SUMMIT PUBLIC SCHOOL: SUMMIT DENALI ENVIRONMENTAL NOISE ASSESSMENT 539 E. WEDDELL DRIVE SUNNYVALE, CALIFORNIA

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Prepared for:

Summit Public Schools
890 Broadway Street
Redwood City, CA 94063

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Sunnyvale International Church of the Assemblies of God
521 E. Weddell Drive
Sunnyvale, CA 94089

Prepared by:

Michael S. Thill

ILLINGWORTH & RODKIN, INC.
Acoustics · Air Quality
1 Willowbrook Court, Suite 120
Petaluma, CA 94954
(707) 797-0400

Job No.: 15-231

INTRODUCTION

Summit Public Schools (SPS) plans to lease an existing 19,402 square foot building (previously used as a Church) and temporarily locate two (2) 960 square foot classroom portables to operate a charter school (grades 6–9). The long term plan is to solely serve the middle school population (Grades 6-8) of 300 students. The school will operate its first academic calendar year (2016-2017) with 400 students. After the first academic calendar year the portables will be removed from the site and the paved area may at times be used for outdoor recreation (e.g., basketball during the lunchtime period or after school). The existing building will require interior tenant improvements to accommodate the school program. No expansion of the existing building footprint is needed.

This report summarizes the assessment of potential noise impacts resulting from the proposed Summit Denali Charter School Project proposed at 539 E. Weddell Drive in Sunnyvale, California. The Setting Section of this report presents the fundamentals of environmental noise, provides a discussion of policies and standards applicable to the project, and presents the results of the ambient noise monitoring survey made to document existing conditions. The Impacts and Mitigation Measures Section of the report summarizes future noise levels resulting from the project and provides an evaluation of the potential significance of project-related noise impacts.

SETTING

Background Information on Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA)*. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the

variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the *sound level meter*. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level (CNEL)* is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 pm - 10:00 pm) and a 10 dB addition to nocturnal (10:00 pm - 7:00 am) noise levels. The *Day/Night Average Sound Level (DNL or L_{dn})* is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Sleep and Speech Interference

The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noise of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA have been shown to affect sleep. Interior residential standards for multi-family dwellings are set by the State of California at 45 dBA DNL. Typically, the highest steady traffic noise level during the daytime is about equal to the DNL and nighttime levels are 10 dBA lower. The standard is designed for sleep and speech protection and most jurisdictions apply the same criterion for all residential uses. Typical structural attenuation is 12-17 dBA with open windows. With closed windows in good condition, the noise attenuation factor is around 20 dBA for an older structure and 25 dBA for a newer dwelling. Sleep and speech interference is therefore possible when exterior noise levels are about 57-62 dBA DNL with open windows and 65-70 dBA DNL if the windows are closed. Levels of 55-60 dBA are common along collector streets and secondary arterials, while 65-70 dBA is a typical value for a primary/major arterial. Levels of 75-80 dBA are normal noise levels at the first row of development outside a freeway right-of-way. In order to achieve an acceptable interior noise environment, bedrooms facing secondary roadways need to be able to have their windows closed; those facing major roadways and freeways typically need special glass windows.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement to the Traffic Noise Analysis Protocol (TeNS), Caltrans, September 2013.

Regulatory Criteria

State CEQA Guidelines. The California Environmental Quality Act (CEQA) includes qualitative guidelines for determining the significance of environmental noise impacts. A project will typically have a significant impact if it would:

(a) Expose people to or generate noise levels in excess of established in the local general plan, noise ordinance, or applicable standards of other agencies.

(b) Expose people to or generate excessive groundborne vibration or groundborne noise levels.

(c) Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project.

(d) Result in a substantial temporary or periodic increase in the ambient noise levels in the project vicinity above levels existing without the project.

(e) Where projects within an area covered by an airport land use plan or within two miles of a public airport or public use airport when such an airport land use plan has not been adopted, or within the vicinity of a private airstrip, expose people residing or working in the project area to excessive aircraft noise levels.

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

Of these guidelines, items (a), (c), and (e) are applicable to the proposed project.

With regard to the impact assessment of the proposed project, Guidelines (b) and (d) would be applied to temporary noise or vibration resulting from construction. The existing building will only require interior tenant improvements to accommodate the school program. No expansion of the existing building footprint is needed. The project will not require the use of heavy construction equipment and substantial noise or excessive groundborne vibration due to project construction is not anticipated. Therefore, Guidelines (b) and (d) are not applicable in the assessment. Guideline (f) is not applicable because the project is not located in the vicinity of a private airstrip and would not expose persons in the project area to excessive airport-related noise. CEQA checklist items (b), (d), and (f) are not carried forward for further analysis.

Santa Clara County Airport Land Use Commission. The Santa Clara County Airport Land Use Commission (ALUC) prepares an ALUC plan that provides for orderly growth of the area surrounding each public airport in Santa Clara County (Moffett Federal Airfield, San Jose International Airport, Palo Alto Airport, Reid-Hillview Airport, and South County Airport). The plan is intended to minimize the public's exposure to excessive noise and safety hazards The ALUC has established provisions for regulating land use, building height, safety, and noise insulation within these areas that are adjacent to each of the airports ("referral boundaries").

The ALUC also reviews the general and specific plans prepared by local agencies (including Sunnyvale) for consistency with the ALUC plan. Recommendations made by the ALUC are advisory in nature to the local jurisdictions, not mandatory.

City of Sunnyvale Safety and Noise Element of the General Plan. The Safety and Noise Element of the Sunnyvale General Plan identifies noise and land use compatibility standards for various land uses. The Safety and Noise Element establishes goals, policies, and standards for evaluating the compatibility of proposed land uses with the noise environment. Relevant goals and policies of the element are as follows:

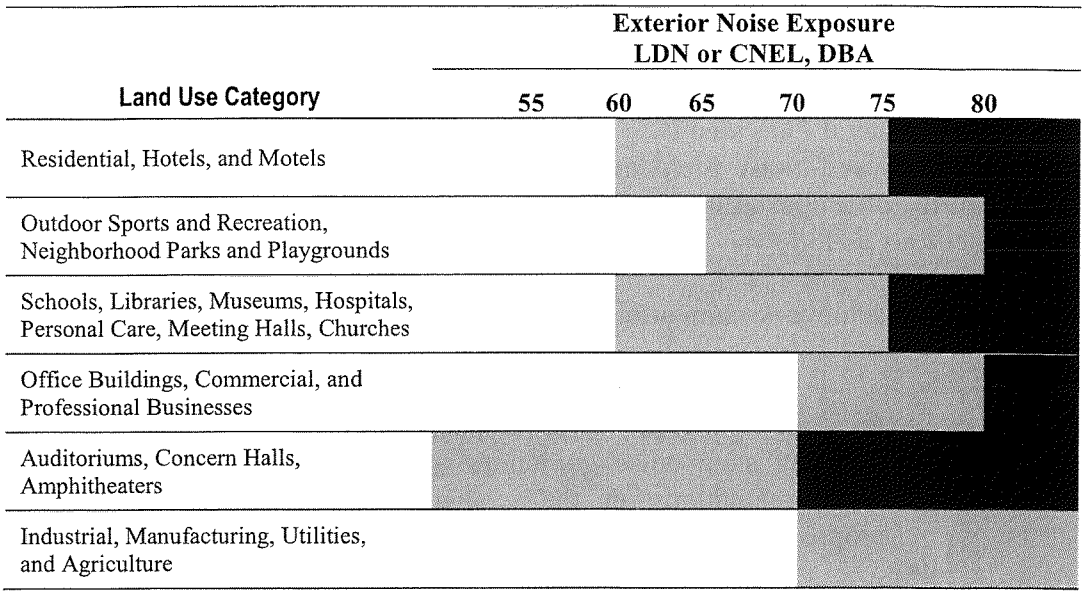
GOAL SN-8 – Maintain or achieve a compatible noise environment for all land uses in the community.

Policy SN-8.4:	Prevent significant noise impacts from new development by applying state noise guidelines and Sunnyvale Municipal Code noise regulations in the evaluation of land use issues and proposals.
Policy SN-8.5:	Comply with "State of California Noise Guidelines for Land Use Planning" (Figure 6-5 of the Safety-Noise Element) for the compatibility of land uses with their noise environments, except where the City determines that there are prevailing circumstances of a unique or special nature.
Policy SN-8.6:	Use Figure 6-6 (of the Safety-Noise Element), "Significant Noise Impacts from New Development on Existing Land Use" to determine if proposed development results in a "significant noise impact" on existing development.
Policy SN-8.9:	Consider techniques that block the path of noise and insulate people from noise.

GOAL SN-9 – Maintain or achieve acceptable limits for the levels of noise generated by land use operations and single-events.

Policy SN-9.1:	Regulate land use operation noise.
Policy SN-9.3:	Apply conditions to discretionary land use permits which limit hours of operation, hours of delivery, and other factors which affect noise.

TABLE 3 Land Use Compatibility Guidelines for Community Noise in Sunnyvale



Normally Acceptable
Specified land use is satisfactory, based on the assumption that any key buildings involved are of normal conventional construction, without any special insulation requirements.

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

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

City of Sunnyvale Municipal Code. Operational noise standards enforced on residentially zoned property lines are presented in Title 19 on the Municipal Code. Chapter 19.42.030, states the following:

(a) Operational noise shall not exceed seventy-five dBA at any point on the property line of the premises upon which the noise or sound is generated or produced; provided, however, that the noise or sound level shall not exceed fifty dBA during nighttime or sixty dBA during daytime hours at any point on adjacent residentially zoned property. If the noise occurs during nighttime hours and the enforcing officer has determined that the noise involves a steady, audible tone such as a whine, screech or hum, or is a staccato or intermittent noise (e.g., hammering) or includes music or speech, the allowable noise or sound level shall not exceed forty-five dBA.

(b) Powered equipment used on a temporary, occasional, or infrequent basis which produces a noise greater than the applicable operational noise limit set forth in subsection (a) shall

be used only during daytime hours when used adjacent to a property with a residential zoning district. Powered equipment used on other than a temporary, occasional or infrequent basis shall comply with the operational noise requirements. For the purpose of this section, powered equipment does not include leaf blowers. Construction activity regulated by Title 16 of this code shall not be governed by this section.

(c) It is unlawful for any person to make or allow to be made a nighttime delivery to a commercial or industrial establishment when the loading/unloading area of the establishment is adjacent to a property in a residential zoning district. Businesses legally operating at a specific location as of February 1, 1995, are exempt from this requirement.

(d) A "leaf blower" is a small, combustion engine-powered device used for property or landscape maintenance that can be hand-held or carried on the operator's back and which operates by propelling air under pressure through a cylindrical tube. It is unlawful for any person to operate a leaf blower on private property in or adjacent to a residential area except between the hours of 8:00 am and 8:00 pm. Effective January 1, 2000, all leaf blowers operated in or adjacent to a residential area shall operate at or below a noise level of sixty-five dBA at a distance of fifty feet, as determined by a test conducted by the American National Standards Institute or an equivalent. The dBA rating shall be prominently displayed on the leaf blower. (Ord. 2623-99 § 1 (part): prior zoning code § 19.24.020(b)--(d))

The City's Code does not define the acoustical time descriptor such as L_{eq} (the average noise level) or L_{max} (the maximum instantaneous noise level) that is associated with the above limits. A reasonable interpretation of the City Code would identify the ambient base noise level criteria as an average or median noise level (L_{eq}/L_{50}).

Existing Noise Environment

A series of noise measurements were made on Thursday, November 5, 2015 and Friday, November 6, 2015 to document ambient noise levels at the project site and in the project vicinity. The noise survey included five short-term (20-minute) noise measurements as depicted in Figure 1. The primary noise source in the project vicinity was vehicle traffic along US Highway 101. Vehicle traffic along E. Weddell Drive and construction-related noise occurring east of the site also contributed to the measured noise levels. The short-term measurement results are shown in Table 4.

FIGURE 1 Noise Measurement Locations

TABLE 4 Summary of Short-Term Noise Measurement Data (A-Weighted Decibels, dBA)

Noise Measurement Location (Date)	Measured Daytime Noise Levels			Primary Noise Sources
	Time	L_{max}	L_{eq}	
ST-1: 220 feet north of US Highway 101 centerline near south building facade. (11/5/2015)	12:50 pm	75	67	US Highway 101
	1:00 pm	71	67	
ST-2: Residential property line north of site. (11/5/2015)	1:20 pm	69	59	Traffic and Construction Activities
	1:30 pm	68	58	
ST-3: Northwest corner of project site. (11/5/2015)	1:50 pm	64	58	Traffic and Construction Activities
	2:00 pm	62	58	
ST-4: 60 feet west of the centerline of E. Weddell Drive. (11/5/2015)	2:10 pm	74	62	Traffic and Construction Activities
	2:20 pm	75	62	
ST-5: South boundary of Seven Seas Park. (11/6/2015)	1:00 pm	61	55	US Highway 101
	1:10 pm	62	56	

Notes: L_{max} - The maximum instantaneous A-weighted noise level during the measurement period.
L_{eq} - The average A-weighted noise level during the measurement period.

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

For the purposes of this assessment, development of the project would present a significant impact if the projects would:

- Expose people to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- Create a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or
- 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, expose people residing or working in the project area to excessive noise levels.

Impact 1: **Noise and Land Use Compatibility.** Future interior noise levels would be considered compatible with the proposed use as a school. **This is a less-than-significant impact.**

The City of Sunnyvale considers schools to be "normally acceptable" in exterior noise environments of up to 60 dBA DNL and "conditionally acceptable" in exterior noise environments of up to 75 dBA DNL. The future exterior noise level at the south façade of the building, nearest US Highway 101, is calculated to reach 71 dBA DNL. Therefore, the specified land use may be permitted only after detailed analysis of the noise reduction requirements and needed noise insulation features are included in the design.

A typical office structure provides about 30 dBA of noise reduction with the windows in the closed position. The building is mechanically ventilated and windows and doors can remain closed to control noise levels indoors. With exterior noise levels at the building facades of 71 dBA DNL or less, interior noise levels would be 41 dBA DNL or less with the windows and doors closed. Interior noise levels would be compatible with the proposed use as day-night average noise levels would be less than 45 dBA DNL and hourly average noise levels would be 38 dBA L_{eq} or less. This is a less-than-significant impact.

Mitigation Measures: **None Required**

Impact 2: **Noise Due to Project Operations.** Operational noise levels attributable to the project would not exceed the City's Municipal Code noise limit or result in a substantial permanent noise increase at the nearest noise sensitive land uses. **This is a less-than-significant impact.**

Noise sources associated with school operations would primarily include student activities such as conversations and outdoor recreation, and low speed vehicle noise associated with parking and student drop-offs before school and pick-ups after school. Existing roof-top mechanical systems would not change with the project, and therefore, the noise attributable to these systems would be expected to remain the same as existing conditions.

The proposed project would serve up to 400 students during its first academic calendar year and then serve 300 students over the long-term. The SPS schedule does not have an outdoor component such as recess or physical education, and as such, SPS students spend minimal time outdoors. SPS has limited sports programs and all practices, training, and competitions occur at other recreation/school sites. However, some students would be expected to congregate outside prior to school (20 minutes or less) and after school (60 minutes or less). The students are also encouraged to go outside during the 40 minute lunch break. The total time per day that students would be outside would be two hours or less.

The closest existing noise sensitive uses are residences located north of the site along Jena Terrace. These residences are exposed to existing traffic noise levels of about 56 dBA L_{eq} during the daytime and a day-night average noise levels of approximately 59 dBA DNL. Residential land uses are also under construction east of the site. The noise environment at the nearest future receptors to the east is dominated by US Highway 101 traffic noise. Future residences to the east

would be exposed to hourly average noise levels of approximately 72 to 75 dBA L_{eq} during school hours. The DNL at these future residential land uses is projected to range from 75 to 78 dBA DNL.

A significant noise impact would occur if project operations would exceed 60 dBA L_{eq} during daytime hours at any point on adjacent residentially zoned property (or the ambient if higher) or if the project would increase day-night average noise levels at noise sensitive receptors by 3 dBA DNL or more.

The highest noise levels attributable to outdoor activities at the school would occur during outdoor recreation periods (i.e., before school, lunch, and after school). It is contemplated by SPS that after the first year of operation, and upon removal of the portables located on the south side of the existing building, the space may be reclaimed for outdoor recreation in the form of mobile basketball hoops and informal skateboarding area. *Illingworth & Rodkin, Inc.* has made measurements of the noise generated by activities at neighborhood parks at numerous locations throughout the bay area. Pick-up basketball games typically generate noise levels of approximately 54 to 58 dBA L_{eq} at a distance of about 100 feet from the center of the court. Skateboarding typically generates noise levels of approximately 54 to 55 dBA L_{eq} at a distance of 30 feet from the edge of the skatepark (approximately 50 feet from the primary skating area). Maximum instantaneous noise levels from voices typically range from 45 to 51 dBA, "grinds" result in maximum instantaneous noise levels of approximately 58 to 64 dBA, and the sounds of tricks (e.g., the skateboard slapping the concrete surface) typically range from 57 to 67 dBA at a distance of 30 feet from the edge of the skatepark.

Residential land uses would be located approximately 100 feet from the center of the parking lot proposed for outdoor recreation, opposite E. Weddell Drive. As noted above, the noise environment at the location of these future residences is relatively high with hourly average noise levels expected to range from 72 to 75 dBA L_{eq} during school hours. Pick-up basketball games would generate noise levels of approximately 54 to 58 dBA L_{eq} at a distance of about 100 feet from the center of the court. Project-generated noise levels due to basketball would be at least 14 dBA less than the traffic noise levels resulting from traffic along US Highway 101 and E. Weddell Drive. Basketball-related noise levels would not measurably contribute to the traffic noise levels expected at these future residences. Noise levels from informal skateboarding in the same area would be less than those levels calculated for pick-up basketball games at the nearest receptors to the east.

Jena Terrace residences are located over 350 feet from the area south of the school building proposed for outdoor recreation. These residences are also shielded from the outdoor recreation area by the intervening school building. At a distance of 350 feet, pick-up basketball games would generate noise levels of approximately 33 to 37 dBA L_{eq} when accounting for the acoustical shielding provided by the intervening school building. Project-generated noise levels due to basketball would be at least 19 dBA less than the traffic noise levels resulting from traffic along US Highway 101 and E. Weddell Drive. Basketball-related noise levels would not measurably contribute to the ambient noise environment. Similarly, noise levels from informal skateboarding in the same area would not measurably contribute to the ambient noise environment. Therefore, outdoor recreation occurring in the area south of the school building

would not generate noise levels at that would exceed 60 dBA L_{eq} during daytime hours at any point on adjacent residentially zoned property (or the ambient if higher) or increase day-night average noise levels at noise sensitive receptors by 3 dBA DNL or more.

Slow moving vehicles entering, exiting, and parking in the school parking lot would be similar in character, but considerably lower in level, to noise levels resulting from existing traffic along E. Weddell Drive or US Highway 101. Such noise levels would also be similar to the noise levels generated by previous uses at the project site. Vehicular traffic associated with the school would be concentrated during the drop-off and pick-up hours. The project is not expected to cause a noticeable or substantial increase in noise during other hours of the day. On a 24-hour average basis, the DNL is calculated to increase by less than 1 dBA. A change in the DNL less than 1 dBA is not substantial. Given the existing volume of traffic and associated noise levels along E. Weddell Drive or US Highway 101, the incremental increase in noise resulting from the noise of project's vehicular traffic would be also be insignificant.

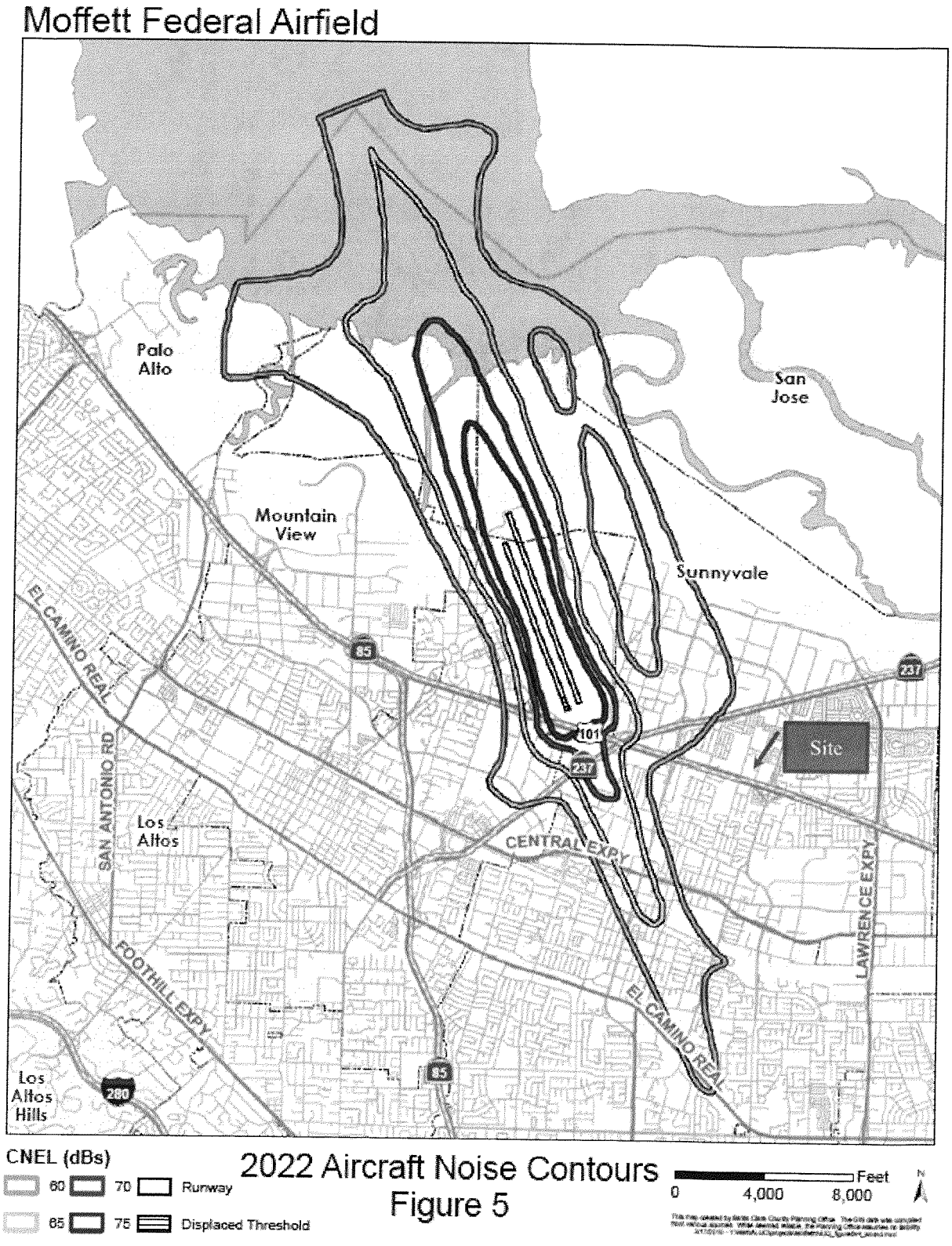
Mitigation Measures: **None Required**

Impact 3: **Noise and Land Use Compatibility - Aircraft.** Aircraft noise at the project site would not exceed the ALUC noise thresholds. **This is a less-than-significant impact.**

The Santa Clara County ALUC has jurisdiction over new land uses in the vicinity of airports. Schools are considered "generally acceptable" in noise environments of 60 dBA CNEL or less. The 2022 noise contours for Moffett Federal Airfield (Figure 5 from the ALUC Plan) are shown below.

The project site is located outside the 60 dBA CNEL noise contour established for Moffett Federal Airfield, and the impact from aircraft noise exposure is therefore considered less-than-significant.

Mitigation Measures: **None Required**



Source: Santa Clara County Airport Land Use Commission, *Comprehensive Land Use Plan—Moffett Federal Airfield*, August 2011.

ATTACHMENT 20