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MEMORANDUM

To:	Land Development LLC PO Box 12409 El Cajon, CA 92022
From:	Connor Burke (Dudek)
Subject:	Noise Analysis for the Valley View Carlsbad Project
Date:	27 July 2020
Attachment(s):	A: Baseline Outdoor Ambient Sound Level Survey Detail B: Construction Noise Model Input and Output Data C: Traffic Noise Model (v. 2.5) Input and Output Data D: Operational Noise Model Input and Output Data

Dudek is pleased to submit this noise impact assessment to assist the City of Carlsbad (City) with initial environmental planning requirements for the proposed Valley View Carlsbad Project (project).

This memorandum estimates potential noise and vibration impacts from construction and operation of the project in accordance with the California Environmental Quality Act (CEQA) Guidelines.

The contents and organization of this memorandum are as follows: project description, environmental setting, regulatory setting, noise and vibration impacts assessment, conclusions, and references cited.

1 Project Description

The project includes construction of an 11,404-square-foot, two-story office building on a portion of an undeveloped, approximately 6.34-acre site (Figure 1, Project Location). The first floor of the building would consist of a parking garage with 1,067 square-feet of building area (consisting of a lobby and utility rooms) and the second floor would include 10,337 square-feet of office space (Figure 2, Site Plan).

2 Environmental Setting

2.1 Acoustics Fundamentals

2.1.1 Terminology

Pressure fluctuations, traveling as waves through air from a source, exert a force perceived by the human ear as sound. Sound pressure level (often referred to generally as “sound level” or “noise level”) is expressed by way of a logarithmic scale in decibels (dB) that represent magnitude of these air pressure waves with respect to the threshold of average human hearing. The human ear is more sensitive to middle and higher frequencies (those usually associated with speech) of the audible spectrum, especially when the noise levels are quieter; thus, to accommodate for this phenomenon, a decibel weighting system was developed to mimic this human hearing frequency response. This frequency weighting called the "A" scale is typically used for quantifying typical environmental sound levels that de-emphasizes the low frequency components of the sound in a manner similar to the response of an average healthy human ear. An A-weighted sound level is thus described in units of "dBA" and distinguishes the value from a "flat" or unweighted dB value. In a manner similar to the scaling of temperature on a thermometer, Table 1 provides examples of common indoor and outdoor sound sources having A-weighted levels that "line-up" with the listed dB values.

Table 1: Typical Sound Levels in the Environment and Industry

Common Outdoor Activities	Noise Level (dB)	Common Indoor Activities
—	110	Rock band
Jet flyover at 300 meters (1,000 feet)	100	—
Gas lawn mower at 1 meter (3 feet)	90	—
Diesel truck at 15 meters (50 feet), at 80 kph (50 mph)	80	Food blender at 1 meter (3 feet)
		Garbage disposal at 1 meter (3 feet)
Noisy urban area, daytime	70	Vacuum cleaner at 3 meters (10 feet)
gas lawn mower at 30 meters (100 feet)		
Commercial area	60	Normal speech at 1 meter (3 feet)
Heavy traffic at 90 meters (300 feet)		
Quiet urban daytime	50	Large business office
		Dishwasher, next room
Quiet urban nighttime	40	Theater, large conference room (background)
Quiet suburban nighttime	30	Library
Quiet rural night time	20	Bedroom at night, concert hall (background)
—	10	Broadcast/recording studio
Lowest threshold of human hearing	0	Lowest threshold of human hearing

Source: Caltrans 2013a.
Notes: kph = kilometers per hour; mph = miles per hour

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The equivalent noise level L_{eq}, also referred to as the energy-average sound level, is a single numerical value representing the fluctuating sound level in decibels (dB) over a specified period of time. It is a sound-energy average of the fluctuating level and is equal to a constant unchanging sound of that dB level. Community noise sources often vary continuously, being the product of many acoustical contributors at various distances from a listener position. Many of these noise sources, in combination, tend to constitute a relatively stable but indistinct background sound environment. This background, added to perceptibly dominant acoustical contributors (i.e., those that are the loudest and/or closest to the listener position) makes the overall "ambient" sound that a sound level meter can detect with its microphone and quantify as an L_{eq} over a specified measurement duration.

Noise levels are generally higher during the daytime and early evening when traffic (including airplanes), commercial, and industrial activity is the greatest. However, noise sources experienced during nighttime hours when background levels are generally lower can be potentially more conspicuous and irritating to the receiver. In order to evaluate noise in a way that considers periodic fluctuations experienced throughout the day and night, a concept termed "community noise equivalent level" (CNEL) was developed. The CNEL scale represents a time-weighted 24-hour average noise level based on the A-weighted equivalent (L_{eq}) sound level. But more than merely a 24-hour L_{eq}, CNEL accounts for the increased noise sensitivity during the evening hours (7 p.m. to 10 p.m.) and nighttime hours (10 p.m. to 7 a.m.) by adding 5 dB to the hourly average sound levels occurring during the evening hours and 10 dB to the hourly average sound levels occurring during nighttime hours.

2.1.2 Exterior Noise Distance Attenuation

Noise sources are largely classified in two forms: 1) point sources, such as stationary equipment or a group of construction vehicles and equipment working within a spatially limited area at a given time; and 2) line sources, such as a roadway with a large number of pass-by sources (motor vehicles). Sound generated by a point source typically diminishes (attenuates) at a rate of 6.0 dBA for each doubling of distance from the source to the receptor at acoustically "hard" sites and at a rate of 7.5 dBA for each doubling of distance from source to receptor at acoustically "soft" sites. These attenuation rates would also be expected for sound propagation away from a horizontal area source, which can be approximated as a single point such as the geographic center of the area. By comparison, sound generated by a line source (such as a roadway) typically attenuates at a rate of 3.0 dBA for each doubling of distance from the source to the receptor at acoustically "hard" sites and at a rate of 4.5 dBA for each doubling of distance from source to receptor at acoustically "soft" sites.

Sound levels can also be attenuated by man-made or natural barriers. For the purpose of a sound attenuation discussion, hard, smooth, or otherwise acoustically reflective surfaces do not provide any excess ground-effect attenuation and are characteristic of sealed asphalt roads, bodies of water, and hard-packed soils. An acoustically soft or absorptive surface, on the other hand, is exemplified by fresh-fallen snow, tilled soils, or thickly-vegetated ground cover.

2.1.3 Vibration

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Vibration can be a serious concern, causing buildings to shake and rumbling sounds to be heard. In contrast to noise, vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of vibration are trains, buses on rough roads, and construction activities, such as blasting, pile driving, and heavy earthmoving equipment.

Several different descriptors are used to quantify vibration. Peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. PPV is most frequently used to describe vibration impacts to buildings and is usually measured in inches per second (ips). The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body and is defined as the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to describe RMS amplitude with respect to a reference quantity. The decibel notation acts to compress, and thus make more convenient for presentation and discussion purposes, the range of numbers required to describe vibration.

High levels of vibration may cause risk of or actual damage to buildings. However, most people consider vibration to be an annoyance that can affect concentration or disturb sleep. In addition, high levels of vibration can interfere with processes or equipment that are highly sensitive to vibration (e.g., electron microscopes). Most perceptible indoor vibration is caused by sources within buildings, such as operation of mechanical equipment, movement of people, or slamming of doors. Typical outdoor sources of perceptible vibration are construction equipment, steel-wheeled trains, and traffic on rough roads. If the roadway is smooth, which means there are little or no bumps that could cause a slight wheel drop or other force impulse, the vibration from traffic is rarely perceptible.

2.1.4 Sensitive Receptors

Noise- and vibration-sensitive land uses are locations where people reside or where the presence of unwanted sound and/or vibration could adversely affect the use of the land. Residences, schools, hospitals, guest lodging, libraries, and some passive recreation areas would be considered noise and vibration sensitive and may warrant unique measures for protection from intruding noise.

Sensitive receptors near the project site include existing single-family residential uses to the north, the closest of which are located approximately 185 feet northeast from the project site boundary. These sensitive receptors represent the nearest residential land uses with the potential to be impacted by construction and operation of the proposed project. Additional sensitive receptors are located farther from the project site in the surrounding community and would be less impacted by noise and vibration levels than the above-listed sensitive receptors.

2.2 Regulatory Setting

2.2.1 Federal

Federal Transit Administration

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.

2.2.2 State

California Code of Regulations, Title 24

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).

California Department of Health Services Guidelines

The California Department of Health Services has developed guidelines of community noise acceptability for use by local agencies (OPR 2017). 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

The normally acceptable exterior noise level for transient lodging use is up to 65 dBA CNEL. Conditionally acceptable exterior noise levels range up to 70 dBA CNEL for transient lodging.

California Department of Transportation

In its Transportation and Construction Vibration Guidance Manual (Caltrans 2013b), the California Department of Transportation (Caltrans) recommends 0.5 ips PPV as a threshold for the avoidance of structural damage 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 2013b) 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 in the range of 0.2-0.25 ips PPV would find it “distinctly perceptible” or “annoying” and thus a likely significant impact. 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.

2.2.32 Local

The project site is located in the City of Carlsbad (City). The following guidance relating to noise is relevant to the proposed project.

City of Carlsbad Noise Guidelines Manual

The City’s Noise Guidelines Manual is primarily intended to address community noise issues related to land use. The City’s Noise Guidelines Manual summarizes the City’s General Plan Noise Element policies, provides a distillation of the science of noise, explains procedures for the processing of a project, lists preferred methods for the mitigation of noise, and presents a preferred noise report format. Additionally, the City’s Noise Guidelines Manual lists typical conditions of approval relative to noise control (City of Carlsbad 1994). The City’s Noise Guidelines Manual does not address noise issues such as animal noise, noise from parties and loud gatherings, motor vehicle noise, or general nuisance noise, for which the best resource is the Carlsbad Municipal Code (Carlsbad Municipal Code, Chapter 8.48, Noise).

City of Carlsbad Municipal Code

Carlsbad Municipal Code Chapter 8.48 outlines regulations for limitation of hours for construction (i.e., the erection, demolition, alteration, or repair of any building or structure or the grading or excavation of land) that creates disturbing, excessive, or offensive noise. Construction can occur Monday through Friday from 7 a.m. to 6 p.m., and Saturday 8 a.m. to 6 p.m.; no work can be conducted on Sundays or on federal holidays. Carlsbad Municipal Code Chapter 8.48 also outlines exceptions that may be granted by the City for circumstances such as emergency repairs required to protect the health and safety of the community.

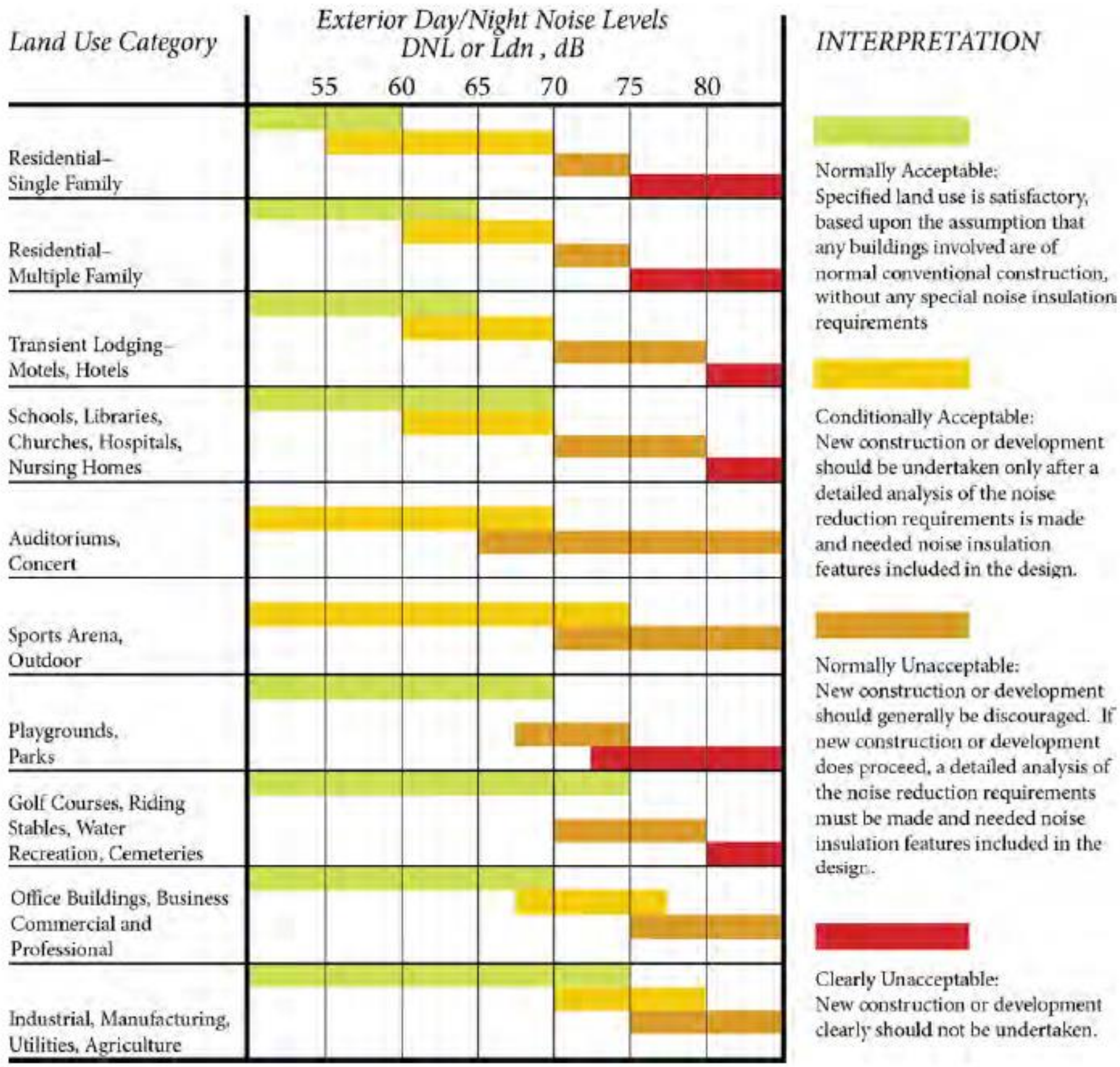
City of Carlsbad General Plan Noise Standards

The Noise Element of the City's General Plan (City of Carlsbad 2015) includes several standards for noise that are applicable to the proposed project, as discussed below.

Community Noise Exposure

Table 2, Land Use Compatibility for Community Noise Environments (reproduced from City of Carlsbad 2015, Table 5-1), presents the community noise exposure matrix, establishing criteria the City uses to evaluate land use compatibility based on noise emanating from all sources.

Table 2. Land Use Compatibility for Community Noise Environments



Source: City of Carlsbad 2015, Noise Element. Table 5-1.

Allowable Noise Exposure

Table 3, Allowable Noise Exposure (reproduced from City of Carlsbad 2015, Table 5-2), presents acceptable limits of noise for various land uses for both exterior and interior environments from transportation sources. Note that Table 2 provides standards to help the City establish the appropriateness of locating specific uses in noise-sensitive environments, and Table 3 provides standards that development must attain through noise attenuation measures.

The limits in Table 3 are based on guidelines provided by the California Office of Planning and Research. As shown in Table 3, the allowable noise exposure for commercial and office uses is 65 dBA CNEL in outdoor activity areas, and 50 dBA CNEL in habitable interior spaces (e.g., living rooms, bedrooms). The 65 dBA CNEL outdoor activity area and 50 dBA CNEL indoor living area standards would be applicable to the proposed project.

Table 3. Allowable Noise Exposure[1]

Land Use	Outdoor Activity[2,3] Areas (dBA CNEL)	Interior Spaces (dBA CNEL)
Residential	60[4]	45
Motels, Hotels	65	45
Hospitals, Residential Care Facilities, Schools, Libraries, Museums, Churches, Day Care Facilities	65	45
Playgrounds, Parks, Recreation Uses	65	50
Commercial and Office Uses	65	50
Industrial Uses	70	65

Source: City of Carlsbad 2013, Table 5-2.

1 Development proposed within the McClellan-Palomar Airport Area of Influence shall also be subject to the noise compatibility policies contained in the ALUCP [Airport Land Use Compatibility Plan].

2 For non-residential uses, where an outdoor activity area is not proposed, the standard does not apply. Where the location of outdoor activity areas is unknown, the exterior noise level standard shall be applied to the property line of the receiving use.

3 Where it is not possible to reduce noise in outdoor activity areas to the allowable maximum, levels up to 5 dB higher may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.

4 An exterior noise exposure level of 65 dBA CNEL is allowable for residential uses in a mixed-use project and for residential uses within the McClellan-Palomar Airport Area of Influence, pursuant to the noise compatibility policies contained in the ALUCP.

Table 4 (reproduced from City of Carlsbad 2015, Table 5-3) provides City standards for noise from non-transportation noise sources, including on-site stationary equipment and machinery such as heating, ventilation, and air conditioning (HVAC) equipment. These standards apply to the noise sources themselves, as measured at the edge of the property line; noise caused by motor vehicles traveling to and from the site is exempt from this standard.

Table 4. Performance Standards for Non-Transportation Sources (As Measured at Property Line of Source/Sensitive Use)

Noise Level Descriptor	Daytime (7 A.M. to 10 P.M.)	Nighttime (10 P.M. to 7 A.M.)
Hourly L_{eq}, dB	55	45
Maximum Level, dB	75	65

Source: City of Carlsbad 2013, Table 5-3.
Note: Each of the noise levels specified above shall be lowered by 5 dB for simple tone noises, noises consisting primarily of speech or music, or for recurring impulsive noises.

3 Existing Measurements

SPL measurements were conducted near the proposed project site on June 30, 2020, to quantify and characterize the existing outdoor ambient sound levels. Table 5 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 5 feet above the ground.

Two (2) short-term (ST) noise level measurement locations (ST1–ST2) that represent existing noise-sensitive receivers were selected on and near the proposed project site. These locations are depicted as receivers ST1–ST2 on Figure 3, Noise Measurement Locations. The measured L_{eq} and L_{max} noise levels are provided in Table 5. The primary noise sources at the sites identified in Table 5 consist of traffic along adjacent roadways, the sounds of leaves rustling, and birdsong. As shown in Table 5, the measured SPL ranged from approximately 55.3 dBA L_{eq} at ST1 to 42.1 dBA L_{eq} at ST2. Beyond the summarized information presented in Table 5, detailed noise measurement data is included in Attachment A, Baseline Outdoor Ambient Sound Level Survey Detail.

Table 5. Measured Baseline Outdoor Ambient Noise Levels

Site	Location/Address	Date/Time	Leq	Lmax
ST1	West of Palmer Way, adjacent from project site	2020-06-30, 12:00 PM to 12:15 PM	55.3	81.4
ST2	South of Sunny Creek Road	2020-06-30, 12:25 PM to 12:40 PM	42.1	47.6

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 above 55 dBA due largely to its proximity to Palmer Way, the closest roadway to the proposed project; ST2 is near Sunny Creek Road, a transportation route with much less traffic than compared to that of Palmer Way.

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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 related 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 regulates construction noise by restricting the allowable hours of construction. Chapter 8.48 of the City of Carlsbad Municipal Code (CCMC) exempts construction noise from the stationary noise standards, provided that construction occurs between 7:00 a.m. and 6:00 p.m., Monday through Friday, and 8:00 a.m. to 6:00 p.m., Saturday. Through adherence to the limitation of allowable construction times provided in the CCMC, the construction-related noise levels would not exceed any standards. However, the apparent proximity of existing residential receptors to the north of the proposed project site suggests that source-to-receiver distances could be as close as 185 feet. Additionally, most construction equipment and vehicles on a project site do not operate continuously. Therefore, consistent with the FTA guidance mentioned in Section 2, Regulatory Setting, this analysis will use 80 dBA L_{eq} over an 8-hour period as the construction noise impact criterion during daytime hours 7:00 a.m. and 6:00 p.m. Monday through Friday, and 8:00 a.m. to 6:00 p.m., Saturday.
- 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 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 the proposed project exceeded 55 dBA hourly L_{eq} at the property line from 7:00 a.m. to 9:59 p.m., and 45 dBA hourly L_{eq} 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.

The following Section 5 considers each of these three significance criteria, evaluating potential impacts with respect to relevant regulations, standards, and guidance that have been introduced in Section 2.

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 standards of other agencies?

Short-Term Construction

Construction activities would occur during the City's allowable hours of operation. The noise levels generated by construction equipment would vary depending upon factors such as the type and specific model of the equipment, the operation being performed, and the condition of the equipment. The average sound level of the construction activity also depends upon the amount of time that the equipment operates and the intensity of the construction during the time period of interest. Construction would involve several temporary phases of onsite activities including site preparation, grading, building construction, paving, and architectural coating. The typical maximum noise levels for various pieces of construction equipment at a distance of 50 feet are presented in Table 6. Project construction equipment would include standard equipment such as backhoes, graders, dozers, cement trucks, pavers, rollers, and miscellaneous trucks.

Table 6. 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
Dump Truck	76
Dozer	82
Generator	72
Paver	77

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

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 6), and the distance from the noise-sensitive receiver to the construction zone. 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 Attachment B, Construction Noise Model Input and Output Data, and produce the predicted results displayed in Table 7.

Table 7. Construction Noise Modeling Summary Results

	Nearest Receiver to Project Property Line (185)	*Nearest Receiver to Project Geographic Center (285)*
Site Preparation	72	68
Grading	72	68
Building Construction	68	64
Paving	69	65
Architectural Coating	63	59

Two predicted levels appear in Table 7 for each construction phase: 1) construction noise received by the nearest receiver when a portion of the anticipated construction equipment onsite (e.g., grader) is working at the closest edge of the project boundary to the adjacent receiver, such as at the limits of site preparation or grading; and 2) construction noise from all expected equipment onsite, with an average location defined by the geographic center of the project site. Although the higher predicted construction noise levels are with respect to activities on or near the project boundary, these levels still would not exceed the FTA 80 dBA L_{eq} 8-hour noise level criterion. The highest noise levels from project construction are predicted to occur during site preparation and grading activities when noise levels from construction would be as high as 72 dBA L_{eq} at the nearest existing residences, approximately 185 feet away. At typical distances (which includes equipment operation distributed across the site, not just at the closest point to adjacent residences), construction noise would range from approximately 58 to 68 dBA L_{eq}. Therefore, on the basis of these predicted levels being less than the FTA guidance threshold, temporary construction-related noise impacts attributed to the proposed project would be less than significant.

Long-Term Operational

Increase of Off-Site Roadway Traffic Noise

The proposed project would result in the contribution of additional vehicle trips on local arterial roadways (i.e., Palmer Way), which could result in increased traffic noise levels at adjacent noise-sensitive land uses. Attachment C, Traffic Noise Model (v. 2.5) Input and Output Data, contains a spreadsheet with traffic volume data (average daily trips [ADT]) converted to peak hour traffic for Palmer Way. These peak hour volumes were calculated by taking 10 percent of the average daily traffic and using a vehicle distribution of 97 percent autos, 2 percent medium trucks, and 1 percent heavy trucks. Consistent with the worked example in the Caltrans Technical Noise Supplement ("TeNS") that is considered 'fairly typical', peak hour volume is assumed to be 10 percent of ADT (Caltrans 2013a). In particular, the proposed project would generate 229 ADTs along Palmer Way (Mizuta Traffic Consulting, 2020). 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 2020) and existing plus project. Existing traffic volumes for 2020 were obtained from the San Diego Association of Governments Transportation Forecast Information Center (SANDAG 2020).

Traffic noise levels were modeled at representative noise-sensitive receivers ST1 and ST2, as shown in Figure 3. Demonstrating validity of the TNM model setup for this study, predicted traffic noise levels for the existing (2020) without proposed project case shown in Table 8 compare well (i.e., within an average difference of 3 dBA, a barely detectable difference) with the measured L_{eq} magnitudes of ST1. Hence, on the basis of the TNM model accuracy for the existing (2020) without project case using existing ADTs, future traffic noise levels using plus-project ADT as input parameters can be predicted with confidence.

The City's Noise Element establishes a policy for exterior use areas of sensitive land uses to be protected from high noise levels. The Noise Element sets 65 dBA CNEL for the outdoor (i.e., exterior use) areas and 50 dBA CNEL for interior areas (e.g., commercial and office indoor space) as the upper limit for normally acceptable levels. In addition, for the purposes of this noise analysis, traffic-related noise impacts are considered significant when they cause an increase of 3 dB or more 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. Off-site Roadway Traffic Noise Modeling Results

Modeled Receiver Tag (Location Description)	Existing (2020) Noise Level	Existing with project Noise Level	Maximum Project-Related Noise Level Increase
	(dBA CNEL)	(dBA CNEL)	(dB)
ST1 West of Palmer Way, adjacent to project site	55.7	56.0	0.3
ST2 Nearest Resident	29.7	29.8	0.1

dBA = A-weighted decibel; CNEL = Community Noise Equivalent Level; dB = decibel.

Table 8 shows that at both listed representative receivers, the addition of proposed project traffic to the roadway network would result in a CNEL increase of less than 1 dB, which is an indiscernible 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.

Stationary Operations Noise

The proposed project is expected to feature "stationary" producers of noise associated with onsite operations that are distinct from the transportation noise studied in the preceding section. The assumed major onsite operating noise sources are as follows:

- The 11,404-square-foot office building would feature ten packaged air-conditioner units on its roof, which this analysis assumes would be something akin to 4-ton (i.e., of refrigeration or cooling capacity) units resembling Carrier CA16NA 048 models and each having individual reference sound power level of 78 dBA (76 dBA if equipped with “sound shield”, Carrier 2012).

Table 9 below shows the estimated combination of this onsite operational noise sources and the applicable City of Carlsbad noise thresholds. Attachment D, Operational Noise Model Input and Output Data, provides details of the calculated values appearing in Table 9. No exceedances with respect to the municipal standards are expected; thus, operational noise impact from stationary sources should be less than significant.

Table 9. Predicted Project Stationary Operations Noise at Nearest Sensitive Receptors

Predicted Stationary Ops Noise Level ($L_{eq\ hour}$)	41
Nighttime hourly L_{eq} Limit (commercial zone)	45
Exceedance?	no

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

Construction activities may expose occupants of buildings to excessive groundborne vibration or groundborne noise, causing a potentially significant impact. Caltrans has collected groundborne vibration information related to construction activities (Caltrans 2013b), which indicates that continuous vibrations with a PPV of approximately 0.2 ips is considered annoying. For context, heavier pieces of operating construction equipment, such as a bulldozer that may be expected on the project site, exhibit peak particle velocities of approximately 0.089 ips or less at a reference distance of 25 feet (DOT 2006).

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., 185 feet from the nearest receiving sensitive land use) the estimated vibration velocity level would be 0.004 ips per the equation as follows (FTA 2006):

$PPV_{rcvr} = PPV_{ref} * (25/D)^{1.5} = 0.004 = 0.089 * (25/185)^{1.5}$

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 for the nearest community receiver, the impact of vibration-induced annoyance to occupants of nearby existing homes would be **less than significant.**

Construction vibration, at sufficiently high levels, can also present a building damage risk. However, anticipated construction vibration associated with the proposed project would yield levels of 0.004 ips PPV, which do not surpass the guidance limit of 0.3 ips PPV for preventing damage to residential structures (Caltrans 2013b).

Because the predicted vibration level at 185 feet is less than this threshold, the risk of vibration damage to nearby structures is considered **less than significant.**

Once operational, the proposed project would not be expected to feature major onsite producers of groundborne vibration. Anticipated mechanical systems like heating, ventilation, and air-conditioning units are designed and manufactured to feature rotating (fans, motors) and reciprocating (compressors) components that are well-balanced with isolated vibration within or external to the equipment casings. On these bases, potential vibration impacts due to proposed project operation would be **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 0.7 miles southeast of the site. According to the McClellan Palomar Airport Noise Compatibility Program, the project site is not located within any identified noise contours and would therefore not expose people residing or working in the project area to excessive noise levels (San Diego County Airport Land Use Commission. 2010). Impacts from aviation overflight noise exposure would be **less than significant.**

5 Conclusions

Based upon the modeled construction, traffic and operational noise, predicted sound levels are not in excess of City standards at the Project boundary with its neighbors.

We trust that this technical memorandum meets your Project needs with the City. Should you have any questions or require additional information, please do not hesitate to contact Mark Storm at (760) 479-4297, mstorm@dudek.com; or, Connor Burke at (760) 479-4272, cburke@dudek.com.

Sincerely,

Mark Storm, INCE Bd. Cert.
Acoustic Services Manager

Connor Burke
Environmental Analyst

Att. A: Baseline Outdoor Ambient Sound Level Survey Detail
B: Construction Noise Model Input and Output Data
C: Traffic Noise Model (v. 2.5) Input and Output Data
D: Operational Noise Model Input and Output Data

6 References

City of Carlsbad. 1994. City of Carlsbad Noise Guidelines Manual. Prepared by Nolte and Associates. 1994; amended July 2013.

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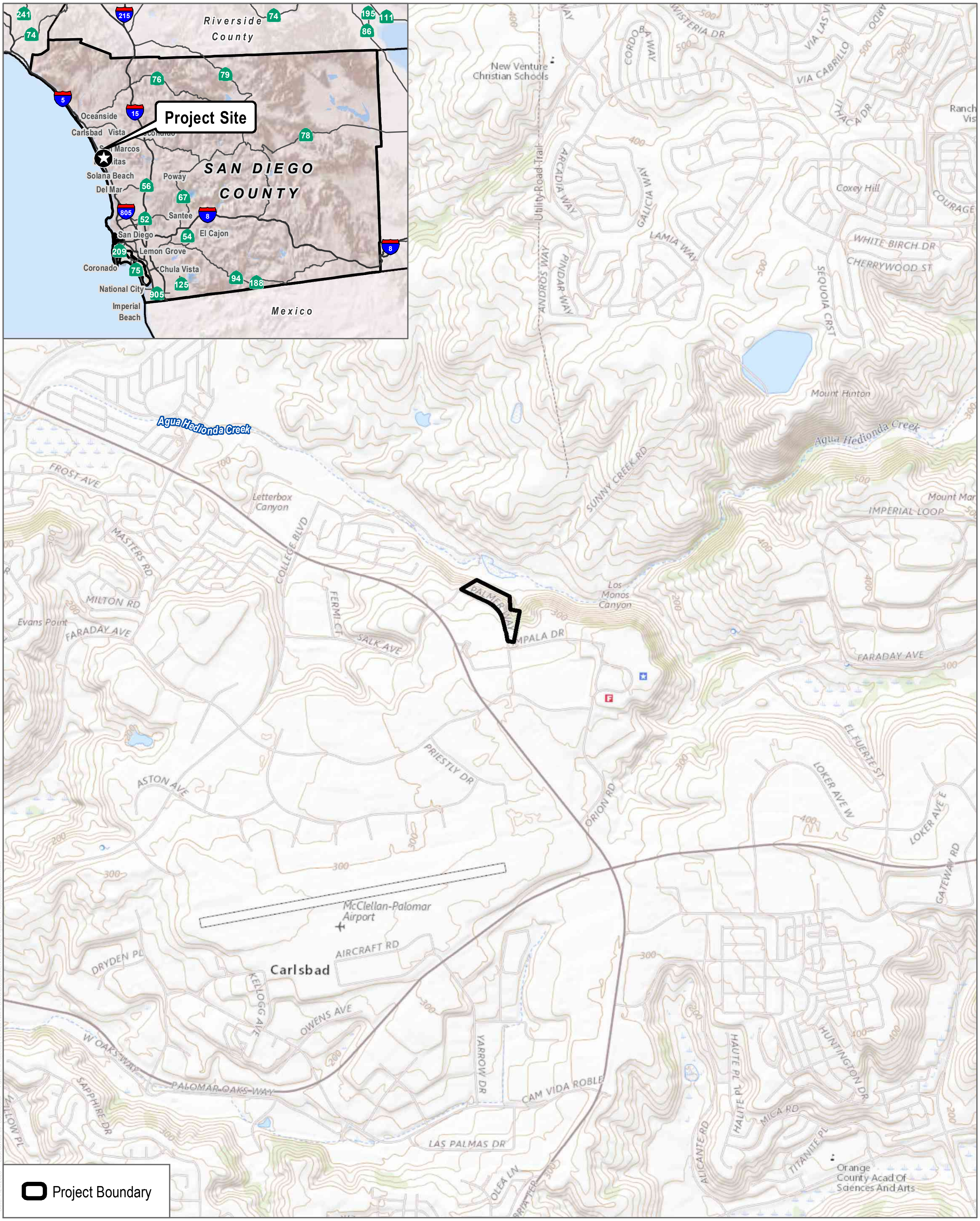


SOURCE: USGS US Topo Series San Luis Rey and Encinitas Quadrangles

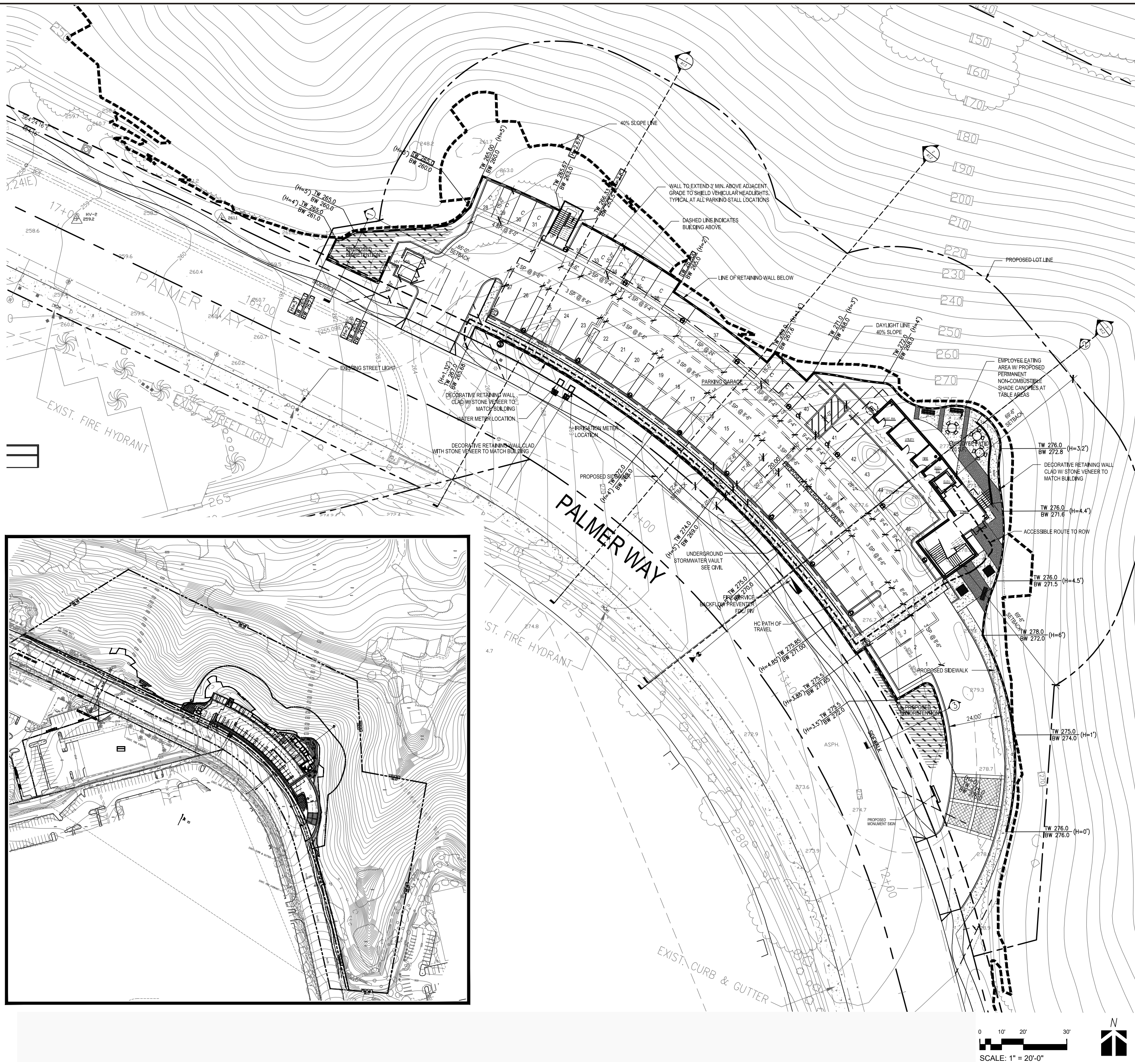
DUDEK

0 1,000 2,000 Feet

FIGURE 1

Project Location

Valley View Project



SOURCE: KIRK MOELLER ARCHITECTS INC. 2020

DUDEK

FIGURE 2

Project Site

Valley View Project

SOURCE: SanGIS 2017; Open Street Maps 2019

DUDEK

0 75 150 Feet

FIGURE 3

Noise Measurement Locations

Valley View Project

Attachment A

Baseline Outdoor Ambient Sound Level Survey Detail

FORMS FIELD DATA REPORT

Field Noise Measurement Data

Record: 1288	
Project Name	*Valley view*
Observer(s)	*Connor Burke*
Date	*2020-06-30*

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	*33.140642, -117.273057*
Begin (Time)	*12:00:00*
End (Time)	*12:15:00*
Leq	*55.3*
Lmax	*81.4*
Lmin	*40.7*
Other Lx?	*L90, L50, L10*
L90	*42.3*
L50	*45.2*
L10	*58.1*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Parking lot activity.*
Other Noise Sources (Background)	*Birds, Distant Aircraft, Distant Conversations / Yelling, Rustling Leaves*
Other Noise Sources Additional Description	*Lunch crowds at coffee shop/bakery. Parking lot noise.*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

FIELD DATA REPORT

Description / Photos

Site Photos

Photo	
Comments / Description	*Facing east*

Monitoring

Record #	*2*
Site ID	*ST2*
Site Location Lat/Long	*33.143230, -117.273146*
Begin (Time)	*12:25:00*
End (Time)	*12:40:00*
Leq	*42.1*
Lmax	*47.6*
Lmin	*38.7*
Other Lx?	*L90, L50, L10*
L90	*39.6*
L50	*41.5*
L10	*43.8*
Other Lx (Specify Metric)	*L*
Primary Noise Source	*Rustling leaves*
Other Noise Sources (Background)	*Birds, Distant Aircraft, Distant Traffic, Rustling Leaves*
Other Noise Sources Additional Description	*Distant construction*
Is the same instrument and calibrator being used as previously noted?	*Yes*
Are the meteorological conditions the same as previously noted?	*Yes*

FORMS DUDEK FIELD DATA REPORT

Description / Photos

Attachment B

Construction Noise Model Input and Output Data

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 (example: 8 for County of San Diego, 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	Grader	1	40	85		285	69.9	8	480	66
	Dozer	1	40	82		285	66.9	8	480	63
	Backhoe	1	40	78		285	62.9	8	480	59
							Total for Site Preparation Phase:			**68.2**
Grading	Grader	1	40	85		285	69.9	8	480	66
	Dozer	1	40	82		285	66.9	8	480	63
	Backhoe	1	40	78		285	62.9	8	480	59
							Total for Grading Phase:			**68.2**
Building Construction	Crane	1	16	81		285	65.9	8	480	58
	Man Lift	1	20	75		285	59.9	8	480	53
	Generator	1	50	72		285	56.9	8	480	54
	Backhoe	1	40	78		285	62.9	8	480	59
	Welder / Torch	3	40	73		285	57.9	8	480	59
							Total for Building Construction Phase:			**64.1**
Architectural Coating	Compressor (air)	1	40	78		285	62.9	8	480	59
							Total for Architectural Coating Phase:			**58.9**
Paving	Concrete Mixer Truck	1	40	79		285	63.9	8	480	60
	Roller	1	20	80		285	64.9	8	480	58
	Backhoe	1	40	78		285	62.9	8	480	59
	Paver	1	50	77		285	61.9	8	480	59
							Total for Paving Phase:			**65.0**

Attachment C

Traffic Noise Model (v. 2.5) Input and Output Data

Dudek 24 July 2020
CB TNM 2.5

INPUT: ROADWAYS
PROJECT/CONTRACT: Valley View Carlsbad
RUN: Existing

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

Roadway Name	Width	Points Name	No.	Coordinates (pavement) X	Y	Z	Flow Control Control Device	Speed Constraint	Percent Vehicles Affected	Segment Pvmt Type	On Struct?
	ft			ft	ft	ft		mph	%		
Palmer Way	60.0	point1	1	1,557,093.2	12,029,942.0	0.00				Average	
		point2	2	1,557,063.2	12,030,078.0	0.00				Average	
		point3	3	1,556,993.1	12,030,348.0	0.00				Average	
		point4	4	1,556,975.5	12,030,430.0	0.00				Average	
		point5	5	1,556,908.2	12,030,539.0	0.00				Average	
		point6	6	1,556,824.5	12,030,608.0	0.00				Average	
		point7	7	1,556,582.6	12,030,730.0	0.00				Average	
		point8	8	1,556,289.0	12,030,867.0	0.00					

Dudek			**24 July 2020**										
CB			**TNM 2.5**										
INPUT: TRAFFIC FOR LAeq1h Volumes													
PROJECT/CONTRACT:	**Valley View Carlsbad**												
RUN:	**Existing**												
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	
Palmer Way	point1	1	261	25	5	25	2	25	0	0	0	0	
	point2	2	261	25	5	25	2	25	0	0	0	0	
	point3	3	261	25	5	25	2	25	0	0	0	0	
	point4	4	261	25	5	25	2	25	0	0	0	0	
	point5	5	261	25	5	25	2	25	0	0	0	0	
	point6	6	261	25	5	25	2	25	0	0	0	0	
	point7	7	261	25	5	25	2	25	0	0	0	0	
	point8	8											

Dudek **24 July 2020**
CB **TNM 2.5**

INPUT: RECEIVERS
PROJECT/CONTRACT: **Valley View Carlsbad**
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	
ST1	1	1	1,556,902.1	12,030,464.0	0.00	4.92	0.00	66	10.0	8.0	Y
ST2	2	1	1,557,150.6	12,031,272.0	-150.00	4.92	0.00	66	10.0	8.0	Y

Dudek							**24 July 2020**					
CB							**TNM 2.5**					
							Calculated with TNM 2.5					
RESULTS: SOUND LEVELS												
PROJECT/CONTRACT:		**Valley View Carlsbad**										
RUN:		**Existing**										
BARRIER DESIGN:		**INPUT HEIGHTS**						**Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.**				
ATMOSPHERICS:		**68 deg F, 50% RH**										
Receiver												
Name	**No.**	**#DUs**	**Existing**	**No Barrier**					**With Barrier**			
			LAeq1h	**LAeq1h**		**Increase over existing**		**Type**	**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
ST1	1	1	0.0	55.7	66	55.7	10	----	55.7	0.0	8	-8.0
ST2	2	1	0.0	29.7	66	29.7	10	----	29.7	0.0	8	-8.0

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

Dudek **24 July 2020**
CB **TNM 2.5**

INPUT: ROADWAYS
PROJECT/CONTRACT: **Valley View Carlsbad**
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									
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	%		
Palmer Way	60.0	point1	1	1,557,093.2	12,029,942.0	0.00				Average	
		point2	2	1,557,063.2	12,030,078.0	0.00				Average	
		point3	3	1,556,993.1	12,030,348.0	0.00				Average	
		point4	4	1,556,975.5	12,030,430.0	0.00				Average	
		point5	5	1,556,908.2	12,030,539.0	0.00				Average	
		point6	6	1,556,824.5	12,030,608.0	0.00				Average	
		point7	7	1,556,582.6	12,030,730.0	0.00				Average	
		point8	8	1,556,289.0	12,030,867.0	0.00					

Dudek			**24 July 2020**										
CB			**TNM 2.5**										
INPUT: TRAFFIC FOR LAeq1h Volumes													
PROJECT/CONTRACT:	**Valley View Carlsbad**												
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	
Palmer Way	point1	1	283	25	5	25	2	25	0	0	0	0	
	point2	2	283	25	5	25	2	25	0	0	0	0	
	point3	3	283	25	5	25	2	25	0	0	0	0	
	point4	4	283	25	5	25	2	25	0	0	0	0	
	point5	5	283	25	5	25	2	25	0	0	0	0	
	point6	6	283	25	5	25	2	25	0	0	0	0	
	point7	7	283	25	5	25	2	25	0	0	0	0	
	point8	8											

Dudek						**24 July 2020**						
CB						**TNM 2.5**						
INPUT: RECEIVERS												
PROJECT/CONTRACT:	**Valley View Carlsbad**											
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		
ST1	1	1	1,556,902.1	12,030,464.0	0.00	4.92	0.00	66	10.0	8.0	Y	
ST2	2	1	1,557,150.6	12,031,272.0	-150.00	4.92	0.00	66	10.0	8.0	Y	

Dudek		24 July 2020
CB		TNM 2.5
		Calculated with TNM 2.5
RESULTS: SOUND LEVELS		
PROJECT/CONTRACT:	Valley View Carlsbad	
RUN:	Existing + Project	
BARRIER DESIGN:	INPUT HEIGHTS	Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.
ATMOSPHERICS:	68 deg F, 50% RH	

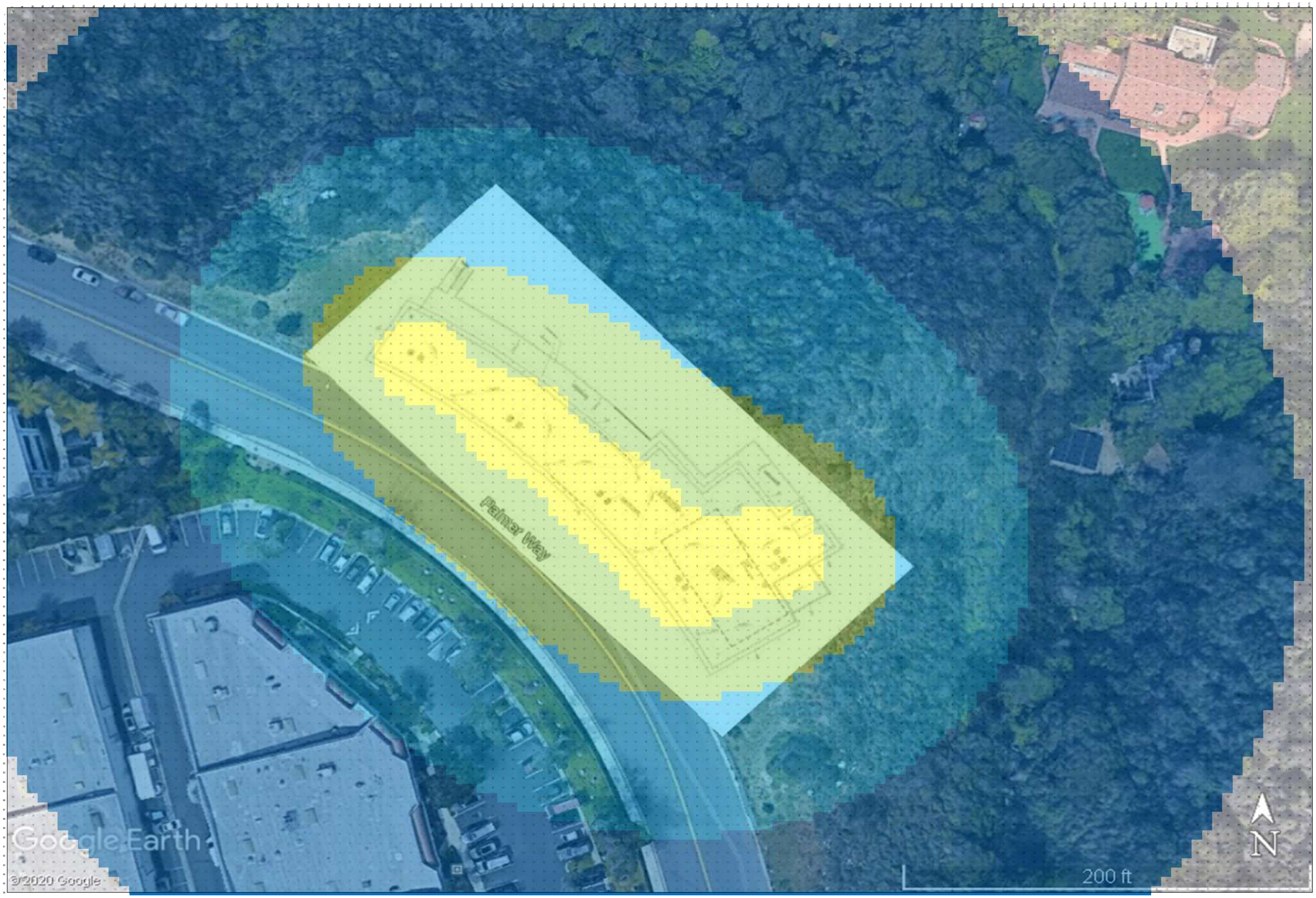
Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	Impact	LAeq1h	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
ST1	1	1	0.0	56.0	66	56.0	10	----	56.0	0.0	8	-8.0
ST2	2	1	0.0	29.8	66	29.8	10	----	29.8	0.0	8	-8.0

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

Attachment D

Operational Noise Model Input and Output Data

Valley View Carlsbad- Stationary Operations Noise Model Output



dBA range

Color	High	Low	Color	High	Low
(yellow)	60	55	(dark blue)	45	40
(green)	55	50			
(light blue)	50	45			

roof model

prepared by Dudek - DRAFT - 7/24/2020