UAIC TRIBAL SCHOOL

Revised Noise Study Report

Prepared for
United Auburn Indian Community (UAIC)

April 2018

ESA

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CHAPTER 1
Introduction

1.1 Purpose

This Noise Technical Report (report) was prepared for the approximately 45-acre United Auburn Indian Community School (UAIC) project (proposed project), located in an unincorporated portion of Placer County (County), California. The purpose of this report is to evaluate the potential for the construction and operation of the proposed project to result in significant impacts associated with noise and vibration.

The UAIC Tribal School would be a pre-K through 8th grade school designed to serve approximately 100 UAIC students with 35 staff members. The campus would also include a Tribal Education Center as well as a Tribal Cultural Center. The Tribal Education Center would provide recreational and continuing education classes for adult tribal members during the week as well as tutoring services and supplemental classes to home schooled and high school age tribal members. Approximately four staff members would be dedicated to the operation of the facility. The Tribal Cultural Center would include gallery and exhibit spaces, artifact archives, storage, and administrative spaces. Access to the Cultural Center would initially be limited to UAIC members, but the tribe may invite researchers, community groups, tribal groups, and school groups by appointment. Site improvements would include a small (non-regulation) lighted ballfield, two dedicated play areas for the students, a nature trail, improvements to the existing pond, vehicular access, and parking areas.

1.2 Environmental Setting

Noise can be generally defined as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. Sound, traveling in the form of waves from a source, exerts a sound pressure level (referred to as sound level) which is measured in decibels (dB), with zero dB corresponding roughly to the threshold of human hearing and 120 to 140 dB corresponding to the threshold of pain. Sound pressure fluctuations can be measured in units of hertz (Hz), which correspond to the frequency of a particular sound. Typically, sound does not consist of a single frequency, but rather a broad band of frequencies varying in levels of magnitude (sound power). The sound pressure level, therefore, constitutes the additive force exerted by a sound corresponding to the frequency/sound power level spectrum.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as "A" weighting and is expressed in units of A-weighted decibels (dBA). Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements. For this reason, the A-

weighted sound level has become the standard tool of environmental noise assessment. Some representative noise sources and their corresponding A weighted noise levels are shown in **Figure 1**.

Noise Exposure and Community Noise

Noise exposure is a measure of noise over a period of time. Noise level is a measure of noise at a given instant in time. Community noise varies continuously over a period of time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic and atmospheric conditions. What makes community noise constantly variable throughout a day, besides the slowly changing background noise, is the addition of short duration single event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual receptor. These successive additions of sound to the community noise environment vary the community noise level from instant to instant, requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise impacts.

This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: the energy-equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The L_{eq} is the constant sound level which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

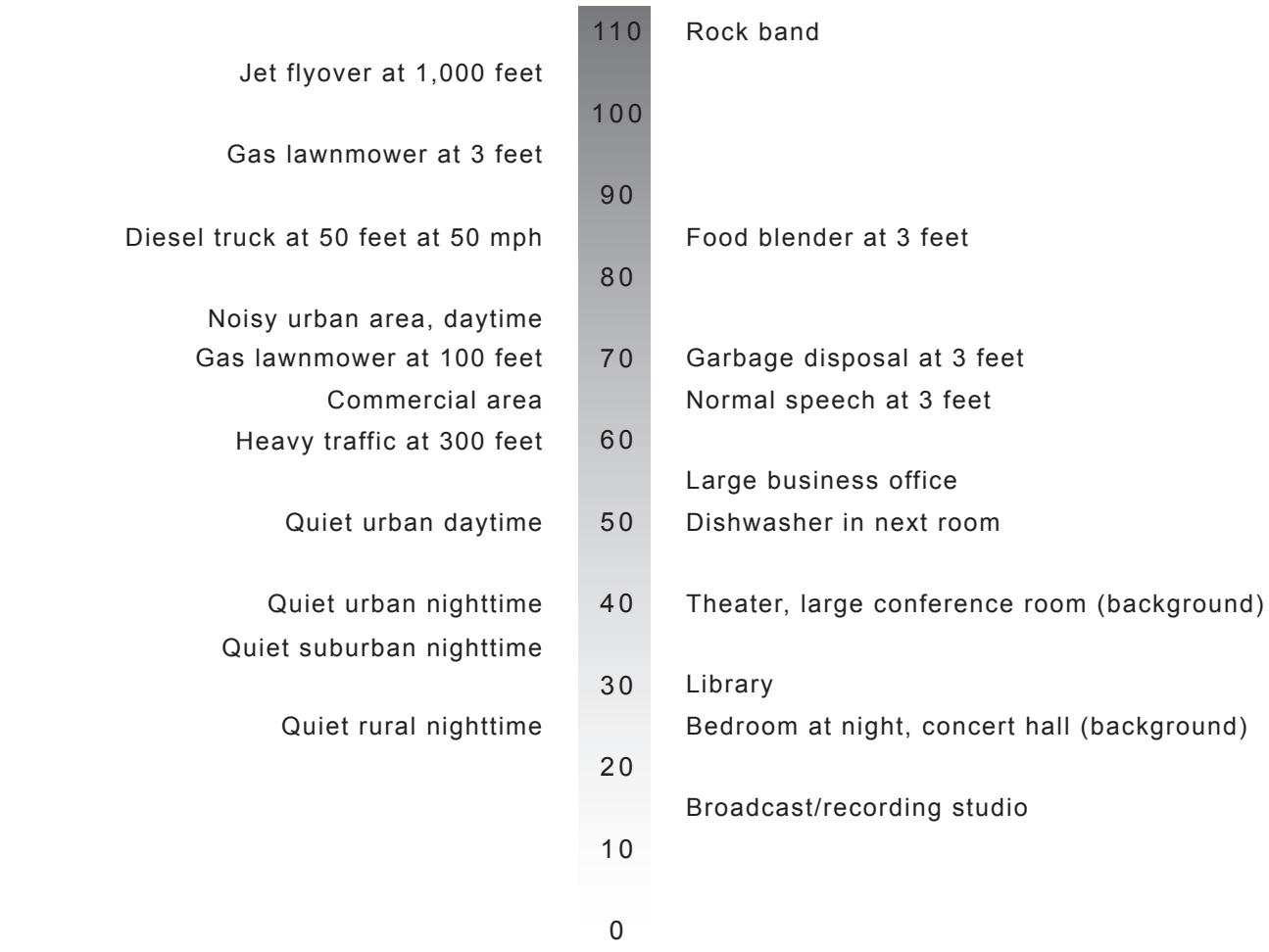
L_{max}: the instantaneous maximum noise level for a specified period of time.

L_{50}: the noise level that is equaled or exceeded 50 percent of the specified time period. The L_{50} represents the median sound level.

L_{90}: the noise level that is equaled or exceeded 90 percent of the specific time period. This is considered the background noise level during a given time period.

L_{dn}: is a 24-hour day and night A-weighted noise exposure level which accounts for the greater sensitivity of most people to nighttime noise by weighting noise levels at night (“penalizing” nighttime noises). Noise between 10:00 p.m. and 7:00 a.m. is weighted (penalized) by adding 10 dB to take into account the greater annoyance of nighttime noises.

The L_{eq} is the foundation of the L_{dn} and shows very good correlation with community response to noise. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment. L_{dn}-based noise standards are commonly used to assess noise impacts associated with traffic, railroad and aircraft noise sources. As a general rule, in areas where the noise environment is dominated by traffic, the L_{eq} during the peak-hour is generally within one to two decibels of the L_{dn} at that location.



SOURCE: Caltrans, 1998

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Figure 1
Typical Noise Levels

Effects of Noise on People

When a new noise is introduced to an environment, human reaction can be predicted by comparing the new noise to the ambient noise level, which is the existing noise level comprised of all sources of noise in a given location. In general, the more a new noise exceeds the ambient noise level, the less acceptable the new noise will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur:

- except in carefully controlled laboratory experiments, a change of 1-dB cannot be perceived;
- outside of the laboratory, a 3-dB change is considered a just-perceivable difference;
- a change in level of at least 5-dB is required before any noticeable change in human response would be expected; and
- a 10-dB change is subjectively heard as approximately a doubling in loudness, and can cause adverse response.

The perceived increases in noise levels shown above are applicable to both mobile and stationary noise sources. These relationships occur in part because of the logarithmic nature of sound and the decibel system. The human ear perceives sound in a non-linear fashion, hence the decibel scale was developed. Because the decibel scale is based on logarithms, two noise sources do not combine in a simple additive fashion, rather logarithmically. For example, if two identical noise sources produce noise levels of 50 dB, the combined sound level would be 53 dBA, not 100 dBA. This methodology also applies to the traffic noise such that when traffic volume is doubled, the resulting noise level increase would be 3 dB.

Noise Attenuation

Stationary point sources of noise, including stationary mobile sources such as idling vehicles, attenuate (lessen) at a rate between 6 dB for hard sites and 7.5 dB for soft sites for each doubling of distance from the reference measurement. Hard sites are those with a reflective surface between the source and the receiver such as parking lots or smooth bodies of water. No excess ground attenuation is assumed for hard sites and the changes in noise levels with distance (drop-off rate) is simply the geometric spreading of the noise from the source. Soft sites have an absorptive ground surface such as soft dirt, grass or scattered bushes and trees. In addition to geometric spreading, an excess ground attenuation value of 1.5 dB (per doubling distance) is normally assumed for soft sites. Line sources (such as traffic noise from vehicles) attenuate at a rate between 3 dB for hard sites and 4.5 dB for soft sites for each doubling of distance from the reference measurement (Caltrans, 2013).

Fundamentals of Vibration

Ground-borne vibration can be a concern for nearby neighbors, causing buildings to shake and rumbling sounds to be heard known as groundborne noise. In contrast to airborne noise, ground-borne vibration and noise is not a common environmental problem. Some common sources of ground-borne vibration are trains, buses on rough roads, and construction activities such as blasting, sheet pile-driving and operating heavy earth-moving equipment.

The effects of ground-borne vibration include movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In extreme cases, the vibration can cause damage to buildings. Building damage is not a factor for most projects, with the occasional exception of blasting and sheet pile-driving during construction. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin. A vibration level that causes annoyance can be well below the damage threshold for normal buildings.

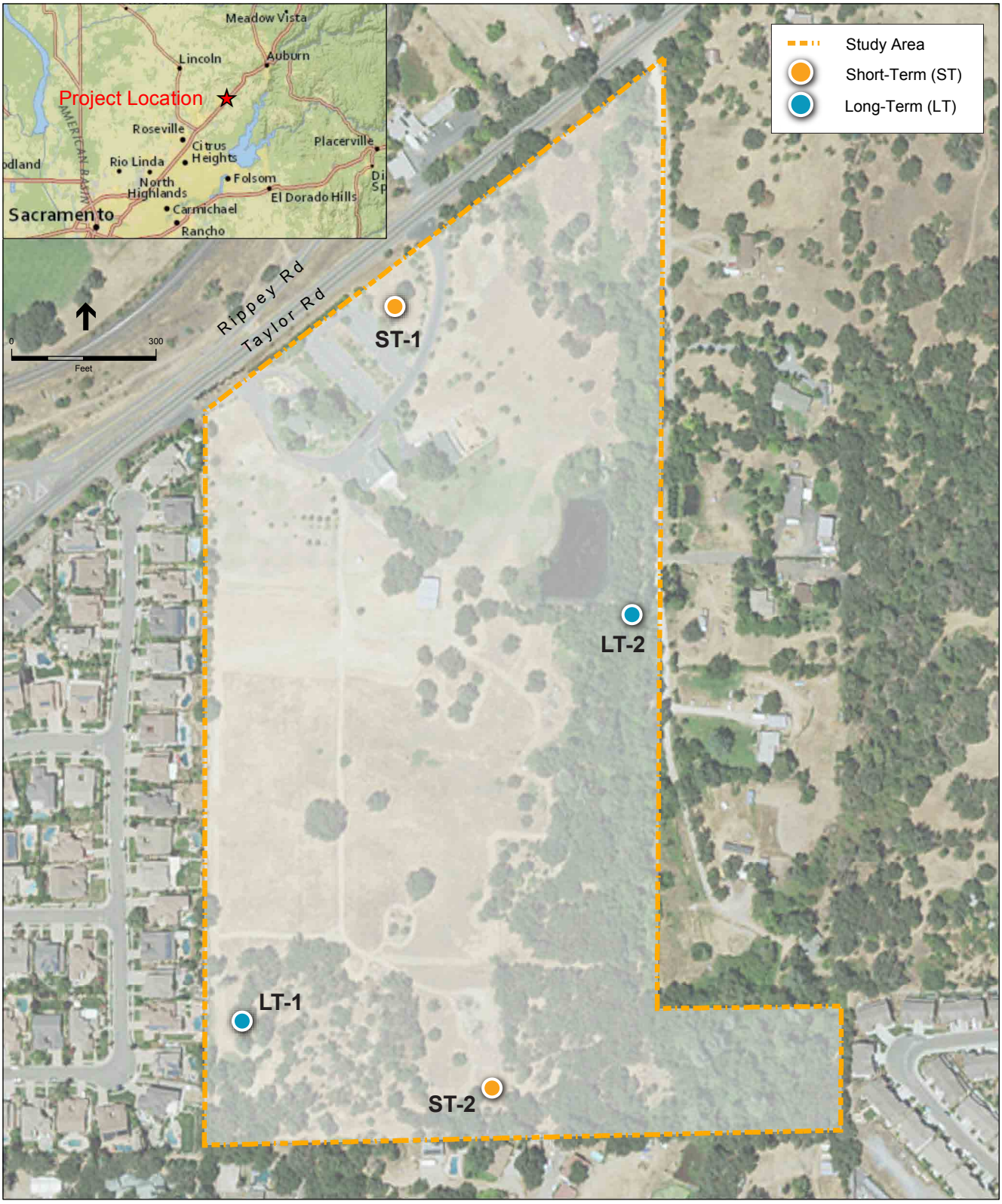
Sensitive Receptors

Noise sensitive land uses are typically defined as residences, schools, institutions, places of worship, hospitals, care centers, and hotels. Land uses surrounding the project site consist of high density single-family residences abutting the project site's western boundary and scattered single-family residences on larger lots located as close as approximately 35 feet to the south and 205 feet to the east of the project site boundary.

Existing Noise Environment

The ambient noise environment surrounding the project site is primarily the result of traffic noise from Taylor Road and Interstate 80 (I-80). Other noise sources in the area include wildlife sounds such as birds chirping and distant dogs barking.

Ambient noise measurements were conducted at the project site from January 5, 2017 to January 6, 2017. To quantify the existing ambient noise environment in the vicinity of the project site, two 24-hour long-term and two 15-minute short-term noise measurements were conducted on the project site adjacent to offsite sensitive land uses. The locations of all long-term and short-term noise measurements are illustrated in **Figure 2**. Larson-Davis (LD) Model 831 and LxT2 precision integrating sound level meters were used to conduct the noise measurements. The meters were calibrated before use with an LD Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 and Type 2 sound level meters (ANSI S1.4). Results of the noise measurements are presented in **Table 1** (short-term measurements) and **Table 2** (long-term measurements).



SOURCE: ESA, 2016

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Figure 2

Noise Measurement Locations

TABLE 1
15-MINUTE SHORT-TERM NOISE MEASUREMENT RESULTS
JANUARY 5, 2017

Measurement Location	Start time	L_{eq} (dBA)	L_{max} (dBA)	L_{min} (dBA)	Primary Noise Source(s)
ST-1	12:14 p.m.	49	68	32	Traffic Noise along Taylor Road
ST-2	11:49 a.m.	39	49	36	Natural Sounds (e.g., crickets, birds)

Source: ESA, 2017

TABLE 2
24-HOUR LONG-TERM NOISE MEASUREMENT RESULTS
JANUARY 5 – 6, 2017

Measurement Location	School-Hour L_{eq} (dBA)	L_{dn} (dBA)	L_{max} (dBA)	L_{min} (dBA)
LT-1	57	57	85	35
LT-2	54	55	85	32

Note: School-Hour L_{eq} is the highest hourly noise level of hours between 7 AM and 5 PM.
Source: ESA, 2017

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CHAPTER 2
Regulatory Setting

2.1 Federal Regulations

The Federal Transit Administration (FTA) has adopted vibration standards that are used to evaluate potential building damage impacts related to construction activities. The vibration damage criteria adopted by the FTA are shown in **Table 3**.

TABLE 3
CONSTRUCTION VIBRATION DAMAGE CRITERIA

Building Category	PPV (in/sec)
I. Reinforced-concrete, steel, or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

SOURCE: FTA, 2006

In addition, the FTA has also adopted standards associated with human annoyance for ground-borne vibration impacts for the following three land-use categories: Vibration Category 1 – High Sensitivity, Vibration Category 2 – Residential, and Vibration Category 3 – Institutional. The FTA defines Category 1 as buildings where vibration would interfere with operations within the building, including vibration-sensitive research and manufacturing facilities, hospitals with vibration-sensitive equipment, and university research operations. Vibration-sensitive equipment includes, but is not limited to, electron microscopes, high-resolution lithographic equipment, and normal optical microscopes. Category 2 refers to all residential land uses and any buildings where people sleep, such as hotels and hospitals. Category 3 refers to institutional land uses such as schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment but still have the potential for activity interference. The vibration thresholds associated with human annoyance for these three land-use categories are shown in **Table 4**. No thresholds have been adopted or recommended for commercial and office uses. Because the project-induced vibration would be from construction activities, the impact thresholds for this project would be based on Infrequent Events as stated in Table 4.

TABLE 4
GROUND-BORNE VIBRATION IMPACT CRITERIA FOR GENERAL ASSESSMENT

Land Use Category	Frequent Events[a]	Occasional Events[b]	Infrequent Events[c]
Category 1: Buildings where vibration would interfere with interior operations	65 VdB[d]	65 VdB[d]	65 VdB[d]
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB

[a] "Frequent Events" is defined as more than 70 vibration events of the same source per day.

[b] "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day.

[c] "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day.

[d] This criterion is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes.

SOURCE: FTA, 2006.

2.2 State Regulations

The State of California does not have statewide standards for environmental noise, but the California Department of Health Services (DHS) has established guidelines for evaluating the compatibility of various land uses as a function of community noise exposure. The purpose of these guidelines is to maintain acceptable noise levels in a community setting for different land use types. Noise compatibility by different land uses types is categorized into four general levels: "normally acceptable," "conditionally acceptable," "normally unacceptable," and "clearly unacceptable." For instance, a noise environment ranging from 50 dBA L_{dn} to 65 dBA L_{dn} is considered to be "normally acceptable" for multi-family residential uses, while a noise environment of 75 dBA L_{dn} or above for multi-family residential uses is considered to be "clearly unacceptable." In addition, Section 65302(f) of the California Government Code requires each county and city in the state to prepare and adopt a comprehensive long-range General Plan for its physical development, with Section 65302(g) requiring a Noise Element to be included in the General Plan. The Noise Element must: (1) identify and appraise noise problems in the community; (2) recognize Office of Noise Control guidelines; and (3) analyze and quantify current and projected noise levels.

The California Noise Act of 1973 (Health and Safety Code Sections 46000–46002) sets forth a resource network to assist local agencies with legal and technical expertise regarding noise issues. The objective of the act is to encourage the establishment and enforcement of local noise ordinances.

2.3 Local Regulations

Placer County General Plan

The Placer County General Plan (Placer County, 2013) outlines goals and policies related to noise in the vicinity of the project site. The following goals and policies are relevant to the proposed project.

Goal 9.A: To protect County residents from the harmful and annoying effects of exposure to excessive noise.

Policy 9.A.1: New development of noise-sensitive uses shall not be permitted where the noise level due to non-transportation noise sources will exceed the noise level standards of **Table 5** as measured immediately within the property line of the new development, unless effective noise mitigation measures have been incorporated into the development design to achieve the standards specified in Table 5.

TABLE 5
ALLOWABLE LDN NOISE LEVELS WITHIN SPECIFIED ZONE DISTRICTS[1]
Applicable to New Projects Affected by or Including Non-Transportation Noise Sources

Zone Distance of Receptor	Property Line of Receiving Use	Interior Spaces[2]
Residential Adjacent to Industrial[3]	60	45
Other Residential[4]	50	45
Office/Professional	70	45
Transient Lodging	65	45
Neighborhood Commercial	70	45
General Commercial	70	45
Heavy Commercial	75	45
Limited Industrial	75	45
Highway Service	75	45
Shopping Center	70	45
Industrial	-	45
Industrial Park	75	45
Industrial Reserve	---	-
Airport	---	45
Unclassified	---	---
Farm	(see footnote 6)	---
Agriculture Exclusive	(see footnote 6)	---
Forestry	---	---
Timberland Preserve	---	---
Recreation & Forestry	70	---
Open Space	---	---
Mineral Reserve	---	---

NOTES:

- Except where noted otherwise, noise exposures will be those which occur at the property line of the receiving use.
- Where existing transportation noise levels exceed the standards of this table, the allowable L_{dn} shall be raised to the same level as that of the ambient level.
- If the noise source generated by, or affecting, the uses shown above consists primarily of speech or music, of if the noise source is impulsive in nature, the noise standards shown above shall be decreased by 5 dB.
- Where a use permit has established noise level standards for an existing use, those standards shall supersede the levels specified in Table 3.6-4 and Table 3.6-5. Similarly, where an existing use which is not subject to a use permit causes noise in excess of the allowable levels in Tables 3.6-4 and 3.6-5 said excess noise shall be considered the allowable level. If a new development is proposed which will be affected by noise from such an existing use, it will ordinarily be assumed that the noise levels already existing or those levels allowed by the existing use permit, whichever are greater, are those levels actually produced by the existing use.
- Existing industry located in industrial zones will be given the benefit of the doubt in being allowed to emit increased noise consistent with the state of the art[5] at the time of expansion. In no case will expansion of an existing industrial operation because to decrease allowable noise emission limits. Increased emissions above those normally allowable should be limited to a one-time 5 dB increase at the discretion of the decision making body.
- The noise level standards applicable to land uses containing incidental residential uses, such as caretaker dwellings at industrial facilities and homes on agriculturally zoned land, shall be the standards applicable to the zone district, not those applicable to residential uses.
- Where no noise level standards have been provided for a specific zone district, it is assumed that the interior and/or exterior spaces of these uses are effectively insensitive to noise.

[1] Overriding policy on interpretation of allowable noise levels: Industrial-zoned properties are confined to unique areas of the County, and are irreplaceable. Industries which provide primary wage-earner jobs in the County, if forced to relocate, will likely be forced to leave the County. For this reason, industries operating upon industrial zoned properties must be afforded reasonable opportunity to exercise the rights/privileges conferred upon them be their zoning. Whenever the allowable noise levels herein fall subject to interpretation relative to industrial activities, the benefit of the doubt shall be afforded to the industrial use.

Where an industrial use is subject to infrequent and unplanned upset or breakdown of operations resulting in increased noise emissions, where such upsets and breakdowns are reasonable considering the type of industry, and where the industrial use exercises due diligence in preventing as well as correcting such upsets and breakdowns, noise generated during such upsets and breakdowns shall not be included in calculations to determine conformance with allowable noise levels.

[2] Interior spaces are defined as any locations where some degree of noise-sensitivity exists. Examples include all habitable rooms of residences, and areas where communication and speech intelligibility are essential, such as classrooms and offices.

[3] Noise from industrial operations may be difficult to mitigate in a cost-effective manner. In recognition of this fact, the exterior noise standards for residential zone districts immediately adjacent to industrial, limited industrial, industrial park, and industrial reserve zone districts have been increased by 10 dB as compared to residential districts adjacent to other land uses.

For purposes of the Noise Element, residential zone districts are defined to include the following zoning classifications: AR, R-1, R-2, R-3, FR, RP, TR-1, TR-2, TR-3, and TR-4.

[4] Where a residential zone district is located within an -SP combining district, the exterior noise level standards are applied at the outer boundary of the -SP district. If an existing industrial operation within an -SP district is expanded or modified, the noise level standards at the outer boundary of the -SP district may be increased as described above in these standards.

Where a new residential use is proposed in an -SP zone, an Administrative Review Permit is required, which may require mitigation measures at the residence for noise levels existing and/or allowed by use permit as described under "NOTES," above, in these standards.

[5] State of the art should include the use of modern equipment with lower noise emissions, site design, and plant orientation to mitigate offsite noise impacts, and similar methodology.

[6] Normally, agricultural uses are noise insensitive and will be treated in this way. However, conflicts with agricultural noise emissions can occur where single-family residences exist within agricultural zone districts. Therefore, where effects of agricultural noise upon residences located in these agricultural zones is a concern, an L_{dn} of 70 dBA will be considered acceptable outdoor exposure at a residence.

SOURCE: Placer County. *Placer County General Plan Noise Element*. Table 9-1. May 21, 2013.

Policy 9.A.2: Noise created by new proposed non-transportation noise sources shall be mitigated so as not to exceed the noise level standards of Table 5 as measured immediately within the property line of lands designated for noise-sensitive uses: provided, however, the noise created by occasional events occurring within a stadium on land zoned for university purposes may temporarily exceed these standards as provided in an approved Specific Plan.

Policy 9.A.6: The feasibility of proposed projects with respect to existing and future transportation noise levels shall be evaluated by comparison to **Table 6**.

TABLE 6
MAXIMUM ALLOWABLE NOISE EXPOSURE TRANSPORTATION NOISE SOURCES

Land Use	Outdoor Activity Area[1] L_{dn}/CNEL, dB	Interior Spaces	
		L_{dn}/CNEL, dB	L_{eq} dB[2]
Residential	60[3]	45	-
Transient Lodging	60[3]	45	-
Hospitals, Nursing Homes	60[3]	45	-
Theaters, Auditoriums, Music Halls	-	-	35
Churches, Meeting Halls	60[3]	-	40
Office Buildings	-	-	45
Schools, Libraries, Museums	-	-	45
Playgrounds, Neighborhood parks	70	-	-

1 Where the location of outdoor activity areas is unknown, the exterior noise level standard shall be applied to the property line of the receiving land use.

2 As determined for a typical worst-case hour during period of use.

3 Where it is not possible to reduce noise in outdoor activity area to 60 dB L_{dn}/CNEL or less using a practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB L_{dn}/CNEL may be allowed provided that available exterior noise level reduction measures have been implemented and interior noise levels are in compliance with this table.

SOURCE: Placer County. *Placer County General Plan Noise Element*. Table 9-3. May 21, 2013.

Placer County Municipal Code

Chapter 9 of the Placer County Code provides non-transportation (stationary) sound level standards. Specifically, Article 9.36.060 is reproduced below:

9.36.060 Sounds Limits for Sensitive Receptors

A. It is unlawful for any person at any location to create any sound, or to allow the creation of any sound, on property owned, leased, occupied or otherwise controlled by such person that:

1. Causes the exterior sound level when measured at the property line of any affected sensitive receptor to exceed the ambient sound level by five dBA; or

2. Exceeds the sound level standards set forth in **Table 7**, whichever is the greater.

TABLE 7
SOUND LEVEL STANDARDS – PLACER COUNTY CODE

Sound Level Descriptor	Daytime (7:00 AM – 10:00 PM)	Nighttime (10:00 PM – 7:00 AM)
Hourly L_{eq}, dB	55	45
Maximum Level, (L_{max}) dB	70	65

SOURCE: Placer County Code, Article 9.36.060.

B. Each of the sound level standards specified in Table 7 above shall be reduced by five dBA for simple tone noises, consisting of speech and music. However, in no case shall the sound level standard be lower than the ambient sound level plus five dBA.

C. If the intruding sound source is continuous and cannot reasonably be discontinued or stopped for a time period whereby the ambient sound level can be measured, the sound level measured while the source is in operation shall be compared directly to the sound level standards of Table 7.

In addition, the following exemptions specified in the Placer County Code, Article 9.36.030, would apply to the project:

- Sound sources associated with property maintenance (e.g., lawn mowers, edgers, snow blowers, blowers, pool pumps, power tools, etc.) provided such activities take place between the hours of 7:00 a.m. and 9:00 p.m.; and

- Construction (e.g., construction, alteration or repair activities) between the hours of 6:00 a.m. and 8:00 p.m. Monday through Friday and between the hours of 8:00 AM and 8:00 PM Saturday and Sunday provided, however, that all construction equipment shall be fitted with factory installed muffling devices and that all construction equipment shall be maintained in good working order.

- The normal operation of public and private schools typically consisting of classes and other school-sponsored activities.

CHAPTER 3
Noise Standards

The proposed project's noise impacts were evaluated using the checklist items in Appendix G of the California Environmental Quality Act (CEQA) Guidelines. Under CEQA, a project may be deemed to have a significant effect on the environment with respect to noise and/or groundborne vibration if it would result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

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

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels.

This report discusses the first four criteria; the fifth and sixth are not discussed because the site lies outside a two-mile radius of a public airport or private airstrip (approximately 9 miles from Auburn Municipal Airport, the nearest airport).

Methodology and Assumptions

Construction Noise

Construction noise is exempted by the Placer County Code, Article 9.36.030 as long as the construction activities would occur between the hours of 6:00 a.m. and 8:00 p.m. Monday through Friday and between the hours of 8:00 a.m. and 8:00 p.m. Saturday and Sunday provided, however, that all construction equipment shall be fitted with factory installed muffling devices and that all construction equipment shall

be maintained in good working order. It is assumed that the construction hours would be within the specified hours.

In terms of determining the temporary noise increase due to the construction activities, it is assumed that the impact would be considered a significant if the construction noise would increase 5 dB over an ambient noise level. As discussed under Section 1.2 (Environmental Setting), a 5 dB increase in noise is considered a noticeable change in human response to the average person. Construction noise levels for the proposed project were estimated using the Federal Highway Administration's (FHWA) *Roadway Construction Noise Model (RCNM)* (FHWA, 2006). FHWA's RCNM provides reference noise levels for construction equipment that are typically used during building construction. These reference noise levels are represented of what would be heard during project construction and are used to estimate the project-related construction noise impacts.

Operational Noise

The County exempts noise generated from the normal operation of public and private schools (Placer County Municipal Code, Chapter 9.36.030(A)(4)), which would include noise sources such as the use of heating, ventilation and air conditioning (HVAC) units, bells to signal the beginning and end of class periods, onsite maintenance activities and the use of public address (PA) systems. Discussion of potential noise from school activities is included in this report.

Project related traffic noise was evaluated by using FHWA's Traffic Noise Model (TNM) version 2.5. Traffic volumes were derived from the project's traffic impact study (KD Anderson and Associates, 2017 and 2018). Table 6 presents the maximum allowable noise levels from transportation sources as 60 dBA L_{dn} at residential exterior use area. Thus, in regards to traffic noise specifically, it would be considered substantial if the noise level exceeds 60 dBA L_{dn}. If the traffic noise level from the existing condition exceeds 60 dBA L_{dn}, an increase of 5 dB would be considered substantial. TNM was used to estimate the vehicular related noise from Taylor Road. For the existing condition with no project, the traffic noise level would be 69 dBA L_{dn} at 50 feet from Taylor Road; thus the 5 dB standard is used.

Project related stationary noise sources such as general school and recreational activities, emergency generators, HVAC units and onsite special events were evaluated using noise data on human voices found in the Environmental Protection Agency's (EPA) *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA, 1974) and other published documents. For this analysis, new proposed project-related noise sources that expose offsite sensitive receptors to greater than 55 dBA hourly L_{eq} as specified in Table 7 or increase the existing ambient noise level by 5 dB or greater would be considered substantial for permanent uses. With regards to the special events, which is considered a temporary use, it would be considered substantial if the noise level increase over the ambient noise levels is 5 dB or greater.

Construction Vibration

For the purposes of this assessment, the methodology described in the FTA's *Transit Noise and Vibration Impact Assessment* (FTA, 2006) was used to evaluate project-related vibration effects to nearby sensitive land uses. No impact pile driving is anticipated to occur during construction of the proposed project.

Other than construction, there are no appreciable sources of vibration proposed for the final development of the proposed project. As a result, only construction-related vibration impacts were assessed. The proposed project would result in a significant vibration impact if buildings would be exposed to the FTA vibration threshold level of 0.2 PPV for building damage or if sensitive receptors would be exposed to a vibration level of 80 VdB for residential land uses. These criteria are for “infrequent” events. Although more stringent criteria are recommended for “frequent” or “occasional” events, these are not used since construction activities would occur during the daytime and would not be intermittent.

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CHAPTER 4
Noise Evaluation

Impact 1: Would the project result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Construction

It is assumed that the construction activities would follow the hours specified in the Placer County Code. Therefore, the noise from construction activities would not result in a violation of the County's noise standard. The potential for construction activities to result in temporary effects on noise levels is discussed under Impact 4.

Operation

The County's General Plan noise standards are summarized in Table 5. As shown in the table, the maximum allowable noise levels within residential zoning (not adjacent to industrial uses) applicable to new projects affected by or including non-transportation noise sources is 50 dBA L_{dn} outside and 45 dBA L_{dn} inside. The table notes indicate that where existing transportation noise levels exceed the standards of this table, the allowable L_{dn} shall be raised to the same level as that of the ambient level. The project site is affected by transportation noise above the standard and thus the existing ambient noise level of 57 dBA L_{dn} is considered allowable and thus, the project siting is consistent with the General Plan standards. As indicated in Table 6 there is no maximum allowable noise exposure from transportation noise sources for schools.

As described in Chapter 2.3, the Placer County Code, Article 9.36.030 exempts noise from the normal operation of public and private schools typically consisting of classes and other school-sponsored activities. These noise sources would include the use of HVAC units, bells to signal the beginning and end of class periods, onsite maintenance activities and the use of PA systems. Although the proposed project would consist of a school and would be exempt from the County's noise standards, a discussion of the project's consistency with the County's exterior noise standard is provided below. The potential for school operations to result in permanent effects on noise levels is discussed further in Impact 3.

Impact 2: Would the project result in exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Construction activities would include excavation, site preparation work, foundation work, and new building, framing, and finishing. Construction activities may generate perceptible vibration when heavy equipment or impact tools such as jackhammers or hoe rams are used. Pile driving can cause excessive

vibration. Because specific construction details are unknown at this point, this analysis presumes that no pile driving would be required during project construction.

The potential use of bulldozers during fine-site grading would be expected to generate the highest vibration levels during construction. Vibration levels would vary depending on soil conditions, construction methods, and equipment used. A large bulldozer typically generates vibration levels of 87 VdB and 0.089 in/sec PPV at a distance of 25 feet.

In order to exceed the 80 VdB threshold for human annoyance, a large bulldozer needs to be within 45 feet of a structure. In order to exceed the 0.2 in/sec PPV threshold for building damage, a large bulldozer needs to be within 15 feet of a structure. The nearest structure could be located 25 feet from construction equipment, causing potential annoyance to offsite uses. However, the 0.2 PPV threshold for building damage would not be exceeded. The implementation of **Noise Reduction Measure 1** would reduce potential annoyance.

Impact 3: Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

For this analysis, new proposed project-related noise sources that expose offsite sensitive receptors to noise levels that exceed the noise standards specific in the County's code or elevate the existing ambient by 5 dB, would be considered a substantial permanent increase in ambient noise levels. An impact discussion for proposed project-related noise sources during normal operation of the project is provided below.

Vehicular Traffic

The primary source of noise from operation of the proposed project would be associated with increased traffic on Taylor Road. The project would utilize passenger vans rather than buses for student drop-off and pick-up. Considering vehicles on-site would be driving no more than 10 miles per hour, the noise from these on-site vehicles would be minimal. TNM was used to estimate the vehicular related noise from Taylor Road. For the existing condition with no project, the traffic noise level would be 69 dBA L_{dn} at 50 feet from Taylor Road. Therefore, Table 8 compares 1) traffic volumes of Existing and Existing plus Project and 2) traffic volumes of Cumulative with and without Project. It should be noted that the traffic impact study generated traffic volumes during three peak periods. Because the AM peak hour traffic volumes are the largest, this assessment uses the AM peak hour. As it is described in Chapter 3 of this report, it would be considered a significant impact when the traffic noise levels increase 5 dB over the no project condition because the existing condition traffic noise level exceeded 60 dBA L_{dn}. It is also noted in Chapter 1 of this report, in order to increase 3 dB, the traffic volume needs to be doubled.

As it is presented in Table 8, the traffic noise along Taylor Road would not increase by 5 dB; therefore, it is considered less than significant. The projected noise level increases are below 1 dB which is below perceptible levels. This would result in a less than significant impact.

TABLE 8
AM PEAK HOUR TRAFFIC VOLUMES AND NOISE INCREASE

Roadway Segment	AM Peak Hour Traffic Volumes		Noise Level Increase (dB)
	Existing No Project	**Existing Plus Project**	
North of Taylor Road	832	883	+0.3
South of Taylor Road	832	859	+0.1
	Cumulative No Project	**Cumulative With Project**	
North of Taylor Road	1,063	1,106	+0.2
South of Taylor Road	1,063	1,082	+0.1

Notes: Noise Increase is based on 10*LOG (Traffic with project / Traffic without project)
Source: KD Anderson and Associates, 2017 and 2018.

Stationary Noise Sources

A summary of the noise levels for each of the new stationary noise sources under the proposed project is described below and presented in **Table 9**.

General School Activities

The noise from general school activities would include school bells, PA systems, HVAC, and recess and recreational activities. EPA's published document *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA, 1974) includes a study on typical noise exposure patterns on school children. According to the EPA study, students in a class room setting are typically exposed to noise levels of approximately 60 dBA and noise levels as high as 65 dBA during lunch and outdoor play time. These noise levels are presented in the study as average hourly L_{eq}. Therefore, the highest hourly L_{eq} noise level a student could generate during a typical school day is assumed to be 65 dBA from a reference distance of 25 feet, which is an assumed typical distance between a source and a receiver. Assuming a propagation rate of 7.5 dB per doubling of distance, the nearest residential property line located approximately 150 feet west of the proposed school buildings and field areas could be exposed to normal school-related noise levels of approximately 46 dBA L_{eq}, which is below the County's exterior noise standard.

As shown in Table 9, noise generated during normal school activities would elevate the existing ambient to 57 dBA L_{eq} or 0 dB above the existing ambient. Since the nearest offsite sensitive receptor property line to the project area would be exposed to noise levels from general school activities that would not exceed the applied 5 dB substantial noise increase threshold, this would result in a less than significant impact.

TABLE 9
PROJECT-RELATED STATIONARY NOISE SOURCES
NOISE EXPOSURE AT NEAREST RESIDENTIAL PROPERTY LINE LOCATED WEST OF THE PROJECT SITE

Noise Source	Distance to Nearest Residential Property Line (feet)	Highest School Hour Existing Ambient (dBA L_{eq})[1]	Project Only (dBA L_{eq})	Project plus Existing Ambient (dBA L_{eq})	Project Increase Over Existing Ambient (dB)	Project Only Noise Exceed 55 dBA Hourly L_{eq}? (yes or no)[6]	Increase Existing Ambient by 5 dB or greater? (yes or no)[6]
General School Activities[2]	150	57	46	57	0	No	No
Recreational Activities[3]	250	57	40	57	0	No	No
Emergency Generators[4]	200	57	55	59	2	No	No
HVAC Units[5]	160	57	22	57	0	No	No

Notes:
1. The school hour is assumed to be between 7 AM and 5 PM. The measured hourly L_{eq} was obtained from a 24-hour long-term noise survey conducted from January 5 – 6, 2017 at LT1 was used because the closest sensitive receptor is to the west of the project site.
2. Noise generated during a typical school day was assumed to be 65 dBA L_{eq} from a reference distance of 3.3 feet (EPA, 1974).
3. Noise generated by raised voices was assumed to be 72 dBA L_{eq} from a reference distance of 3.3 feet (EPA, 1974).
4. The sound pressure level from the proposed generator would be 75 dBA at 25 feet with a Cummings Level II sound enclosure, muffler and silencer installed.
5. The HVAC units would consist of a Carrier's 50DJ cooling/heating unit, which has a sound power level of 74 dBA.
6. Noise standards specified in the Placer County Municipal Code 9.36.060.

Source: ESA, 2018

Recreational Activities

Students could be participating in recreational sports at the outdoor playground between Buildings A and C as well as at the playing field south of Building B after school or on weekends. It was assumed for this analysis that the playing field would not be used after 10:00 p.m. as after-school sports, particularly for elementary and middle school students typically end before 10:00 p.m. EPA's published document *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA, 1974) estimates the noise level of raised voices at 72 dBA L_{eq} from a reference distance of 3.3 feet. Assuming 30 students scattered within the playing field, the total noise level would be 87 dBA L_{eq} from a distance of 3.3 feet. The distance between the center of the playing field and the nearest residential property line to the west is approximately 250 feet. Based on the propagation rate of 7.5 dB per doubling of distance, the noise level at the closest residence would be 40 dBA L_{eq}, which is below the County's exterior noise standard.

As shown in Table 9, noise generated during onsite recreational activities would elevate the existing ambient to 57 dBA L_{eq} or 0 dB above the existing ambient. Since the nearest offsite sensitive receptor property line to the project area would be exposed to noise levels from onsite recreational activities that would not exceed the applied 5 dB substantial noise increase threshold, this would result in a less than significant impact.

Emergency Generators

A transformer and two emergency generators would be located at the northwest corner of Building E. Both emergency generators will be installed in a Cummings Level II sound enclosure and surround by a perf metal or CMU depending on the location. The proposed generators would be used for emergency purposes only and tested at most once a month. The emergency generators would be located approximately 200 feet from the closest residential property line to the west of the project area. According to the specification of the generator, the sound pressure level from one of the proposed generators in a

Cummings Level II sound enclosure and with a muffler and silencer installed would be 75 dBA at 25 feet. Assuming both generators are tested at the same time, the combined sound pressure level would be 78 dBA from a distance of 25 feet. Based on the propagation rate of 7.5 dB per doubling the distance, the noise level at the closest residence would be 55 dBA L_{eq}, which is meets the County's exterior noise standard.

As shown in Table 9, the noise generated when both generators are operational would elevate the existing ambient to 59 dBA L_{eq} or 2 dB above the existing ambient. Since the nearest offsite sensitive receptor property line to the proposed project area would be exposed to noise levels from the onsite emergency generator that would not exceed the applied 5 dB substantial noise increase threshold, this would result in a less than significant impact.

Heating, Ventilation, and Air-Conditioning Systems

HVAC units could be installed at each of the proposed school and office buildings. The closest proposed building (i.e., Building E) would be located approximately 160 feet west from the nearest offsite residence property line. The HVAC units would consist of a Carrier's 50DJ cooling/heating unit, which has a sound power level of 74 dBA. Assuming a distance of 160 feet and a sound power level of 74 dBA, the nearest residence to the HVAC units at Building E would be exposed to a sound pressure level of 22 dBA L_{eq}, which is below the County's exterior noise standard. It should be noted that the HVAC unit usage would be intermittent.

As shown in Table 9, noise generated during the operation of the onsite HVAC units would elevate the existing ambient to 57 dBA L_{eq} or 0 dB above the existing ambient. Since the nearest offsite sensitive receptor property line to the project area would be exposed to noise levels during the operation of the onsite HVAC units would not exceed the applied 5 dB substantial noise increase threshold, this would result in a less than significant impact.

Impact 4: Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Construction

Construction activity noise levels at the proposed project site would fluctuate depending on the particular type, number and duration of use of various pieces of construction equipment and would periodically increase noise levels in the vicinity of the project site. Construction activities associated with the proposed project would involve excavation, grading and earth movement, as well as construction of the classrooms and faculty buildings. **Table 10** shows typical reference noise levels of off-road construction equipment likely to be used during project construction.

TABLE 10
REFERENCE CONSTRUCTION EQUIPMENT NOISE LEVELS
(50 feet from source)

Type of Equipment	L_{max}, dBA	Hourly L_{eq}, dBA Percent Use[1]
Backhoe	80	76/40
Grader	85	81/40
Concrete Mixer Truck	85	81/40
Loader	80	76/40
Pneumatic Tools	85	76/40
Air Compressor	80	81/40
Excavator	85	81/40

SOURCE: FHWA, 2006.

Land uses surrounding the proposed project site consist of single-family residences. The loudest source of noise during project construction would occur during the grading phase. Based on grading plans prepared for the proposed project, grading activities on the northwestern portion of the site could occur from a distance of 20 feet of the nearest residential property line. The loudest piece of construction equipment that would be operating during the grading phase is a grader. Using the reference noise levels provided in Table 10, a grader would generate a maximum noise level of 85 dBA and hourly L_{eq} of 81 dBA at a distance of 50 feet. Assuming a 7.5 dB per doubling of distance attenuation rate, the nearest residential property line could be exposed to a maximum noise level of 95 dBA and hourly L_{eq} of 91 dBA.

The highest measured daytime hourly L_{eq} levels at the western proposed project boundary is 57 dBA. Noise generate during the grading phase of the proposed project could expose the nearest residential property line to noise levels that would temporarily elevate the existing ambient by up to 34 dB, which would exceed the applied 5 dB noise increase threshold and thus is considered potentially significant. It should be noted that the presented noise levels would be the worst case condition at a short period of time because construction equipment generally would not stay in one place for a long time. The implementation of **Noise Reduction Measures 1** and **2** would reduce impacts associated with this noise increase by providing up to 30 dB or more of noise reduction.

Operation

Outdoor Special Events

During project operation, special events would be held on school grounds. The events are expected to be held three times a year and could take place during the weekdays from 10:00 a.m. to 2:00 p.m. or 5:00 p.m. to 8:00 p.m. Up to 200 people could attend any one event. Typical noise sources associated with these types of special events would consist of amplified sound for speeches or music and crowd noise (i.e., people talking and laughing).

Since the exact specifications of the speakers are unknown at this time, it is assumed that the two speakers would generate a noise level as high as 85 dBA from a distance of 25 feet, which assumes that speakers would be orientated away from offsite sensitive receptors. The speakers were also assumed to be located

at 270 feet from the nearest residential property line. Noise generated by raised normal speaking raised voices are assumed to be 72 dBA L_{eq} from a reference distance of 3.3 feet (EPA, 1974). As shown in **Table 11**, offsite residences could be expose to a combined noise level of 59 dBA L_{eq} during special events within the proposed project area.

TABLE 11
NOISE EXPOSURE LEVELS AT THE NEAREST OFFSITE RESIDENTIAL PROPERTY LINE

Noise Source	Noise Level (dBA L_{eq})
Speakers[1]	59
Raised Voices[2, 3]	48
Combined Noise Level	59
Highest Measured Existing Ambient during the a Special Event[4]	57
Project plus Existing Ambient	61
Project Increase Over Existing Ambient (dB)	4
Increase Existing Ambient by 5 dB or Greater? (yes or no)[5]	No

Notes:
1. Assumed the two outdoor speakers would generate a noise level of 85 dBA L_{eq} from a distance of 25 feet. Assumed speakers are facing away from residential properties at a distance of 270 feet.
2. Noise generated by raised normal speaking raised voices are assumed to be 60 dBA L_{eq} from a reference distance of 3.3 feet (EPA, 1974).
3. Assumed 200 attendees any one special event.
4. The measured hourly L_{eq} was obtained from a 24-hour long-term noise survey conducted from January 5 – 6, 2017 at LT-1 was used because the closest sensitive receptor is to the west of the project site between the hours of 5:00 p.m. and 8:00 p.m.
5. Noise standards specified in the Placer County Municipal Code 9.36.060.

Source: ESA, 2018

As shown in Table 2, the highest existing L_{eq} noise level at the residences located west of the proposed project area is 57 dBA. Assuming that the special event would occur for three hours during the daytime hours, the nearest residential property line to the special event area would be exposed to event noise that would elevate the existing ambient to 61 dBA L_{eq} or a 4 dB increase over the existing ambient. Since the nearest offsite sensitive receptor to the project area would be exposed noise levels during an onsite special event that would not exceed the applied 5 dB temporary substantial noise increase threshold, the project would result in a less than significant impact. Although it is anticipated that the speakers during onsite special events would not be orientated directly at the offsite residential area to the west, the exact layout of equipment is unknown. If speakers in the special event area are facing the residential property line or closer than 270 feet to the nearest residential property line, noise generated during onsite special events would result in a 5 dB or greater increase and could be potentially significant depending on the number of attendees.

To ensure that this impact remains less than significant, **Noise Reduction Measure 3** recommends that all speakers used during special events be orientated away from the nearest offsite residential property and located at least 270 feet from the nearest residential property line.

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CHAPTER 5
Recommended Noise Reduction Measures

Noise Reduction Measure 1. To reduce human annoyance from vibration due to construction near sensitive receptors, the project applicant should require construction contractors to implement the following measure:

- Large construction equipment, such as large bulldozer and loaded trucks, should be replaced with smaller equipment when the construction equipment is within 45 feet of an occupied residence.

Noise Reduction Measure 2. To reduce daytime construction noise levels due to construction at the nearby off-site sensitive receptors, the project applicant should require construction contractors to implement the following measures:

- Equipment and trucks used for project construction should utilize the best available noise control techniques, such as improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds. The implementation of best control techniques could result in a noise reduction of 10-dB

- Impact tools (i.e., jack hammers, pavement breakers, and rock drills) used for project construction should be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust should be used; this muffler can lower noise levels from the exhaust by up to about 10-dB. External jackets on the tools themselves should be used, to achieve a reduction of 5-dB. Quieter procedures will be used, such as drills rather than impact equipment.

- Stationary noise sources should be located as far from adjacent receptors as possible, and they will be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures. The use of temporary enclosures or barriers around stationary noise sources (e.g., generators, compressors, pumps, etc.) would result in a noise reduction of up to 10-dB.

Noise Reduction Measure 3. To reduce the noise exposure on nearby sensitive receptors adjacent to the project site, all speakers used during special events shall be located at least 270 feet from the nearest residential property. The speakers shall be oriented away from the nearest residential property. The distance between the speakers and nearby residence and the orientation of the speakers shall be inspected by a designated operations manager for the Tribe prior to any onsite special events.

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CHAPTER 6
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