Appendix E

Noise Assessment

DRAFT

Technical Noise Study Report

1535-1575 Industrial Avenue

UPDATED DECEMBER 2021

Prepared for:

CITY OF SAN JOSÉ
200 East Santa Clara Street
San José, California 95113
Contact: Bethelhem Telahun

Prepared by:

Michael Carr, David Ortega

DUDEK

1102 R Street
Sacramento, California 95811

Contact: Christine Fukasawa
cfukaswa@dudek.com

Printed on 30% post-consumer recycled material.

Table of Contents

SECTION **PAGE NO.**

APPENDIX(CES)

FIGURE(S)

TABLE(S)

INTENTIONALLY LEFT BLANK

Acronyms and Abbreviations

Acronym/Abbreviation	Definition
ANSI	American National Standards Institute
ASTM	American Standards for Testing and Measurement
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
City	City of San Jose
CNEL	community noise equivalent level
dB	decibel
dBA	A-weighted decibel
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GSF	gross-square foot
HI	heavy industrial
HVAC	heating, ventilation, and air conditioning
IP	industrial park
in/sec	inches per second
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
L_{max}	maximum sound level
L_{min}	minimum sound level
NIST	National Institute of Standards and Technology
NSR	nearest sensitive receptor
RCNM	Roadway Construction Noise Model
SLM	sound level meter
SPL	sound pressure level
PPV	peak particle velocity
PQP	Public/Quasi-Public

INTENTIONALLY LEFT BLANK

1 Introduction

This technical noise report evaluates the potential noise impacts during construction and operation of the proposed Nakano project (proposed project). This assessment utilizes the significance thresholds in Appendix G of the California Environmental Quality Act (CEQA) Guidelines (14 CCR 15000 et seq.).

1.1 Project Description

The proposed project would include demolition of the existing structures on the site and construction of a new, 71,550-gross-square-foot (GSF) warehouse building and associated site improvements (see Figure 1).[1] On the south side of the building, the Project includes nine dock doors for loading. The north of the proposed buildings, the Project would construct a parking lot with 41 parking stalls, including three ADA parking spaces. As shown in Figure 1, Site Plan, the propose building would occupy the majority of the central portion of the site. The new warehouse building would be one story and have a maximum height of 42 feet, which conforms to the 50-foot height limit for the Heavy Industrial zoning district.

The project would replace the existing impervious surfaces on the site and add 21,812 square feet of new impervious surface area, for a total impervious surface area on the site of 140,751 square feet (90 percent of the site). Stormwater runoff would be directed to bioretention basins on site prior to entering storm drains.

1.2 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

---

[1] Analyses in this report and description of the project make reference to existing buildings located on-site. The five (5) buildings originally located on-site were demolished in August 2021 with City approval.

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 Leq 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 Leq 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.

Other acoustical terms and descriptors are provided in Appendix A.

1.3 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 (in/sec) 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.

2 Regulatory Setting

Standards and guidelines for addressing noise exposure within the City of San Jose are contained primarily in the City of San Jose General Plan, with additional guidelines found in the City of San Jose Municipal Code.

City of San Jose General Plan

The General Plan Noise Element establishes objectives, policies, and actions to protect its inhabitants against exposure of noise-sensitive uses to loud noise and to prevent encroachment of noise-sensitive uses on existing noise producing facilities. The following goals and policies are applicable to the project:

Goal EC-1. Minimize the impact of noise on people through noise reduction and suppression techniques, and through appropriate land use policies.

Policy EC-1.1. Locate new development in areas where noise levels are appropriate for the proposed uses. Consider federal, state and City noise standards and guidelines as a part of new development review. Applicable standards and guidelines for land uses in San Jose include:

- Interior Noise Levels – The City's standard for interior noise levels in residences, hotels, motels, residential care facilities, and hospitals is 45 dBA DNL. Include appropriate site and building design, building construction and noise attenuation techniques in new development to meet this standard. For sites with exterior noise levels of 60 dBA DNL or more, an acoustical analysis following protocols in the City-adopted California Building Code is required to demonstrate that development projects can meet this standard. The acoustical analysis shall base required noise attenuation techniques on expected *Envision General Plan* traffic volumes to ensure land use compatibility and General Plan consistency over the life of this plan.
- Exterior Noise Levels – The City's acceptable exterior noise level objective is 60 dBA DNL or less for residential and most institutional land uses (Table EC-1). The acceptable exterior noise level objective is established for the City, except in the environs of the San Jose International Airport and the Downtown, as described below:
    - For new multi-family residential projects and for the residential component of mixed-use development, use a standard of 60 dBA DNL in usable outdoor activity areas, excluding balconies and residential stoops and porches facing existing roadways. Some common use areas that meet the 60 dBA DNL exterior standard will be available to all residents. Use noise attenuation techniques such as shielding by buildings and structures for outdoor common use areas. On sites subject to aircraft overflights or adjacent to elevated roadways, use noise attenuation techniques to achieve the 60 dBA DNL standards for noise from sources other than aircraft and elevated roadway segments.
    - For single family residential uses, use a standard of 60 dBA DNL for exterior noise in private usable outdoor activity areas, such as backyards.

Table EC-1: Land Use Compatibility Guidelines for Community Noise in San Jose

Land Use Category	Exterior Noise Exposure (DNL in Decibels (dBA))					
	55	60	65	70	75	80

1. Residential, Hotels and Motels, Hospitals and Residential Care[1]	░	▒	▒	▒	▓	▓
2. Outdoor Sports and Recreation, Neighborhood Parks and Playgrounds	░	░	▒	▒	▒	▓
3. Schools, Libraries, Museums, Meeting Halls, Churches	░	▒	▒	▒	▓	▓
4. Office Buildings, Business Commercial, and Professional Offices	░	░	░	▒	▒	▓
5. Sports Arena, Outdoor Spectator Sports	░	░	░	▒	▒	▓
6. Public and Quasi-Public Auditoriums, Concert Halls, Amphitheaters	▒	▒	▒	▓	▓	▓

[1] Noise mitigation to reduce interior noise levels pursuant to Policy EC-1.1 is required.

Normally Acceptable: ░

Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable: ▒

Specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features included in the design.

Unacceptable: ▓

New construction or development should general not be undertaken because mitigation is usually not feasible to comply with noise element policies.

Source: Envision San Jose 2040 General Plan

Policy EC-1.2. Minimize the noise impacts of new development on land uses sensitive to increased noise levels (Categories 1, 2, 3 and 6) by limiting noise generation and by requiring use of noise attenuation measures such as acoustical enclosures and sound barriers, where feasible. The City considers significant noise impacts to occur if a project would:

- Cause the DNL at noise sensitive receptors to increase by five dBA DNL or more where the noise levels would remain "Normally Acceptable"; or
- Cause the DNL at noise sensitive receptors to increase by three dBA DNL or more where noise levels would equal or exceed the "Normally Acceptable" level.

Policy EC-1.3. Mitigate noise generation of new nonresidential land uses to 55 dBA DNL at the property line when located adjacent to existing or planned noise sensitive residential and public/quasi-public land uses.

Policy EC-1.6. Regulate the effects of operational noise from existing and new industrial and commercial development on adjacent uses through noise standards in the City's Municipal Code.

Policy EC-1.7. Require construction operations within San Jose to use best available noise suppression devices and techniques and limit construction hours near residential uses per the City's Municipal Code. The City considers significant construction noise impacts to occur if a project located within 500 feet of residential uses or 200 feet of commercial or office uses would:

- Involve substantial noise generating activities (such as building demolition, grading, excavation, pile driving, use of impact equipment, or building framing) continuing for more than 12 months.

For such large or complex projects, a construction noise logistics plan that specifies hours of construction, noise and vibration minimization measures, posting or notification of construction schedules, and designation of a noise disturbance coordinator who would respond to neighborhood complaints will be required to be in place prior to the start of construction and implemented during construction to reduce noise impacts on neighboring residents and other uses.

Goal EC-2. Minimize vibration impacts on people, residences, and business operations.

Policy EC-2.3. Require new development to minimize continuous vibration impacts to adjacent uses during demolition and construction. For sensitive historic structures, including ruins and ancient monuments or building that are documented to be structurally weakened, a continuous vibration limit of 0.08 in/sec PPV (peak particle velocity) will be used to minimize the potential for cosmetic damage to a building. A continuous vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction. Equipment or activities typical of generating continuous vibration include but are not limited to: excavation equipment; static compaction equipment; vibratory pile drivers; pile-extraction equipment; and vibratory compaction equipment. Avoid use of impact pile drivers within 125 feet of any buildings, and within 300 feet of historical buildings, or buildings in poor condition. On a project-specific basis, this distance of 300 feet may be reduced where warranted by a technical study by a qualified professional that verifies that there will be virtually no risk of cosmetic damage to sensitive buildings from the new development during demolition and construction. Transient vibration impacts may exceed a vibration limit of 0.08 in/sec PPV only when and where warranted by a technical study by a qualified professional that verifies that there will be virtually no risk of cosmetic damage to sensitive buildings from the new development during demolition and construction.

City of San Jose Code

The City of San Jose Municipal Code addresses and provides a means for protection of the citizens of San Jose through both qualitative and quantitative provisions and prohibitions. The primary purpose of the Code is intended to promote and secure the public health, comfort, safety, welfare and prosperity, and the peace and quiet of the city and its inhabitants. The Code serves as an implementation method for the General Plan and enforcement element for establishing the desired character of the City.

As a means of enforcement, the City of San Jose Code of ordinance contains subjective (qualitative) guidelines, codes and statutes within Chapter 10.16. The City of San Jose provides further guidance and regulation on allowable noise levels within Title 20 of the Code of Ordinances, which are specific to land use. The performance standards vary from a maximum noise level of 55 dBA (e.g., residential) to 70 dBA (e.g., industrial or open space next to industrial uses), unless a conditional use permit is granted.

The City of San Jose Zoning Maps designate the parcel where the proposed project is located as Heavy Industrial (HI). The parcels abutting the proposed project site are designated as Heavy Industrial; while other parcels in the immediate vicinity are zoned as Industrial Park (IP) and Planned Development (Combined Industrial/Commercial Base District; CIC(PD)).

The Municipal Code establishes in Section 20.50.300 that for Industrial Zoning Districts, "*the sound pressure level generated by any use or combination of uses shall not exceed the decibel level at any property line as shown in Table 20-135, except upon issuance and in compliance with a special use permit as provided in.*" Table 20-135 establishes a maximum noise level of 60 dB for industrial uses adjacent to a property used or zoned for commercial purposes, and 70 dB for industrial uses adjacent to adjacent to a property used or zoned for commercial or other non-residential purposes.

Additionally, the Municipal Code establishes in Section 20.40.600 that for Commercial Zoning Districts or Public/Quasi-Public Districts (PQP), "*the sound pressure level generated by any use or combination of uses on a property shall not exceed the decibel levels indicated in Table 20-105 at any property line, except upon issuance and in compliance with a conditional use permit as provided in Chapter 20.100.*" Table 20-105 establishes a maximum noise level of 60 dB for commercial or PQP uses adjacent commercial or PQP uses adjacent to a property used or zoned for commercial or other non-residential purposes.

City of San Jose Standard Conditions of Approval

The following City SCAs regarding noise generation are applicable to the project.

SCA NO-1: Construction-Related Noise

The project applicant shall implement noise minimization measures that include, but are not limited to, the following:

- Limit construction hours to between 7 a.m. and 7 p.m., Monday through Friday, unless permission is granted with a development permit or other planning approval. No construction activities are permitted on the weekends at sites within 500 feet of a residence.
- Construct solid plywood fences around ground level construction sites adjacent to operational businesses, residences, or other noise-sensitive land uses.
- Equip all internal combustion-driven equipment with intake and exhaust mufflers that are in good condition and appropriate for the equipment.
- Prohibit unnecessary idling of internal combustion engines.
- Locate stationary noise-generating equipment such as air compressors or portable power generators as far as possible from sensitive receptors. Construct temporary noise barriers to screen stationary noise-generating equipment when located near adjoining noise-sensitive land uses.
- Utilize "quiet" air compressors and other stationary noise sources where technology exists.
- Control noise from construction workers' radios to a point where they are not audible at existing residences bordering the project site.
- Notify all adjacent businesses, residences, and other noise-sensitive land uses of the construction schedule in writing and provide a written schedule of "noisy" construction activities to the adjacent land uses and nearby residences.
- If complaints are received or excessive noise levels cannot be reduces using the measures above, erect a temporary noise control blanket barrier along surrounding building facades that face the construction sites.
- Designate a "disturbance coordinator" who shall be responsible for responding to any complaints about construction noise. The disturbance coordinator shall determine the cause of the noise complaint (e.g., bad muffler, etc.) and shall require that reasonable measures be implemented to correct the problem.

Conspicuously post a telephone number for the disturbance coordinator at the construction site and include it in the notice sent to neighbors regarding the construction schedule.

- Limit construction hours to 7 a.m. to 7 p.m., Monday through Friday for any on-site or off-site work within 500 feet of any residential unit. Construction outside of these hours may be approved through a development permit based on a site-specific "construction noise mitigation plan" and a finding by the Director of Planning, Building and Code Enforcement that the construction noise mitigation plan is adequate to prevent noise disturbance of affected residential uses. Because it is anticipated that certain construction activities (such as continuous pours of concrete foundations) may require work outside normally permitted construction hours (e.g., overnight), the project's Planned Development Permit would allow for such construction activities, subject to conditions of approval, including performance standards, imposed by the City to limit noise impacts.

3 Existing Noise Environment

The project area is located in a generally heavy industrial area within the City of San Jose. The project area is generally bounded by Industrial Avenue to the east Interstate 880 to the west. The project area is currently developed and leased for industrial uses. Other developed areas surrounding the project area include a variety of industrial uses to the north, east, and south.

The project area has a number of existing noise sources influencing the ambient noise environment. The most dominant noise source is transportation noise; primarily generated from vehicular traffic on the local and regional roadway network. Heavy industrial facilities north, east, and south of the project site also contribute to the ambient noise levels. Additionally, aircraft operations from the Norman Y. Mineta International Airport to the west of the project site contribute to the ambient noise levels, but to a lesser extent. The existing ambient noise environment was quantified through field surveys, sound level measurements and through the application of accepted reference data and noise prediction methodologies. Separate discussions of identified major noise sources and their respective effects are provided in the following sections.

3.1 Existing Sensitive Land Uses

Noise-sensitive land uses generally include those uses where exposure to noise would result in adverse effects, as well as uses where quiet is an essential element of the intended purpose. Residential dwellings are of primary concern because of the potential for increased and prolonged exposure of individuals to both interior and exterior noise levels.

The nearest noise-sensitive land use to the project area is the Challenger School - Berryessa located approximately 1,196 feet east of the project site along East Gish Road. Other noise-sensitive land uses in the vicinity of the project area are primarily residential land uses generally located further east of the project site, across Oakland Road.

3.2 Existing Ambient Noise Survey

Sound level measurements were conducted on August 25, 2021 to document the existing noise environment at and adjacent to the project area to establish baseline noise conditions against which to compare project operational noise levels. Specific consideration was given to document noise levels in the vicinity of nearby noise-sensitive receptors, and additionally to document existing periodic noise source levels. All noise measurements were performed in accordance with American National Standards Institute (ANSI) and American Standards for Testing and Measurement (ASTM) guidelines, at three locations at and around the project area, as shown on Figure 2, Noise Measurement Locations.

Noise measurements were performed using a SoftdB Piccolo II, Type 2 precision integrating sound level meters (SLMs). Field calibrations were performed on the SLMs with acoustic calibrators before and after the measurements. All instrumentation components, including microphones, preamplifiers and field calibrators have laboratory certified calibrations traceable to the National Institute of Standards and Technology (NIST). The equipment used meets all pertinent specifications of the ANSI for Type 2 SLMs (ANSI S1.4-1983 [R2006]). Meteorological conditions during the monitoring periods were fair with temperature steady at 75 degrees Fahrenheit (F), light winds from 0 to 10 mph, and sunny, clear skies. No precipitation was experienced during the monitoring periods.

Table 1. Measured Baseline Outdoor Ambient Noise Levels

Site	Location/Address	Date (yyyy-mm-dd), Time	L_{eq} (dBA)	L_{max} (dBA)
ST1	East project site boundary along Industrial Avenue; near 1535 Industrial Avenue	2021-08-25, 02:59 PM to 03:19 PM	66.2	80.4
ST2	East of project site; south of Challenger School – Berryessa, along E Gish Road	2021-08-25, 03:42 PM to 03:57 PM	65.6	78.6
ST3	East of project site; west side of Challenger School – Berryessa, along school's private drive	2021-08-25, 04:07 PM to 04:17 PM	61.5	66.7

Source: Performed by Dudek for this analysis.
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.

The primary noise source affecting the ST1 and ST2 noise monitoring locations was vehicular traffic on the local and regional roadway network (i.e., East Gish Road, Interstate 880). Additional noise sources experienced during noise-monitoring included HVAC equipment on the portable buildings near the ST3 monitoring location as well as distant industrial activities. Ambient noise level exposure at the monitoring locations were dependent on the relative distance from nearby roadways to noise measurement locations and shielding provided by nearby existing structures.

Short-term noise monitoring (10 – 20-minute duration) was conducted at three locations to provide additional insight into the existing ambient noise environment. Concurrent manual traffic counts and vehicle classification was performed during the short-term monitoring at location ST2 to aid in quantifying traffic noise levels. Monitoring equipment was configured to catalog pertinent noise metrics as identified above. Field data cataloged at the short-term monitoring locations is presented in Appendix B and monitoring locations are shown on Figure 2.

3.3 Existing Traffic Noise

Existing traffic noise levels are generated primarily by commuters traveling on Interstate 880, located immediately west of the project site. According to the City's Envision San Jose 2040 General Plan Comprehensive Update

Environmental Noise Assessment, the project site lies within the 75 dBA DNL or greater traffic noise contour for Interstate 880 (City of San Jose 2010).

3.4 Existing Aircraft Operations

The project area is located approximately 1.5 miles east of Norman Y. Mineta International Airport. The project area is not located within the currently adopted 60 dBA CNEL noise contours of the Norman Y. Mineta International Airport Master Plan (City of San Jose 2020). As such, aircraft operations do not generate significant noise impacts on the project area.

3.5 Existing Vibration

The existing vibration environment, similar to that of the noise environment, is dominated by transportation-related vibration from roadways adjacent to the project area. Heavy truck traffic can generate groundborne vibration, which varies considerably depending on vehicle type, weight, and pavement conditions. However, groundborne vibration levels generated from vehicular traffic are not typically perceptible outside of the roadway right-of-way.

4 Thresholds of Significance

The following significance criteria are based on Appendix G of the CEQA Guidelines (14 CCR 15000 et seq.) and will be used to determine the significance of potential noise impacts. Such potential noise and vibration impacts to the community would be considered 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 City of San Jose standards to evaluate potential noise and vibration impacts at onsite and offsite land uses under City of San Jose jurisdiction.

- A significant noise impact would be identified if the project would generate a substantial temporary or permanent noise level increase over ambient noise levels at existing noise-sensitive receptors surrounding the project site and that would exceed applicable noise standards presented in the General Plan or Municipal Code at existing noise-sensitive receptors surrounding the project site.
    - Hourly average noise levels during construction that would exceed 60 dBA Leq at residential land uses or exceed 70 dBA Leq at commercial land uses and exceed the ambient noise environment by at least 5 dBA Leq for a period of more than one year (i.e., more than 12 months) would constitute a significant temporary increase in the project vicinity.

  - A significant permanent noise level increase would occur if project-generated traffic would result in: a) a noise level increase of 5 dBA DNL or greater, with a future noise level of less than 60 dBA DNL, or b) a noise level increase of 3 dBA DNL or greater, with a future noise level of 60 dBA DNL or greater.
  - A significant noise impact would occur if project-attributed stationary operational noise levels exceed 60 dBA at commercial land uses and/or 70 dBA at adjacent industrial land uses.
- A significant impact would be identified if the construction of the project would generate excessive vibration levels surrounding receptors. Groundborne vibration levels exceeding 0.2 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

5 Impact Discussion

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

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.

Equipment that would 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 2, Typical Construction Equipment Maximum Noise Levels. Usually, construction equipment operates in alternating cycles of full power and low power, producing average noise levels over time that are less than the 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 2. 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
Roller	80
Manlift	75
Generator	72
Front End Loader	79
Paver	77
Concrete Saw	90

Equipment Type	Typical Equipment (L_{max}, dBA at 50 Feet)
Welder	74

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

Aggregate noise emission from proposed project construction activities, broken down by sequential phase, was predicted from the geographic center of the construction site to the nearest existing noise-sensitive receptor, which serves as the time-averaged location or geographic *acoustic center* of active construction equipment for the phase under study. The acoustic center 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 acoustic center. The acoustic center was calculated by taking the square root of the product of the nearest distance from construction activity to the nearest sensitive receptor (NSR) and the furthest distance from construction activity to the NSR.

A 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 2, 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 C, Construction Noise Modeling Input and Output, and produce the predicted results displayed in Table 3, Predicted Construction Noise Levels.

Table 3. Predicted Construction Noise Levels

Construction Phase (and Equipment Types Involved)	Distance from Acoustic Center of Site to NSR (Feet)	L_{eq} at Nearest Noise-Sensitive Receptor (dBA)
Site Preparation (Dozer, Loader)	1,196	59.7
Grading (Excavator, Grader, Dozer, Backhoe)	1,196	59.4
Building Construction (Crane, Forklift, Backhoe, Welder, Generator)	1,196	60.4
Paving (Roller, Loader, Dump Truck, Paver, Concrete Mixer Truck)	1,196	61.3
Architectural Finishes (Air Compressor)	1,196	48.4

Notes: NSR = Nearest sensitive receptor; dBA = A-weighted decibels

As presented in Table 3, the estimated construction noise levels at the nearest NSR are predicted to range from approximately 48.4 dBA L_{eq} and 61.3 dBA L_{eq}. Accounting for the man-made intervening structures present along the path between the proposed project site and the nearest noise-sensitive receptor, construction noise levels would be further reduced by approximately 8 dB or more due to shielding provided by the structures. Additionally, noise minimization measures will be implemented during construction-related activities to adhere to the City's standard conditions of approval. Comparing the mitigated construction noise levels to measurements of the daytime outdoor ambient sound level at representative sample locations as shown in Table 1, Measured Baseline Outdoor Ambient Noise Levels, predicted construction noise levels would be lower than measured ambient levels and would not be clearly perceptible to an average listener having healthy human hearing.

Based on the analysis, noise generated by the project's construction-related activities are anticipated to comply with the 60 dBA and 70 dBA noise level thresholds for school and office uses, respectively. It is anticipated that construction activities associated with the proposed project would not last more than twelve (12) months and take place within the hours of 7:00 a.m. and 7:00 p.m., Monday through Friday. Therefore, construction noise impacts would be considered **less than significant.**

Long-Term Operational

Roadway Traffic Noise

The project's traffic analysis was conducted by Hexagon Transportation Consultants, Inc. on July 22, 2021. According to the study, the project is anticipated to generate and distribute a net total of 91 trips to the local and regional roadways surrounding the project site (i.e., East Gish Road, Industrial Avenue, Interstate 880). When comparing existing and existing plus project peak hour traffic volumes, traffic volumes along East Gish Road and Interstate 880 northbound ramps would increase by no more than three (3) percent; traffic volumes along Industrial Avenue would increase by approximately ten (10) percent.

Based upon the fundamentals of acoustics, a doubling (i.e., a 100 percent increase) in traffic volumes would be needed to result in a 3 decibel increase in noise levels, which is the level corresponding to an audible change to the typical human listener. An incremental increase of three to ten percent would not correspond to an audible or a measurable increase in traffic noise exposure. As such, noise levels are anticipated to increase by less than one (1) dB along local and regional roadways in the vicinity of the project site. Therefore, traffic volume increases associated with the proposed project would not result in 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. Impacts from project-related traffic noise would be **less than significant.**

Stationary Operations Noise

The proposed project would consist of the following stationary operational noise sources within the project site: a 41-stall parking lot on the north side of the site, a 9-dock truck loading/unloading area on the south side of the site, and rooftop mechanical equipment for the office use. Operational activities from the proposed project would be similar to the existing industrial activities in the vicinity of the proposed project. The project site is currently exposed to traffic noise levels of approximately 75 dBA or greater from Interstate 880, located directly west of the proposed project site (City of San Jose 2010). Project operations are not anticipated to generate noise levels above the City's 70 dBA threshold at adjacent industrial properties, or greater than the existing 75 dBA noise level from Interstate 880 traffic. Additionally, the NSR (i.e., Challenger School – Berryessa) is located further away from the project site than the adjacent and nearby industrial uses. As such, due to distance between the project site and the NSR, stationary operational noise associated with the project would be reduced to levels below ambient at the NSR and impacts would be **less than significant.**

Impact NOI-2
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. 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 in/sec PPV or less at a reference distance of 25 feet (FTA 2018).

Policy EC-2.3 of the City of San Jose General Plan limits vibration levels during demolition and construction to 0.08 in/sec PPV for sensitive historic structures to minimize the potential for cosmetic damage to buildings on adjacent sites. A vibration limit of 0.20 in/sec PPV will be used to minimize the potential for cosmetic damage at buildings of normal conventional construction. With no known historical buildings in the vicinity of the project site, a significant impact would occur if nearby buildings were exposed to vibration levels in excess of 0.20 in/sec PPV.

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 southern project boundary (i.e., approximately 15 feet from the nearest receiving occupied structure) the estimated vibration velocity level would be 0.19 in/sec per the equation as follows (FTA 2018):

$$PPV_{rcvr} = PPV_{ref} * (25/D)^{\wedge}1.5 = 0.19 = 0.089 * (25/15)^{\wedge}1.5;$$

where 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.

The predicted 0.19 in/sec PPV at the nearest receiver approximately 15 feet away from on-site operation of the bulldozer during construction would not surpass the guidance limit of 0.20 in/sec PPV for preventing damage to structures of normal conventional construction. Other sensitive receptors, such as the Challenger School – Berryessa, are located further away from the project site and would not experience significant vibration levels generated by construction activity. Because the predicted vibration level at 15 feet is less than the building damage risk threshold of 0.20 in/sec PPV, vibration from project conventional construction activities is considered **less than significant.**

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

The Norman Y. Mineta San Jose International Airport is a public-use airport located approximately 1.5 miles west of the project site. The Santa Clara County Airport Land Use Commission considers industrial land uses generally acceptable in noise environments of 70 dBA CNEL or less. As indicated in the Norman Y. Mineta San Jose

International Airport Master Plan (City of San Jose 2020), the project site lies outside the existing (i.e., 2018) and future (i.e., 2037) 60 dBA CNEL noise contours. Therefore, aircraft noise would be compatible with the proposed project and impacts from aviation overflight noise exposure would be considered **less than significant.**

INTENTIONALLY LEFT BLANK

6 References

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 2020.

City of San Jose. 2021. Envision San Jose 2040 General Plan. May 2021.

City of San Jose. 2010. *Envision San Jose 2040 General Plan Comprehensive Update Environmental Noise Assessment*. December 2010.

City of San Jose. 2021. San Jose Municipal Code. August 2021.

City of San Jose. 2020. *Amendment to the Norman Y. Mineta San Jose International Airport Master Plan*. Integrated Final Environmental Impact Report. April 2020.

County of Santa Clara. 2016. *Comprehensive Land Use Plan Santa Clara County*. Norman Y. Mineta San Jose International Airport. November 2016.

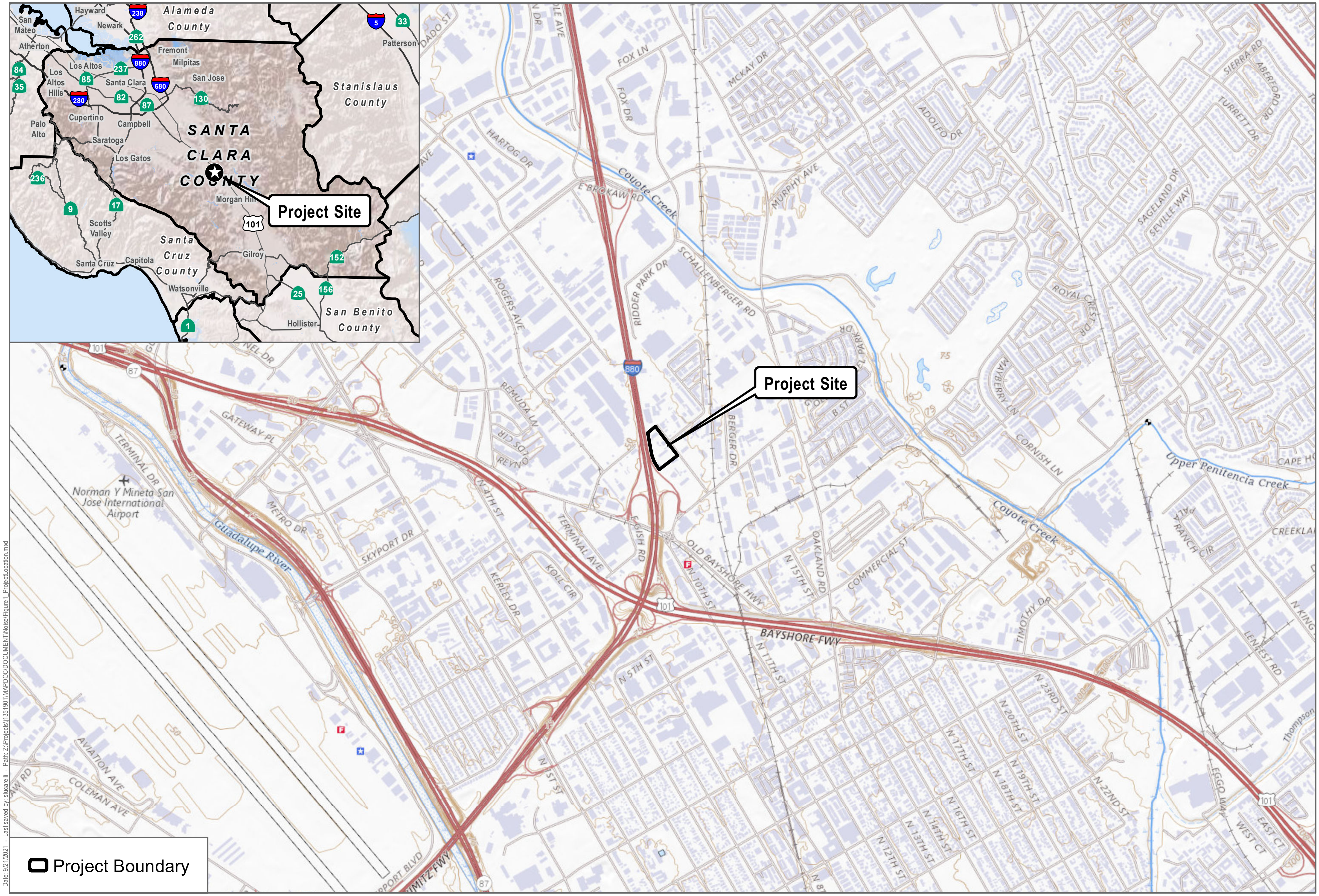
DOT (U.S. Department of Transportation). 2006. *FHWA Roadway Construction Noise Model: User's Guide*. Final Report. FHWA-HEP-06-015. DOT-VNTSC-FHWA-06-02. Cambridge, Massachusetts: DOT, Research and Innovative Technology Administration. August 2006.

FHWA. 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. December 8, 2008.

FHWA. 2011. *Highway Traffic Noise: Analysis and Abatement Guidance*. FHWA-HEP-10-025. December 2011. https://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/revguidance.pdf.

FTA (Federal Transit Administration). 2018. *Transit Noise and Vibration Impact Assessment Manual*. FTA Report No. 123. September.

INTENTIONALLY LEFT BLANK



SOURCE: USGS National Map 2021;
San Jose West Quadrangle

DUDEK

0 1,000 2,000 Feet

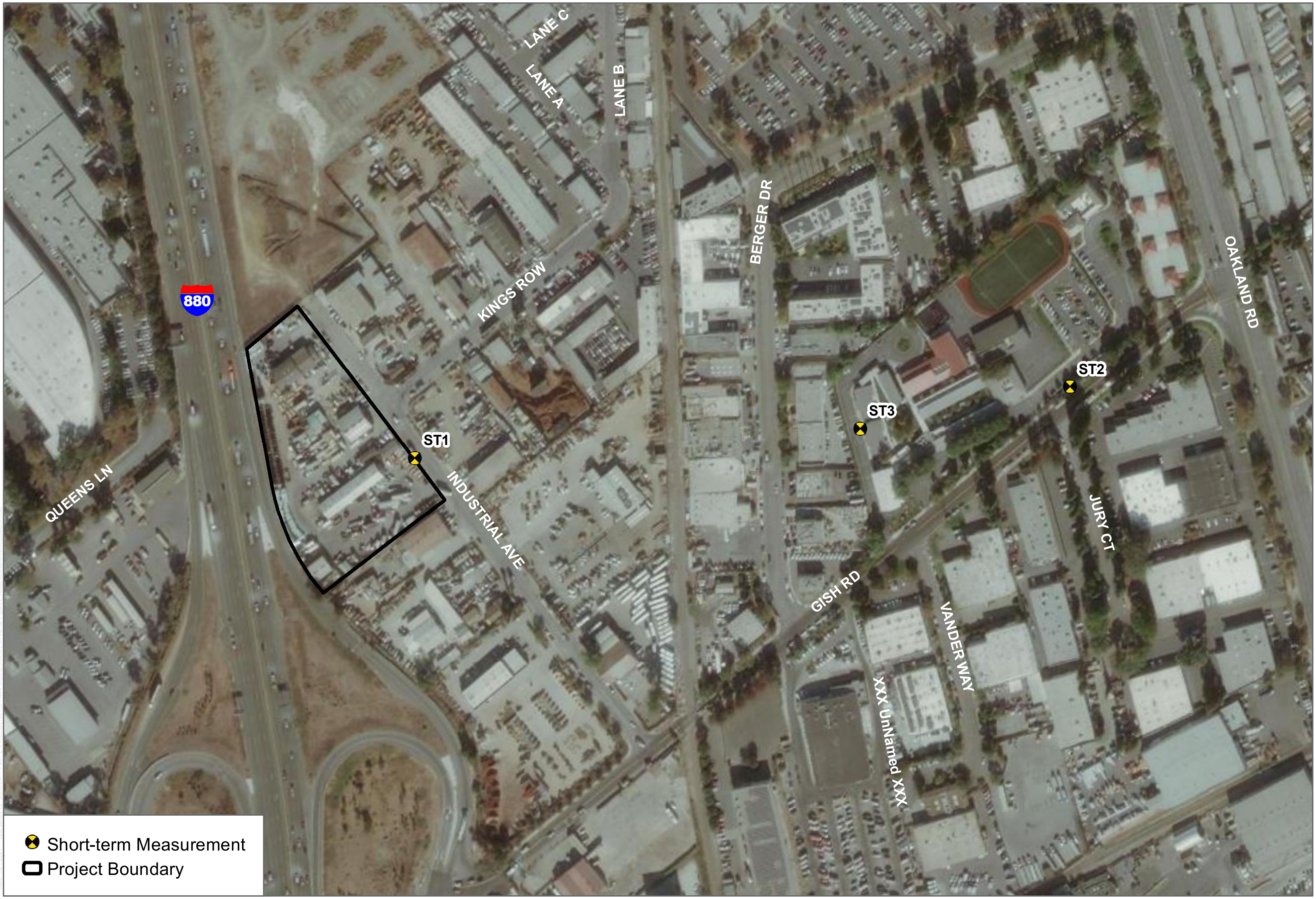
FIGURE 1

Project Location

1535-1575 Industrial Avenue Project

Date: 9/21/2021 - Last saved by: slucarelli - Path: Z:\Projects\j1351901\MAPDOC\DOCUMENT\Noise\Figure1_ProjectLocation.mxd

INTENTIONALLY LEFT BLANK



SOURCE:

DUDEK

FIGURE 2

Noise Measurement Locations

1535-1575 Industrial Avenue Project

INTENTIONALLY LEFT BLANK

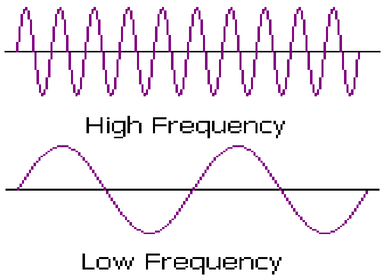
Appendix A

Acoustical Fundamentals

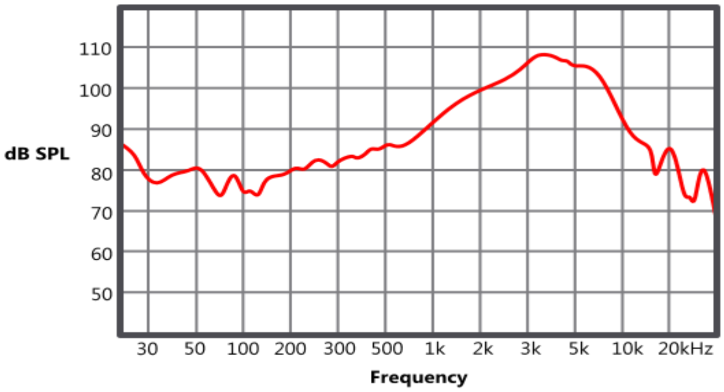
Acoustic Fundamentals

Acoustics is the scientific study that evaluates perception, propagation, absorption, and reflection of sound waves. Sound is a mechanical form of radiant energy, transmitted by a pressure wave through a solid, liquid, or gaseous medium. Sound that is loud, disagreeable, unexpected, or unwanted is generally defined as noise; consequently, the perception of sound is subjective in nature, and can vary substantially from person to person. Common sources of environmental noise and relative noise levels are shown in Figure A-1.

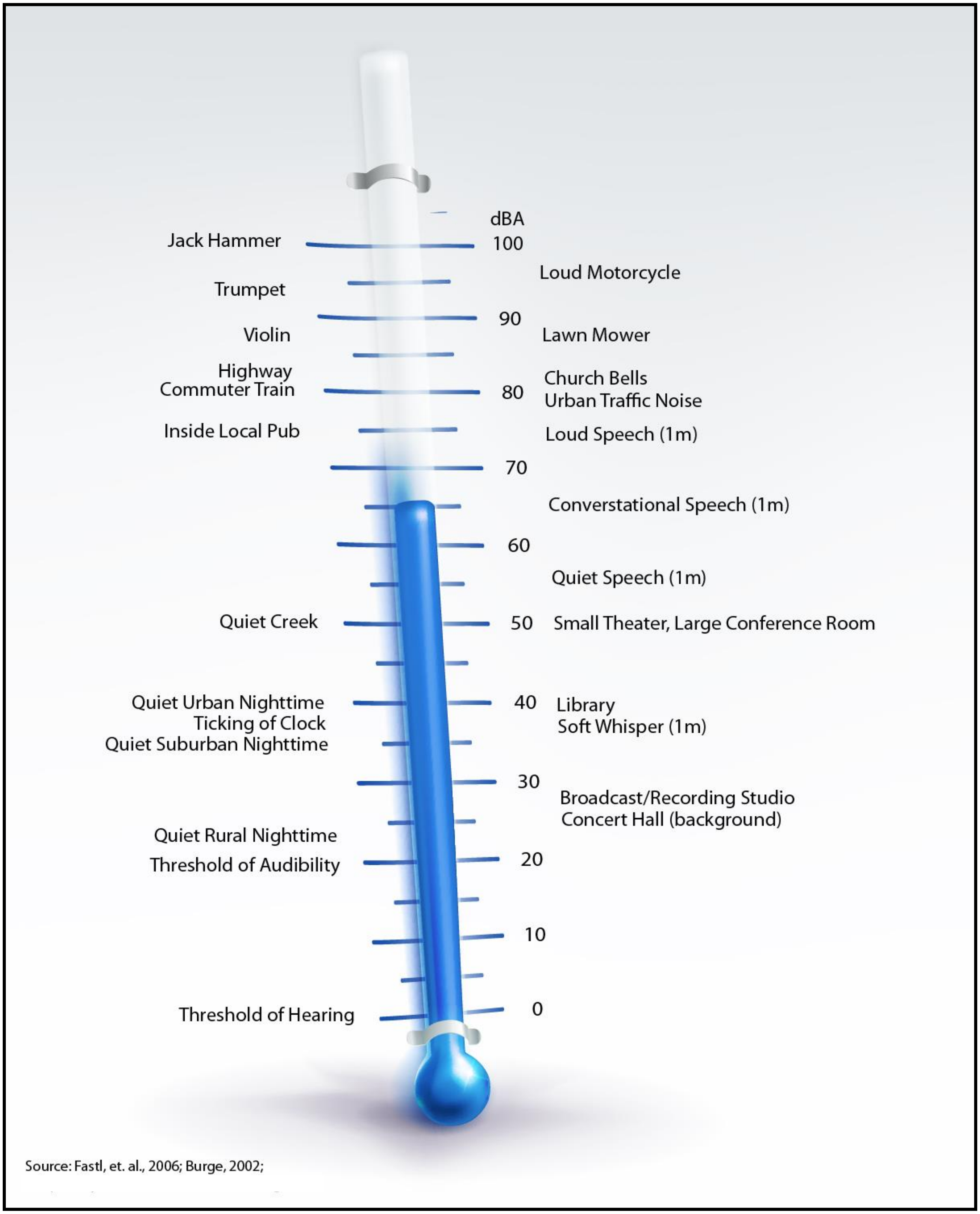
A sound wave is initiated in a medium by a vibrating object (e.g., vocal chords, the string of a guitar, the diaphragm of a radio speaker). The wave consists of minute variations in pressure, oscillating above and below the ambient atmospheric pressure. The number of pressure variation cycles occurring per second is referred to as the frequency of the sound wave and is expressed in hertz (Hz), which is equivalent to one complete cycle per second.



Directly measuring sound pressure fluctuations would require the use of a very large and cumbersome range of numbers. To avoid this and have a more useable numbering system, the decibel (dB) scale was introduced. Sound level expressed in decibels (dB) is the logarithmic ratio of two like pressure quantities, with one pressure quantity being a reference sound pressure and the second pressure being that of the sound source of concern. For sound pressure in air, the standard reference quantity is generally considered to be 20 micropascals, which directly corresponds to the threshold of human hearing. The use of the decibel is a convenient way to handle the million-fold range of sound pressures to which the human ear is sensitive. A decibel is logarithmic; it does not follow normal algebraic methods and cannot be directly added. For example, a 65 dB source of sound, such as a truck, when joined by another 65 dB source results in a sound amplitude of 68 dB, not 130 dB (i.e., doubling the source strength increases the sound pressure by 3 dB). A sound level increase of 10 dB corresponds to 10 times the acoustical energy, and an increase of 20 dB equates to a 100-fold increase in acoustical energy.



The loudness of sound perceived by the human ear depends primarily on the overall sound pressure level and frequency content of the sound source. The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. The standard weighting networks are identified as A through E. There is a strong correlation between the way humans perceive sound and A-weighted sound levels (dBA). For this reason, the dBA can be used to predict community response to noise from the environment, including noise from transportation and stationary sources. Sound levels expressed as dB in this section are A-weighted sound levels, unless noted otherwise.



Source: Fastl, et. al., 2006; Burge, 2002;

Figure A-1 -Common Noise Sources and Levels.

Noise can be generated by a number of sources, including mobile sources (transportation noise) such as automobiles, trucks, and airplanes and stationary sources (non-transportation noise) such as construction sites, machinery, and commercial and industrial operations. As acoustic energy spreads through the atmosphere from the source to the receiver, noise levels attenuate (decrease) depending on ground absorption characteristics, atmospheric conditions, and the presence of physical barriers (e.g., walls, building façades, berms). Noise generated from mobile sources generally attenuate at a rate of 3dBA (typical for hard surfaces, such as asphalt) to 4.5 dBA (typical for soft surfaces, such as grasslands) per doubling of distance, depending on the intervening ground type. Stationary noise sources spread with more spherical dispersion patterns that attenuate at a rate of 6 to 7.5 dBA per doubling of distance for hard and soft sites, respectively.

Atmospheric conditions such as wind speed, turbulence, temperature gradients, and humidity may additionally alter the propagation of noise and affect levels at a receiver. Furthermore, the presence of a large object (e.g., barrier, topographic features, and intervening building façades) between the source and the receptor can provide significant attenuation of noise levels at the receiver. The amount of noise level reduction or “shielding” provided by a barrier primarily depends on the size of the barrier, the location of the barrier in relation to the source and receivers, and the frequency spectra of the noise. Natural barriers such as berms, hills, or dense woods as well as man-made features such as buildings, berms and walls may be effective barriers for the reduction of source noise levels.

Noise Level Descriptors

The intensity of environmental noise levels can fluctuate greatly over time and as such, several different descriptors of time-averaged noise levels may be used to provide the most effective means of expressing the noise levels. The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of both the noise source and the environment near the receptor(s). Noise descriptors most often used to describe environmental noise are defined below.

Lmin (Minimum Noise Level): The minimum noise level during a specific period of time, while accounting for the appropriate weighting curve and response setting (i.e., A-weighted, slow).

Lmax (Maximum Noise Level): The maximum instantaneous noise level during a specific period of time, while accounting for the appropriate weighting curve and response setting (i.e., A-weighted, slow).

SEL (Sound Exposure Level): The cumulative exposure to sound energy over a stated period of time.

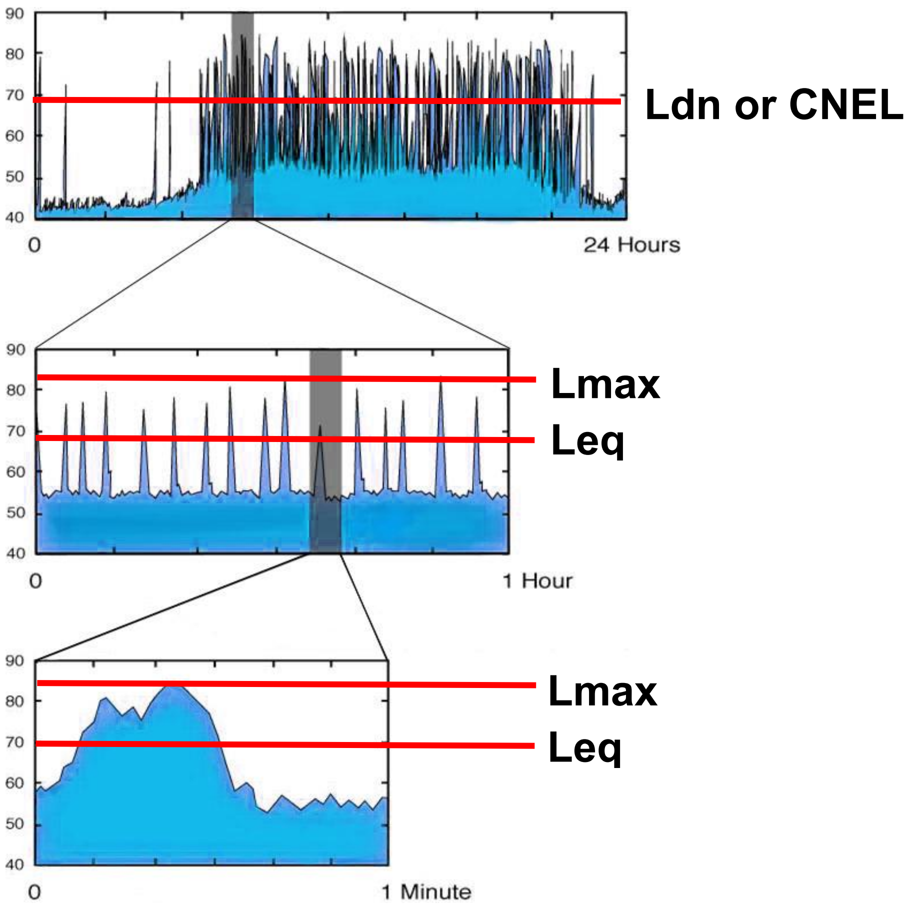
Ln (Statistical Descriptor): The noise level exceeded “n”% of a specific period of time. For example, L50 is the median noise level, or level exceeded 50% of the time (typically equated to the noise level exceeded 30-minutes out of the hour).

Leq (Equivalent Noise Level): The energy-average noise level or exposure, from all noise events that occur in a specified period; such as one-minute, one-hour, 24-hours, etc. Leq can be used to report results of short-term noise measurements, usually ranging between 15 minutes and 1 hour, to supplement longer term measurements.

Ldn (Day-Night Average Noise Level): The 24-hour Leq with a 10-dBA "penalty" for noise events that occur during the noise-sensitive hours between 10 p.m. and 7 a.m. In other words, 10 dBA is "added" to noise events that occur in the nighttime hours, and this generates a higher reported noise level when determining compliance with noise standards. The Ldn attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.

CNEL (Community Noise Equivalent Level): The CNEL is similar to the Ldn described above, but with an additional 5-dBA "penalty" added to noise events that occur during the noise-sensitive hours between 7 p.m. and 10 p.m., which are typically reserved for relaxation, conversation, reading, and television. When the same 24-hour noise data are used, it is typical for the reported CNEL to be approximately 0.5 dBA higher than the Ldn.

Community noise is commonly described in terms of the ambient noise level which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent sound level (Leq)which corresponds to the steady-state A-weighted sound level containing the same total energy as the time-varying signal over a given time period (usually one hour). The Leq is the foundation of the composite noise descriptors such as Ldn and CNEL, as defined above, and shows very good correlation with community response to noise. Use of these descriptors along with the maximum noise level occurring during a given time period provides a great deal of information about the ambient noise environment in an area.



Effect of Noise on Humans

Excessive and chronic exposure to elevated noise levels can result in auditory and non-auditory effects on humans. Auditory effects of noise on people are those related to temporary or permanent hearing loss caused by loud noises. Non-auditory effects of exposure to elevated noise levels are those related to behavioral and physiological effects. The non-auditory behavioral effects of noise on humans are associated primarily with the subjective effects of annoyance, nuisance and dissatisfaction, which lead to interference with activities such as communications, sleep and learning. The non-auditory physiological health effects of noise on humans have been the subject of considerable research attempting to discover correlations between exposure to elevated noise levels and health problems, such as hypertension and cardiovascular disease. The mass of research infers that noise-related health issues are predominantly the result of behavioral stressors and not a direct noise-induced response. The extent to which noise contributes to non-auditory health effects remains a subject of considerable research, with no definitive conclusions.

The degree to which noise results in annoyance and interference is highly subjective and may be influenced by several non-acoustic factors. The number and effect of these non-acoustic environmental and physical factors vary depending on individual characteristics of the noise environment such as sensitivity, level of activity, location, time of day, and length of exposure. One key aspect in the prediction of human response to new noise environments is the individual level of adaptation to an existing noise environment. The greater the change in the noise levels that are attributed to a new noise source, relative to the environment an individual has become accustomed to, the less tolerable the new noise source will be to an individual.

With respect to how humans perceive and react to changes in noise levels, a 1 dBA increase is generally imperceptible outside of a laboratory environment, a 3 dBA increase is barely perceptible, a 6 dBA increase is clearly noticeable, and a 10-dBA increase is subjectively perceived as approximately twice as loud (Egan 1988). These subjective reactions to changes in noise levels was developed on the basis of test subjects' reactions to changes in the levels of steady-state, pure tones or broad-band noise and to changes in levels of a given noise source. Perception and reaction to changes in noise levels in this manner is thought to be most applicable in the range of 50 to 70 dBA, as this is the usual range of voice and interior noise levels.

Vibration Fundamentals

Vibration is similar to noise in that it is a pressure wave traveling through an elastic medium involving a periodic oscillation relative to a reference point. Vibration is most commonly described in respect to the excitation of a structure or surface, such as in buildings or the ground. Human and structural response to different vibration levels is influenced by a number of factors, including ground type, distance between source and receptor, duration, and the number of perceived vibration events. Sources of vibration include natural phenomena (e.g., earthquakes, volcanic eruptions, sea waves, landslides) and those introduced by human activity (e.g., explosions, machinery, traffic, trains, construction equipment). Vibration sources may be continuous, (e.g., operating factory machinery) or transient in nature (e.g., explosions, impacts). Vibration levels can be depicted in terms of amplitude and frequency; relative to displacement, velocity, or acceleration.

Vibration amplitudes are commonly expressed in peak particle velocity (PPV) or root-mean-square (RMS) vibration velocity. PPV is defined as the maximum instantaneous positive or negative peak of a vibration signal, or the quantity of displacement measured from peak to trough of the vibration wave. Root-mean-square is defined as the positive and negative statistical measure of the magnitude of a varying quantity. The RMS of a signal is the average of the squared amplitude of the signal, typically calculated over a period of one second. PPV is typically used in the monitoring of transient and impact vibration and has been found to correlate well to the stresses experienced by buildings (Federal Transit Administration [FTA] 2018, California Department of Transportation [Caltrans] 2020b). PPV and RMS vibration velocity are nominally described in terms of inches per second (in/sec).

Typical outdoor sources of perceptible groundborne vibration include construction equipment, steel-wheeled trains, and traffic on rough roads. Although the effects of vibration may be imperceptible at low levels, effects may result in detectable vibrations and slight damage to nearby structures at moderate and high levels, respectively. At the elevated levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings) and rarely results in damage to structural components.

Appendix B

Field Noise Measurement Data Sheets

DUDEK

FIELD NOISE MEASUREMENT DATA

PROJECT: INDUSTRIAL WAY OFFICE
PROJECT #: 13519
SITE ID: 1535 INDUSTRIAL WAY [ST-1]
SITE ADDRESS:
OBSERVER(S): JVL/DJH
START DATE: 8/25/21
END DATE: 8/25/21
START TIME:
END TIME:

METEOROLOGICAL CONDITIONS

TEMP: 75 F
HUMIDITY: 51 % R.H.
WIND: CALM [✓ LIGHT] MODERATE VARIABLE STEADY GUSTY
WINDSPD: 8 MPH
DIR.: N NE S [✓ SE] S SW W NW
SKY: [✓ SUNNY] [✓ CLEAR] OVRCAST PRTLY CLDY FOG RAIN

ACOUSTIC MEASUREMENTS

MEAS. INSTRUMENT: PICCOLO II
TYPE 1 2
SERIAL #: 0221052801
CALIBRATOR:
SERIAL #: 200526321
CALIBRATION CHECK: PRE-MEASUREMENT 94 dBA SPL POST-MEASUREMENT 94 dBA SPL
WINDSCRN: X

SETTINGS: [✓ A-WTD] [✓ SLOW] FAST [✓ FRONTAL] RANDOM ANSI OTHER:

REC. #	BEGIN	END	Leq	Lmax	Lmin	L90	L50	L10	OTHER (SPECIFY METRIC
1-22	2:59	3:19							

COMMENTS:

SOURCE INFO AND TRAFFIC COUNTS

PRIMARY NOISE SOURCE: [✓ TRAFFIC] AIRCRAFT RAIL INDUSTRIAL OTHER:
ROADWAY TYPE: HIGHWAY 880
DIST. TO RDWY C/L OR EOP:
TRAFFIC COUNT DURATION: ___ MIN SPEED
___ MIN SPEED

COUNT 1 (OR RDWY 1)

DIRECTION	NB/EB	SB/WB	NB/EB	SB/WB
AUTOS				
MED TRKS				
HVY TRKS				
BUSES				
MOTRCLS				

IF COUNTING BOTH DIRECTIONS AS ONE, CHECK HERE ___

COUNT 2 (OR RDWY 2)

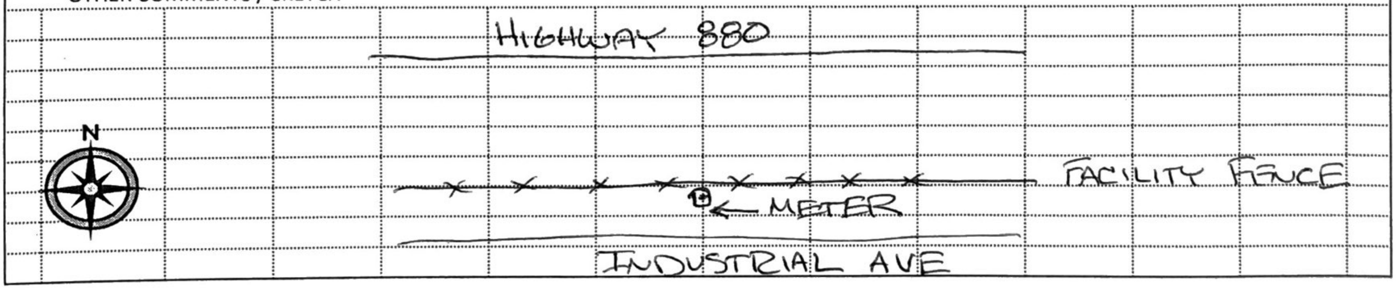
DIRECTION	NB/EB	SB/WB	NB/EB	SB/WB
AUTOS				
MED TRKS				
HVY TRKS				
BUSES				
MOTRCLS				

SPEEDS ESTIMATED BY: RADAR / DRIVING THE PACE
POSTED SPEED LIMIT SIGNS SAY:

OTHER NOISE SOURCES (BACKGROUND): DIST. AIRCRAFT RUSTLING LEAVES DIST. BARKING DOGS BIRDS DIST. INDUSTRIAL DIST. KIDS PLAYING DIST. CONVRSTNS / YELLING DIST. TRAFFIC (LIST RDWYS BELOW) DISTD GARDENERS/LANDSCAPING NOISE
OTHER:

DESCRIPTION / SKETCH

TERRAIN: [✓ HARD] SOFT MIXED FLAT OTHER:
PHOTOS: #1-3
OTHER COMMENTS / SKETCH



DUDEK

FIELD NOISE MEASUREMENT DATA

PROJECT Industrial Way Office **PROJECT #** 13519
SITE ID Gish Road [ST-2]
SITE ADDRESS 711 East Gish Road **OBSERVER(S)** JVL/DJH
START DATE 8/25/21 **END DATE** 8/25/21
START TIME **END TIME**

METEOROLOGICAL CONDITIONS
TEMP 75 F **HUMIDITY** 51 % R.H. **WIND** CALM [✓ LIGHT] MODERATE
WINDSPD 8 MPH **DIR.** N NE S [✓ SE] S SW W NW VARIABLE STEADY GUSTY
SKY [✓ SUNNY] [✓ CLEAR] OVRCAST PRTLY CLDY FOG RAIN

ACOUSTIC MEASUREMENTS
MEAS. INSTRUMENT Piccolo II TYPE 1 [✓ 2] SERIAL # 0221052801
CALIBRATOR Reed 8090 SERIAL # 200526321
CALIBRATION CHECK PRE-MEASUREMENT 94 dBA SPL POST-MEASUREMENT 94 dBA SPL WINDSCRN X

SETTINGS A-WTD SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC. #	BEGIN	END	Leq	Lmax	Lmin	L90	L50	L10	OTHER (SPECIFY METRIC
23-42	3:41	4:01							

COMMENTS

SOURCE INFO AND TRAFFIC COUNTS
PRIMARY NOISE SOURCE [✓ TRAFFIC] AIRCRAFT RAIL INDUSTRIAL OTHER:
ROADWAY TYPE: 2 Lane Arterial DIST. TO RDWY C/L OR [✓ EOP] 7 Ft.
TRAFFIC COUNT DURATION: ___ MIN SPEED ___ MIN SPEED

COUNT 1 (OR RDWY 1)

DIRECTION	[✓ NB/EB]	SB/WB	NB/EB	SB/WB
AUTOS	131			
MED TRKS	3			
HVY TRKS	6			
BUSES	1			
MOTRCLS	2			

IF COUNTING BOTH DIRECTIONS AS ONE, CHECK HERE X

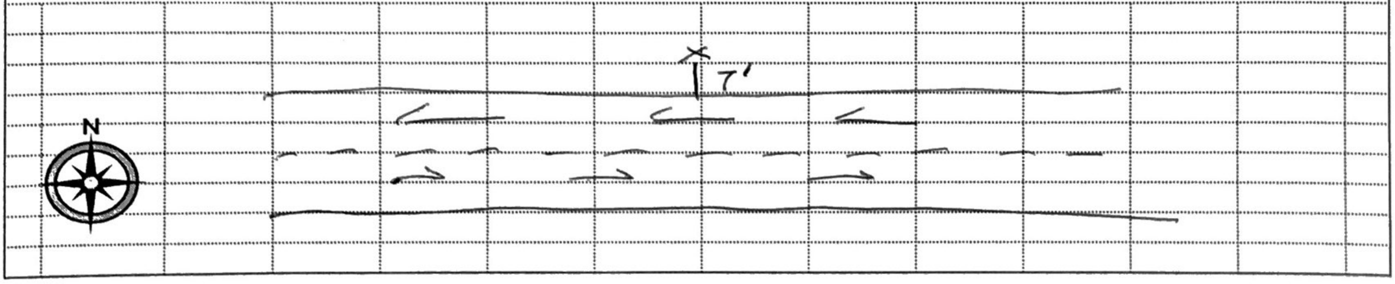
COUNT 2 (OR RDWY 2)

DIRECTION	NB/EB	SB/WB	NB/EB	SB/WB
AUTOS				
MED TRKS				
HVY TRKS				
BUSES				
MOTRCLS				

SPEEDS ESTIMATED BY: RADAR / DRIVING THE PACE
POSTED SPEED LIMIT SIGNS SAY: 30

OTHER NOISE SOURCES (BACKGROUND): DIST. AIRCRAFT RUSTLING LEAVES DIST. BARKING DOGS BIRDS DIST. INDUSTRIAL DIST. KIDS PLAYING DIST. CONVRSTNS / YELLING DIST. TRAFFIC (LIST RDWYS BELOW) DISTD GARDENERS/LANDSCAPING NOISE
OTHER:

DESCRIPTION / SKETCH
TERRAIN [✓ HARD] SOFT MIXED FLAT OTHER:
PHOTOS #4-6
OTHER COMMENTS / SKETCH



DUDEK

FIELD NOISE MEASUREMENT DATA

PROJECT INDUSTRIAL WAY OFFICE **PROJECT #** 13519
SITE ID CHALLENGER SCHOOL [ST-3]
SITE ADDRESS FIRST PORTABLE NORTH OF GISH **OBSERVER(S)** JVL/DJH
START DATE 8/25/21 **END DATE** 8/25/21
START TIME **END TIME**

METEOROLOGICAL CONDITIONS
TEMP 75 F **HUMIDITY** 51 % R.H. **WIND** CALM [✓ LIGHT] MODERATE
WINDSPD 8 MPH **DIR.** N NE S [✓ SE] S SW W NW VARIABLE STEADY GUSTY
SKY [✓ SUNNY] [✓ CLEAR] OVRCAST PRTLY CLDY FOG RAIN

ACOUSTIC MEASUREMENTS
MEAS. INSTRUMENT PICCOLO II **TYPE** 1 [✓ 2] SERIAL # 02210528O1
CALIBRATOR REED 8090 SERIAL # 200526321
CALIBRATION CHECK PRE-MEASUREMENT 94 dBA SPL POST-MEASUREMENT 94 dBA SPL WINDSCRN

SETTINGS A-WTD SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC. #	BEGIN	END	Leq	Lmax	Lmin	L90	L50	L10	OTHER (SPECIFY METRIC
43-56	4:06	4:19							

COMMENTS

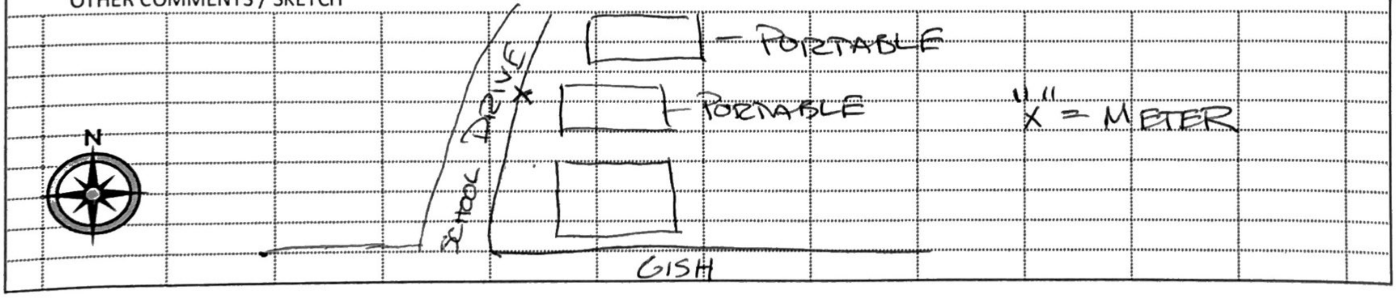
SOURCE INFO AND TRAFFIC COUNTS
PRIMARY NOISE SOURCE TRAFFIC AIRCRAFT RAIL INDUSTRIAL OTHER: HVAC
ROADWAY TYPE: DIST. TO RDWY C/L OR EOP:
TRAFFIC COUNT DURATION: ___ MIN SPEED ___ ___ MIN SPEED

	COUNT 1 (OR RDWY 1)				IF COUNTING BOTH DIRECTIONS AS ONE, CHECK HERE	COUNT 2 (OR RDWY 2)			
DIRECTION	NB/EB	SB/WB	NB/EB	SB/WB		NB/EB	SB/WB	NB/EB	SB/WB
AUTOS									
MED TRKS									
HVY TRKS									
BUSES									
MOTRCLS									

SPEEDS ESTIMATED BY: RADAR / DRIVING THE PACE
POSTED SPEED LIMIT SIGNS SAY:

OTHER NOISE SOURCES (BACKGROUND): DIST. AIRCRAFT RUSTLING LEAVES DIST. BARKING DOGS BIRDS [✓ DIST. INDUSTRIAL] DIST. KIDS PLAYING DIST. CONVRSTNS / YELLING [✓ DIST. TRAFFIC (LIST RDWYS BELOW)] DISTD GARDENERS/LANDSCAPING NOISE
OTHER: GISH ROAD

DESCRIPTION / SKETCH
TERRAIN [✓ HARD] SOFT MIXED FLAT OTHER:
PHOTOS #7-10
OTHER COMMENTS / SKETCH



Appendix C

Construction Noise Modeling Input and Output

Appendix C

Project-Generated Construction Source Noise Prediction Model

1535-1575 Industrial Avenue

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)	Equipment Assumptions	Qty.	Reference Emission Noise Levels (Lmax) at 50 feet^1	Usage Factor^1
Challenger School - Berryessa	1196	59.7	**Front End Loader**	**4**	80	0.4
	50	87.3	**Dozer**	**3**	85	0.4
	100	81.3				
	150	77.8				
	200	75.3				
	250	73.3				
	300	71.8				
	350	70.4	**Ground Type**		Hard	
	400	69.3	**Source Height**		5	
	450	68.2	**Receiver Height**		8	
	500	67.3	**Ground Factor**		0.00	
	550	66.5				

Predicted Noise Level ^{2}	L_{eq} dBA at 50 feet^2
Front End Loader	82.0
Dozer	85.8

Predicted Combined Noise Level (L_{eq} dBA at 50 feet)
87.3

Sources:

1 - Obtained from the FHWA Roadway Construction Noise Model, January 2006.

2 - Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix C

Project-Generated Construction Source Noise Prediction Model

1535-1575 Industrial Avenue

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Challenger School - Berryessa	1196	59.4
	50	87.0
	100	81.0
	150	77.4
	200	74.9
	250	73.0
	300	71.4
	350	70.1
	400	68.9
	450	67.9
	500	67.0
	550	66.2

Equipment Assumptions	Qty.	Reference Emission Noise Levels (Lmax) at 50 feet[1]	Usage Factor[1]
Excavator	**1**	85	0.4
Grader	**1**	85	0.4
Dozer	**1**	85	0.4
Backhoe	**3**	80	0.4

Ground Type	Hard
Source Height	5
Receiver Height	8
Ground Factor	0.00

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Excavator	81.0
Grader	81.0
Dozer	81.0
Backhoe	80.8

Predicted Combined Noise Level (L_{eq} dBA at 50 feet)
87.0

Sources:

1 - Obtained from the FHWA Roadway Construction Noise Model, January 2006.

2 - Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix C

Project-Generated Construction Source Noise Prediction Model

1535-1575 Industrial Avenue

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Challenger School - Berryessa	1196	60.4
	50	88.0
	100	82.0
	150	78.5
	200	76.0
	250	74.0
	300	72.4
	350	71.1
	400	69.9
	450	68.9
	500	68.0
	550	67.2

Equipment Assumptions	Qty.	Reference Emission Noise Levels (Lmax) at 50 feet[1]	Usage Factor[1]
Crane	**1**	85	0.16
Gradall	**3**	85	0.4
Generator	**1**	82	0.5
Backhoe	**3**	80	0.4
Welder / Torch	**1**	73	0.05

Ground Type	Hard
Source Height	5
Receiver Height	8
Ground Factor	0.00

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Crane	77.0
Gradall	85.8
Generator	79.0
Backhoe	80.8
Welder / Torch	60.0

Predicted Combined Noise Level (L_{eq} dBA at 50 feet)
88.0

Sources:

1 - Obtained from the FHWA Roadway Construction Noise Model, January 2006.

2 - Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix C

Project-Generated Construction Source Noise Prediction Model

1535-1575 Industrial Avenue

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Challenger School - Berryessa	1196	61.3
	50	88.9
	100	82.9
	150	79.4
	200	76.9
	250	74.9
	300	73.3
	350	72.0
	400	70.9
	450	69.8
	500	68.9
	550	68.1

Equipment Assumptions	Qty.	Reference Emission Noise Levels (Lmax) at 50 feet[1]	Usage Factor[1]
Concrete Mixer Truck	**2**	85	0.4
Paver	**1**	85	0.5
Dump Truck	**2**	84	0.4
Roller	**2**	85	0.2
Front End Loader	**1**	80	0.4

Ground Type	Hard
Source Height	5
Receiver Height	8
Ground Factor	0.00

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Concrete Mixer Truck	84.0
Paver	82.0
Dump Truck	83.0
Roller	81.0
Front End Loader	76.0

Predicted Combined Noise Level (L_{eq} dBA at 50 feet)
88.9

Sources:

1 - Obtained from the FHWA Roadway Construction Noise Model, January 2006.

2 - Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold

Appendix C

Project-Generated Construction Source Noise Prediction Model

1535-1575 Industrial Avenue

Location	Distance to Nearest Receiver in feet	Combined Predicted Noise Level (L_{eq} dBA)
Challenger School - Berryessa	1196	48.4
	50	76.0
	100	70.0
	150	66.5
	200	64.0
	250	62.0
	300	60.5
	350	59.1
	400	58.0
	450	56.9
	500	56.0
	550	55.2

Equipment Assumptions	Qty.	Reference Emission Noise Levels (Lmax) at 50 feet[1]	Usage Factor[1]
Compressor (air)	**1**	80	0.4

Ground Type	Hard
Source Height	5
Receiver Height	8
Ground Factor	0.00

Predicted Noise Level [2]	L_{eq} dBA at 50 feet[2]
Compressor (air)	76.0

Predicted Combined Noise Level (L_{eq} dBA at 50 feet)
76.0

Sources:

1 - Obtained from the FHWA Roadway Construction Noise Model, January 2006.

2 - Based on the following from the Federal Transit Noise and Vibration Impact Assessment, 2006.

L_{eq}(equip) = E.L.+10*log (U.F.) - 20*log (D/50) - 10*G*log (D/50)

Where: E.L. = Emission Level;

U.F.= Usage Factor;

G = Constant that accounts for topography and ground effects; and

D = Distance from source to receiver.

*Project specific threshold