5**

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: **upham**
RUN: **Future + Project**

Roadway	Points												
Name	Name	No.	Segment										
			Autos		MTrucks		HTrucks		Buses		Motorcycles	
			V	S	V	S	V	S	V	S	V	S
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph
Roadway7	point19	19	0	0	0	0	0	0	0	0	0	0
	point20	20										
Roadway9	point23	23	0	0	0	0	0	0	0	0	0	0
	point24	24										
Roadway10	point25	25	0	0	0	0	0	0	0	0	0	0
	point26	26										
S Pacific St	point27	27	784	35	16	35	8	35	0	0	0	0
	point28	28										
Las Posas	point29	29	1598	45	32	45	16	45	0	0	0	0
	point30	30	1598	45	32	45	16	45	0	0	0	0
	point31	31										
Roadway13	point32	32	0	0	0	0	0	0	0	0	0	0
	point33	33										
Linda Vista	point34	34	1066	45	21	45	10	45	0	0	0	0
	point35	35										
Roadway15	point36	36	0	0	0	0	0	0	0	0	0	0
	point37	37	0	0	0	0	0	0	0	0	0	0
	point38	38										
Roadway16	point39	39	0	0	0	0	0	0	0	0	0	0
	point40	40										
La Mirada	point43	43	626	35	12	35	6	35	0	0	0	0
	point44	44										

dudek 29 March 2021
cb TNM 2.5

INPUT: RECEIVERS
PROJECT/CONTRACT: upham
RUN: Future + Project

Receiver Name	No.	#DUs	Coordinates (ground) X	Y	Z	Height above Ground	Input Sound Levels and Criteria: Existing LAeq1h	Impact Criteria LAeq1h	Sub'l	NR Goal	Active in Calc.
			ft	ft	ft	ft	dBA	dBA	dB	dB	
ST3	1	1	1,579,789.1	12,030,466.0	0.00	4.92	60.50	66	10.0	8.0	Y
ST4	2	1	1,580,427.0	12,029,338.0	0.00	4.92	64.70	66	10.0	8.0	Y
ST1	3	1	1,581,199.6	12,029,810.0	0.00	4.92	66.90	66	10.0	8.0	Y
ST2	4	1	1,580,433.8	12,030,680.0	0.00	4.92	61.00	66	10.0	8.0	Y

dudek
cb

29 March 2021
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: upham
RUN: Future + Project
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
ST3	1	1	60.5	64.1	66	3.6	10	----	64.1	0.0	8	-8.0
ST4	2	1	64.7	67.0	66	2.3	10	Snd Lvl	67.0	0.0	8	-8.0
ST1	3	1	66.9	69.0	66	2.1	10	Snd Lvl	69.0	0.0	8	-8.0
ST2	4	1	61.0	63.9	66	2.9	10	----	63.9	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Appendix D

Transmission Loss Prediction

Type A.2, bedroom with ***Closed Windows***

37 = approx. STC

	qty	width	height	Square feet	
material or element #1				105	Exterior Wall
material or element #2	2	3	5	30	vinyl window (dual pane)
material or element #3				0	
material or element #4	0	0	0	0	
material or element #5				0	opening
total surface		15	9	135	arbitrary total surface area

Octave Band Center Frequency (OBCF, Hz)

TL Data Source		125	250	500	1000	2000	4000
NRC-CNRC IC-IR-761 (p. 25: G16_WS90(406)_MFB90_2G16)	Exterior Wall	16	40	41	48	43	52
2 x 5/8" GWB, 2"x4" wood, 24" o.c., fiber batt fill, 1 x 5/8" GWB	material #1 τ	0.02512	0.0001	7.94328E-05	1.6E-05	5E-05	6.3E-06
available TL data for comparable assembly:	vinyl window (dual pane)	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass + 3/8" airspace + 1/8" glass	material #2 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
available TL data for comparable assembly:	0	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass + 3/8" airspace + 1/8" glass	material #3 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
available TL data for comparable assembly:	0	17	21	26	29	31	34
Bies & Hansen (1996), Table 8.1, "solid hardwood...", 43mm thick	material #4 τ	0.01995	0.00794	0.002511886	0.00126	0.00079	0.0004
	opening	0	0	0	0	0	0
	material #5 τ	1	1	1	1	1	1
	composite TL	17	29	33	41	44	42
enter desired STC value: 37	prospective STC curve	21	30	37	40	41	41
sum of negative differentials: -9	differentials	-4	-1	-4	1	3	1

Type A.2 bedRoom with ***Open Windows***

8 = approx. STC

	qty	width	height	Square feet	
material or element #1				60	Exterior Wall
material or element #2	1	3	5	15	vinyl window (dual pane)
material or element #3				0	
material or element #4	0	0	0	0	
material or element #5	1	3	5	15	opening
total surface		10	9	90	arbitrary total surface area

Octave Band Center Frequency (OBCF, Hz)

TL Data Source		125	250	500	1000	2000	4000
NRC-CNRC IC-IR-761 (p. 25: G16_WS90(406)_MFB90_2G16)	Exterior Wall	16	40	41	48	43	52
2 x 5/8" GWB, 2"x4" wood, 24" o.c., fiber batt fill, 1 x 5/8" GWB	material #1 τ	0.02512	0.0001	7.94328E-05	1.6E-05	5E-05	6.3E-06
available TL data for comparable assembly:	vinyl window (dual pane)	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass + 3/8" airspace + 1/8" glass	material #2 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
available TL data for comparable assembly:	0	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass + 3/8" airspace + 1/8" glass	material #3 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
available TL data for comparable assembly:	0	17	21	26	29	31	34
Bies & Hansen (1996), Table 8.1, "solid hardwood...", 43mm thick	material #4 τ	0.01995	0.00794	0.002511886	0.00126	0.00079	0.0004
	opening	0	0	0	0	0	0
	material #5 τ	1	1	1	1	1	1
	composite TL	7	8	8	8	8	8
enter desired STC value: 8	prospective STC curve	-8	1	8	11	12	12
sum of negative differentials: -12	differentials	15	7	0	-3	-4	-4

*Tpye E Bedroom with **Closed Windows** and optional deck door*

36 = approx. STC

	qty	width	height	Square feet	
material or element #1				51	Exterior Wall
material or element #2	1	3	5	15	vinyl window (dual pane)
material or element #3				0	
material or element #4	1	3	8	24	French Door Glazing (dual pane)
material or element #5				0	opening
total surface		10	9	90	arbitrary total surface area

Octave Band Center Frequency (OBCF, Hz)

TL Data Source		125	250	500	1000	2000	4000
NRC-CNRC IC-IR-761 (p. 25: G16_WS90(406)_MFB90_2G16)	Exterior Wall	16	40	41	48	43	52
2 x 5/8" GWB, 2"x4" wood, 24" o.c., fiber batt fill, 1 x 5/8" GWB	material #1 τ	0.02512	0.0001	7.94328E-05	1.6E-05	5E-05	6.3E-06
available TL data for comparable assembly:	vinyl window (dual pane)	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass + 3/8" airspace + 1/8" glass	material #2 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
available TL data for comparable assembly:	0	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass + 3/8" airspace + 1/8" glass	material #3 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
	French Door Glazing (dual pane)	23	23	27	35	47	36
	material #4 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
	opening	0	0	0	0	0	0
	material #5 τ	1	1	1	1	1	1
	composite TL	18	27	30	38	44	39
enter desired STC value: 36	prospective STC curve	20	29	36	39	40	40
sum of negative differentials: -11	differentials	-2	-2	-6	-1	4	-1

Type E Bedroom with Open Windows and closed optional deck door

11 = approx. STC

	qty	width	height	Square feet	
material or element#!				51	Exterior Wall
material or element #2	1	1.5	5	7.5	vinyl window (dual pane)
material or element #3				0	
material or element #4	1	3	8	24	French Door Glazing (dual pane)
material or element #5	1	1.5	5	7.5	opening
total surface		10	9	90	arbitrary total surface area

Octave Band Center Frequency (OBCF, Hz)

TL Data Source		125	250	500	1000	2000	4000
NRC-CNRC IC-IR-761 (p. 25: G16_WS90(406)_MFB90_2G16)	Exterior Wall	16	40	41	48	43	52
2 x 5/8" GWB, 2"x4" wood, 24" o.c., fiber batt fill, 1 x 5/8" GWB	material #1 τ	0.02512	0.0001	7.94328E-05	1.6E-05	5E-05	6.3E-06
available TL data for comparable assembly:	vinyl window (dual pane)	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass +3/8" airspace + 1/8" glass	material #2 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
available TL data for comparable assembly:	0	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass +3/8" airspace + 1/8" glass	material #3 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
	French Door Glazing (dual pane)	23	23	27	35	47	36
	material #4 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
	opening	0	0	0	0	0	0
	material #5 τ	1	1	1	1	1	1
	composite TL	10	11	11	11	11	11
enter desired STC value: 11	prospective STC curve	-5	4	11	14	15	15
sum of negative differentials: -12	differentials	15	7	0	-3	-4	-4

*Type F Bedroom with **Closed Windows***

38 = approx. STC

	qty	width	height	Square feet	
material or element #1				75	Exterior Wall
material or element #2	1	3	5	15	vinyl window (dual pane)
material or element #3	0	0	0	0	
material or element #4	0	0	0	0	
material or element #5				0	opening
total surface		10	9	90	arbitrary total surface area

Octave Band Center Frequency (OBCF, Hz)

TL Data Source		125	250	500	1000	2000	4000
NRC-CNRC IC-IR-761 (p. 25: G16_WS90(406)_MFB90_2G16)	Exterior Wall	16	40	41	48	43	52
2 x 5/8" GWB, 2"x4" wood, 24" o.c., fiber batt fill, 1 x 5/8" GWB	material #1 τ	0.02512	0.0001	7.94328E-05	1.6E-05	5E-05	6.3E-06
available TL data for comparable assembly:	vinyl window (dual pane)	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass + 3/8" airspace + 1/8" glass	material #2 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
available TL data for comparable assembly:	0	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass + 3/8" airspace + 1/8" glass	material #3 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
	0						
	material #4 τ	1	1	1	1	1	1
	opening	0	0	0	0	0	0
	material #5 τ	1	1	1	1	1	1
	composite TL	17	30	34	42	43	43
enter desired STC value 38	prospective STC curve	22	31	38	41	42	42
sum of negative differentials -10	differentials	-5	-1	-4	1	1	1

Type F Bedroom with Open Windows

11 = approx. STC

	qty	width	height	Square feet	
material or element #1				75	Exterior Wall
material or element #2	1	1.5	5	7.5	vinyl window (dual pane)
material or element #3				0	
material or element #4				0	
material or element #5	1	1.5	5	7.5	opening
total surface		10	9	90	arbitrary total surface area

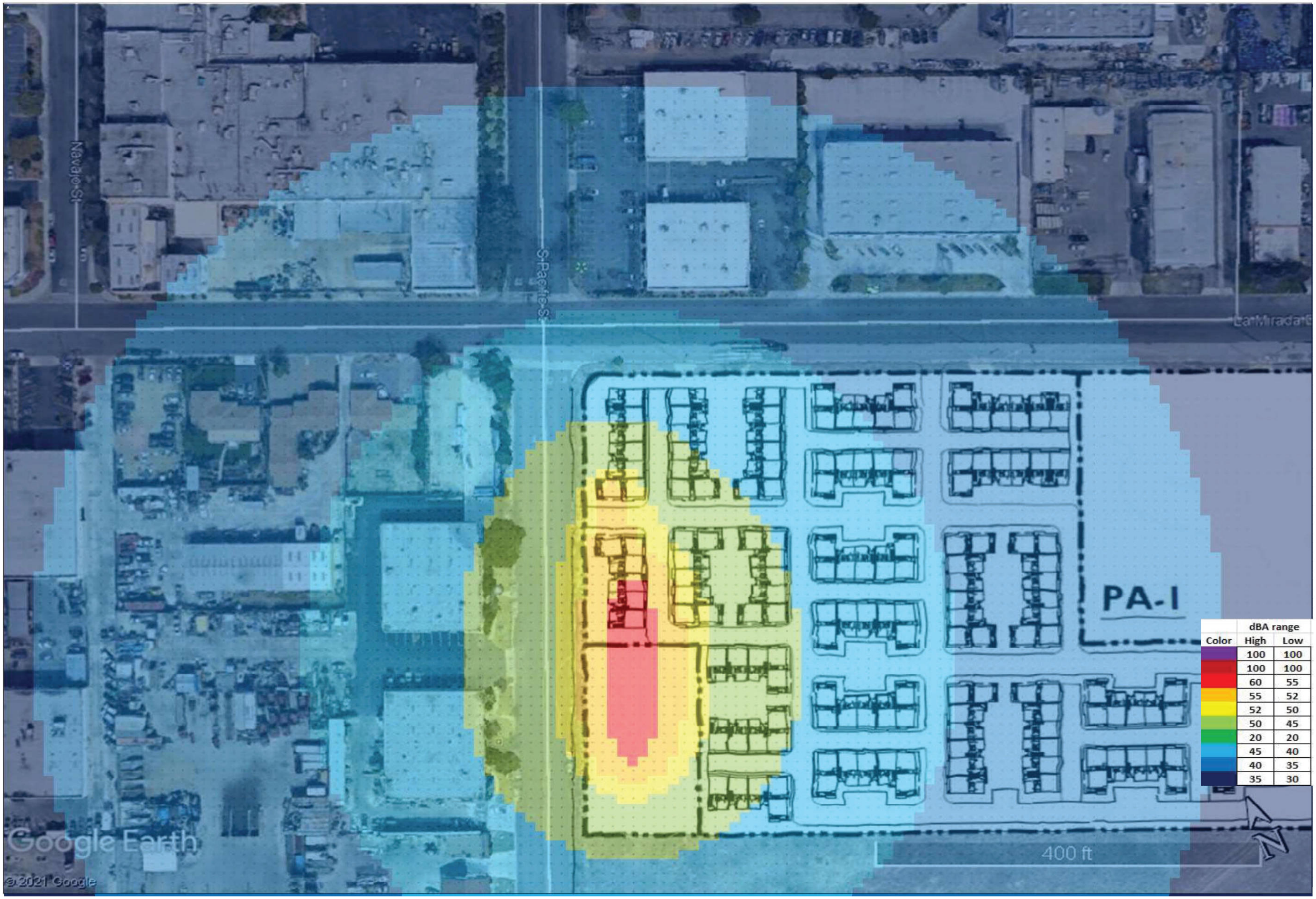
Octave Band Center Frequency (OBCF, Hz)

TL Data Source		125	250	500	1000	2000	4000
NRC-CNRC IC-IR-761 (p. 25: G16_WS90(406)_MFB90_2G16)	Exterior Wall	16	40	41	48	43	52
2 x 5/8" GWB, 2"x4" wood, 24" o.c., fiber batt fill, 1 x 5/8" GWB	material #1 τ	0.02512	0.0001	7.94328E-05	1.6E-05	5E-05	6.3E-06
available TL data for comparable assembly:	vinyl window (dual pane)	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass + 3/8" airspace + 1/8" glass	material #2 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
available TL data for comparable assembly:	0	23	23	27	35	47	36
Viracon 5/8" overall - 1/8" glass + 3/8" airspace + 1/8" glass	material #3 τ	0.00501	0.00501	0.001995262	0.00032	2E-05	0.00025
	0						
	material #4 τ	1	1	1	1	1	1
	opening	0	0	0	0	0	0
	material #5 τ	1	1	1	1	1	1
	composite TL	10	11	11	11	11	11
enter desired STC value 11	prospective STC curve	-5	4	11	14	15	15
sum of negative differentials -12	differentials	15	7	0	-3	-4	-4

Appendix E

Residential HVAC Noise Prediction

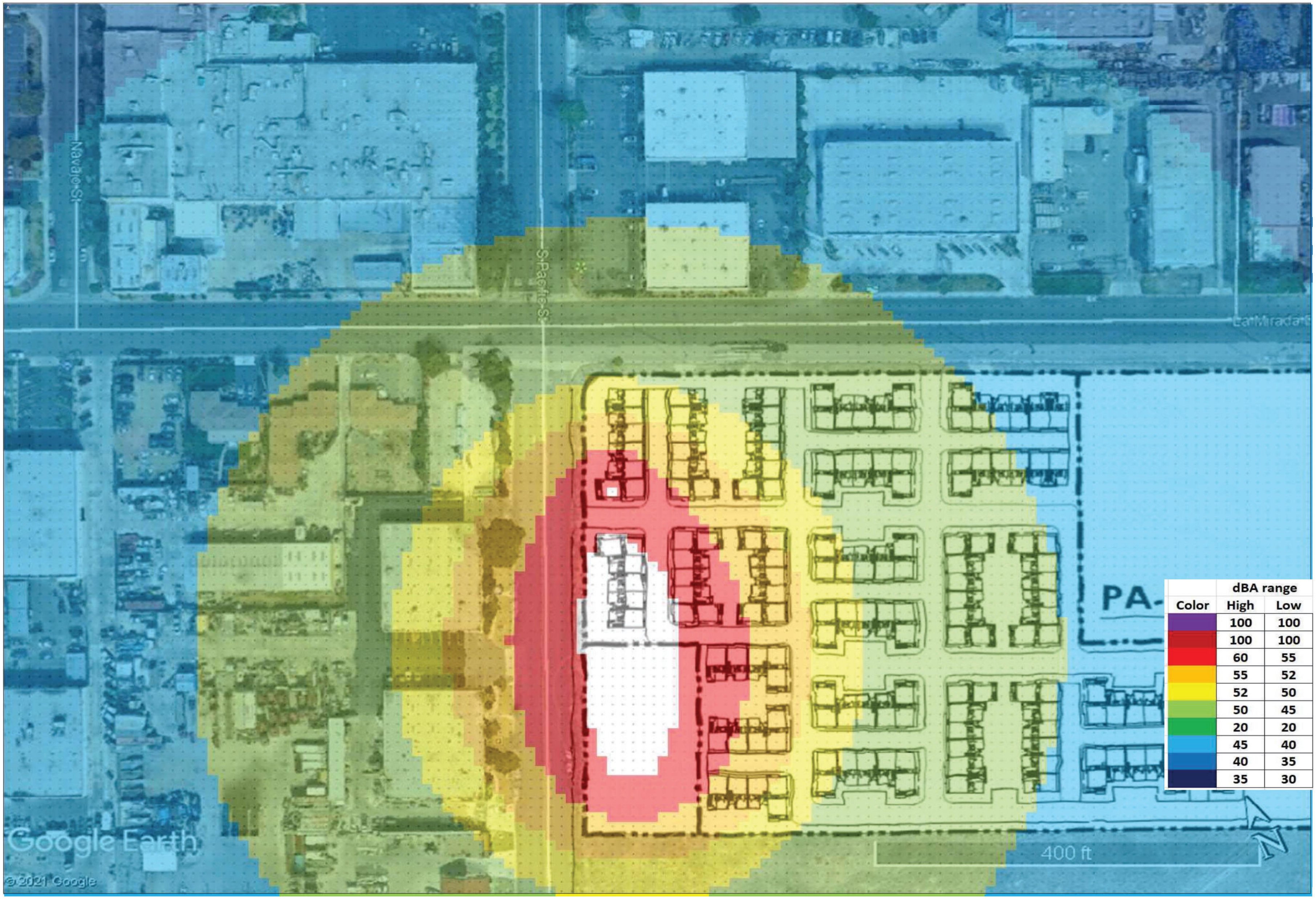
PACIFIC GENERAL PLAN AMENDMENT/REZONE PROJECT- Residential HVAC Noise Prediction



HVAC residential

prepared by Dudek - DRAFT - 3/30/2021

PACIFIC GENERAL PLAN AMENDMENT/REZONE PROJECT- Commercial HVAC Noise Prediction



HVAC commercial

prepared by Dudek - DRAFT - 3/30/2021