

ALVERNO HEIGHTS ACADEMY
SIERRA MADRE, CA
NOISE IMPACT ANALYSIS



Prepared For: Alverno Heights Academy

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1.0 Executive Summary

The project consists of the development of two new sports courts near the south end of the Alverno Heights Academy (AHA) campus by West Highland Avenue (this location is herein referred to as “future sports courts”). We understand there are concerns from neighbors regarding the noise impact of these courts on the nearby residences. Even though noise from the sports courts will occur during regular school hours and are not subject to noise limits, AHA commissioned the noise study to determine if mitigation measures may be necessary in case the City redefines school noise criteria in the proposed amendment to the noise ordinance, since the City’s current noise ordinance does not address noise generated from schools.

Acoustical measurements were conducted on January 30, 2024, during the Girls’ Varsity Basketball game at the existing court near the north end of the AHA campus and, concurrently, at the future sports courts. The purpose of these measurements was to analyze the collected data and predict noise level and character from similar use of the future sports courts. The analysis also includes commenting on whether a rubberized court flooring system will provide noise reduction compared to an asphalt court. This report summarizes our analysis of the future sports courts impacting the surrounding residences. In summary:

- Our analysis is based on discussions with AHA faculty, the Site Plan drawings received on January 9, 2024, the proposed noise criteria, and our measurements on January 30, 2024.
- Even though activities on the future sports court are considered part of the school day and exempt from noise criteria, noise levels on the future sports courts may exceed the City’s proposed 5-minute event noise limit criterion of 70 dBA by up to 3 dB at the south AHA property line (along West Highland Avenue).
- Basketball bounces and footfall noise are not contributors to the 1-minute and 5-minute noise levels during a basketball game. Therefore, a rubberized court flooring system will not reduce the controlling noise sources of spectators yelling and whistle blows.
- Since noise from the future sports courts will be considered part of the school day, this report does not further discuss recommendations for activities that exceed the City’s proposed event noise limit criteria.

Definitions of acoustical terms used in this report can be found in **Appendix A**.

2.0 Acoustical Criteria

The current Sierra Madre Municipal Code (dated May 7, 2024) Chapter 9.32 “Noise” of Title 9 “Public Peace, Morals and Welfare” does not include a section pertaining to noise generated from a school. *Section 9.32.70 – Schools, hospitals and churches* includes language pertaining to people creating noise that interferes with school activities but does not address school noise affecting others. For the residences across the street from AHA, *Section 9.32.030 – Residential property noise limits* are applicable to machinery/mechanical equipment noise impacting residential properties.

We understand that the City of Sierra Madre is preparing to adopt Ordinance No. 1467 amending Chapter 9.32 “Noise” of Title 9 “Public Peace, Morals and Welfare” of the Sierra Madre Municipal Code. This amendment contains *Section 9.32.090: Schools, Churches, or Other Institutional Uses*, which stipulates event noise limit criteria under Item C:

Event noise on any property adjacent to a school, church, or other institutional use shall not exceed 70 dBA at any point along the shared property plane. If the event noise is greater than 70 dBA at any point outside of the property plane, event noise limits shall be limited to 84 dBA for up to one minute per hour.

- The sports activities on the Michillinda Parking Lot are considered part of the school day and no different than recess and lunch-time activities; therefore, they would not be considered events subject to the criteria of Ordinance No. 1467.
- The sports activities are not amplified and do not include microphones or loudspeakers for music or announcements.
- The Alverno Heights Academy school day ends at 6:00pm, and activities after 6:00pm (such as school dances) may be considered events subject to the noise limits outlined in Ordinance No. 1467.

Even though AHA sports activities are not scheduled to exceed the 6:00pm time frame and may not qualify as event noise, AHA has asked that we analyze potential noise from the future sports courts to the AHA property lines and compare it to the noise limits outlined in Ordinance No. 1467.

Therefore, we have used the following noise limit criteria as a basis for our analysis:

- 5-minute noise level exceeding 70 dBA.
- 1-minute noise level of 84 dBA.

3.0 Measurements

Resonance conducted a noise study at the Michillinda Parking Lot, located at the northwest corner of the school site. At the time of the measurements, the parking lot was being used for student basketball games. Simultaneous measurements were conducted at the Michillinda Parking Lot and future sports courts. Both teams warmed up till around 3:45pm, and the game was from around 3:45pm to about 4:50pm. After the game was over there was no further activity at the Michillinda Park Lot. There were roughly 30 spectators including parents and students; we were informed by AHA that this attendance can be considered typical.

Each measurement was taken using a Type 1 Larson Davis Model 831 sound level meter, which recorded spectral measurements in one-third octave bands from 16 Hz to 20 kHz in continuous, 1-second intervals. The sound level meters' calibration was checked immediately prior to and following the measurements. The noise measurement locations, nearby residential properties, and the AHA property line are shown in Figure 1. Descriptions are provided below:

- **Short-term Measurement 1 (ST-1):** This measurement was conducted concurrently with ST-2 on January 30, 2024, beginning at approximately 3:30 PM, at the Michillinda Parking Lot during a Girls' Varsity Basketball game. The sound level meter was positioned on a tripod, approximately 4 feet above grade, and set up along the east edge of the asphalt lot, approximately 120 feet from the center of the existing court. This meter was continuously monitored during the measurement, and descriptions of sports court activity were logged in real-time. Noise levels at this location were controlled by activity on the basketball court, with increased levels being associated with spectator noise (raised voices/yelling) and whistle blows.

Additionally, an ambient measurement was conducted at this location following the Girls' Varsity Basketball game after students, spectators, and faculty had cleared the area (at approximately 5:00 PM).

- **Short-term Measurement 2 (ST-2):** This measurement was conducted concurrently with ST-1 on January 30, 2024, beginning at approximately 3:30 PM, at the future sports courts during a Girls' Varsity Basketball game to collect ambient measurements at the site of the future sports courts. The sound level meter was positioned on a tripod, approximately 4 feet above grade.

The analyses and modeling procedures are further discussed in Section 4.0.

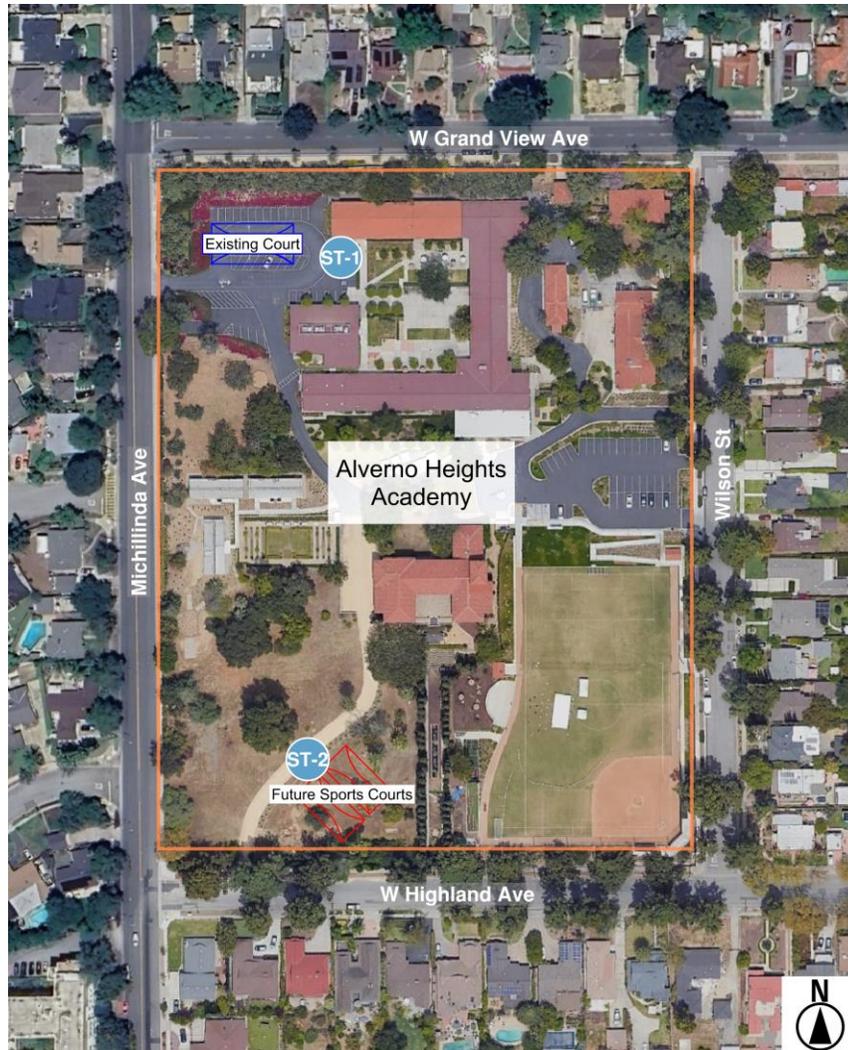


Figure 1: Noise Measurement Locations

4.0 Analysis

Noises that impacted a 1-minute and 5-minute measurement timeframe included whistle blows and spectator noise (clapping, raised voices, and yelling from the coach/spectators).

The overall noise level for the entire game, and noise levels per noise type were analyzed. By the direction of AHA, the average and maximum noise level for each noise type were compared to the

measured average ambient noise level at ST-1. The results are shown in Table 1, labeled as “Msd.” (measured) noise levels.

Table 1: Measured Noise Levels at Michillinda Parking Lot

Noise Type	Msd. Max. Noise Level ¹	Msd. Average Noise Level ¹	Msd. Average Ambient Noise Level	Msd. [Overall] Avg. Noise Level during Game
Basketball Bounce	65 dBA	56 dBA	48 dBA	66 dBA
Spectator Noise	84 dBA	70 dBA		
Whistle	78 dBA	69 dBA		
<u>Notes</u>				
¹ Noise level measured 120 ft from center of asphalt basketball court.				

4.1 Rubber vs. Asphalt Flooring

We reviewed the noise reduction afforded by a synthetic rubber flooring as compared to asphalt flooring. Different court flooring types will impact the noise emanated in response to a ball being bounced, or a person running or jumping, on the surface.

The following court flooring materials were evaluated:

- Asphalt
- Synthetic Rubber (Rephouse Decoflex D10)

Several manufacturers were contacted to acquire acoustical data to quantify the predicted noise levels on rubber court flooring material. Acoustical data concerning noise reduction offered by court flooring is scarce. However, Rephouse (distributor of Decoflex D10 court flooring) was able to provide acoustical data indicating that their rubber flooring could provide a 10 dB impact noise reduction.

Based on our measured noise levels, basketball bounces on asphalt are more than 10 dB quieter than spectator noise and whistles. For compliance with the proposed 1-minute and 5-minute noise level criteria contained in Ordinance No. 1467, a rubberized court flooring system will not reduce the controlling noise sources of spectators yelling and whistle blows. Thus, during the game day scenario, the difference between an asphalt court and a rubber court is not noticeable along the AHA property lines.

4.2 Future Sports Courts Noise Levels

To understand the noise levels at the future sports courts, we created a CadnaA computer model accounting for a “worst-case” scenario in which both future sports courts are used simultaneously. CadnaA utilizes the ISO 9613-2 calculation methodology. The computer model incorporates topography, shielding, as well as reflections from buildings and the ground in its evaluation. We calculated noise levels to the AHA property lines. Table 2 outlines the distances to each property line (PL) from the future sports courts.

Table 2: Minimum Distances between Center of Future Sports Courts to AHA Property Lines

AHA PL	Distance to Future Sports Courts (ft)
North	760
South	100
East	370
West	260

The existing sports court was modeled and calibrated to align with the measured data. Since the future sports courts consist of two adjacent courts, two calibrated area sources were used at the future sports courts' locations. Other environmental noise sources, such as vehicular traffic, were not included in the model.

This process was repeated to create two models using the following data:

Model 1. Maximum 5-minute noise level (see Figure 2 and Table 3).

Model 2. Maximum 1-minute noise level (see Figure 3 and Table 3).

Approximate distances are reported from the center of the two courts to the beginning of each noise contour along each cardinal direction (north, south, east, west).

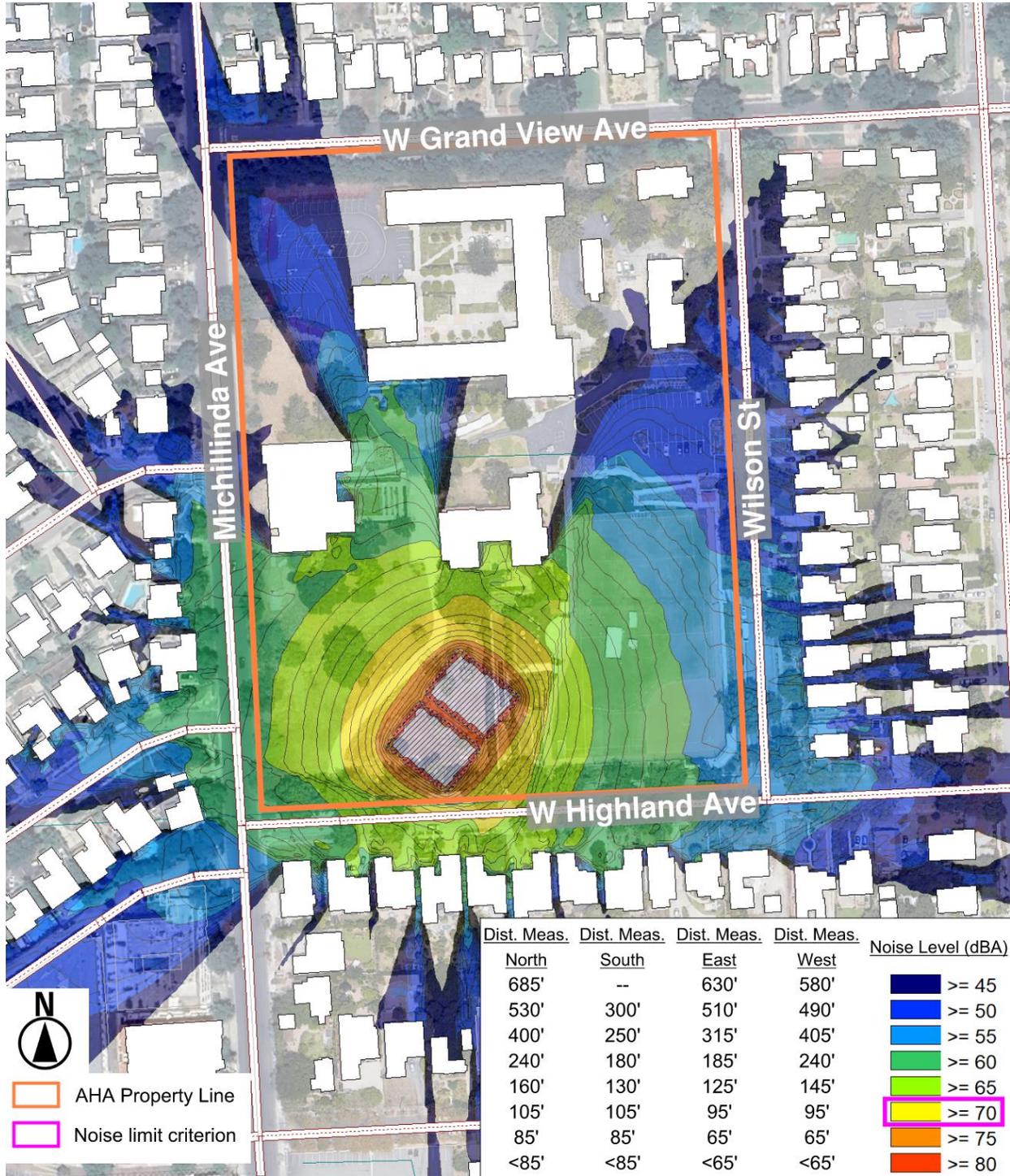


Figure 2: Modeled Noise Propagation from Future Sports Courts – Maximum 5-Minute Noise Level

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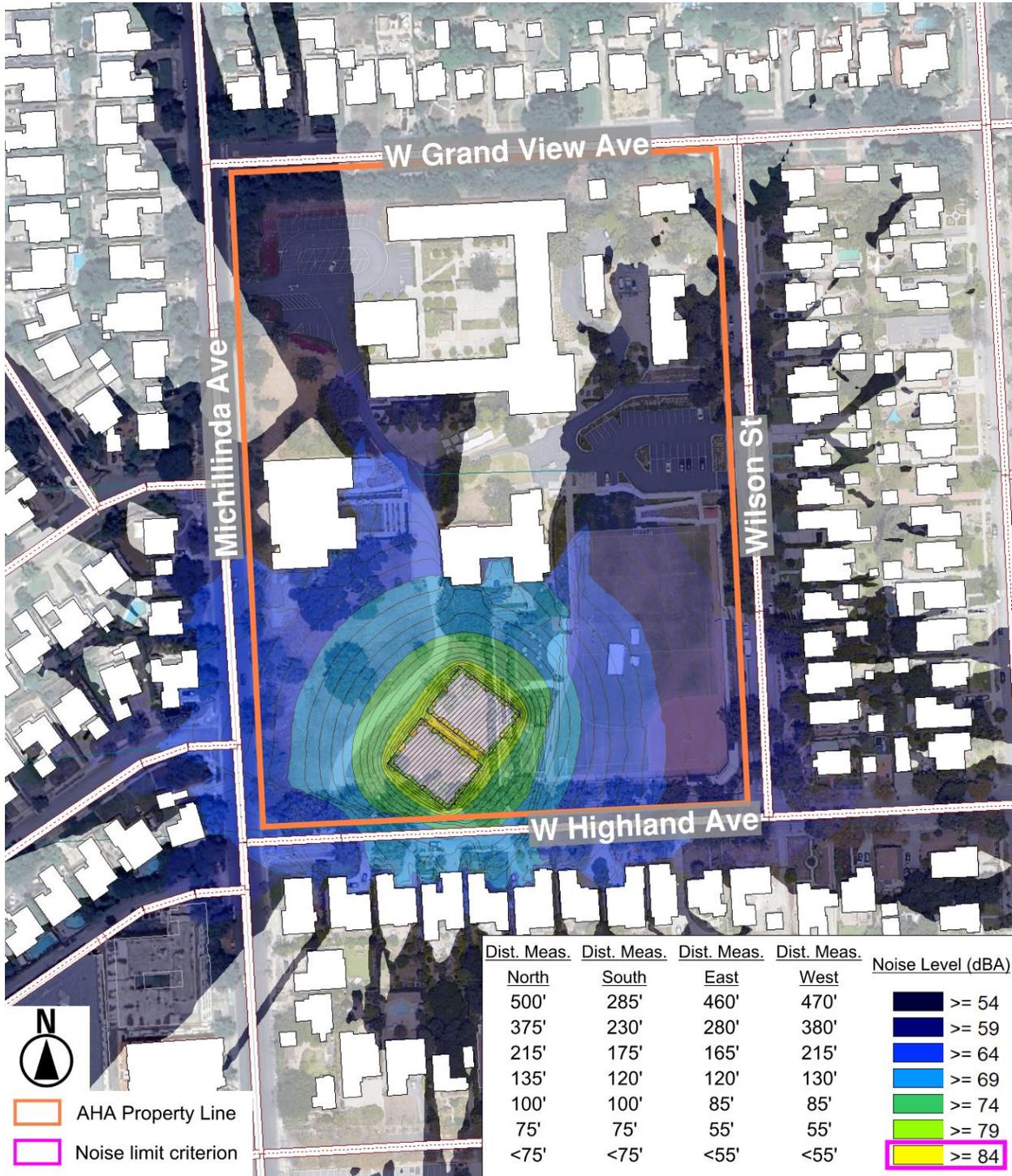


Figure 3: Modeled Noise Propagation from Future Sports Courts – Maximum 1-Minute Noise Level

The results presented in Table 3 are based on the noise contours shown in Figure 2 and Figure 3.

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Table 3: Calculated Noise at AHA Property Lines from Proposed Future Sports Courts

Noise Metric	Modeled Noise Level at North PL	Modeled Noise Level at South PL	Modeled Noise Level at East PL	Modeled Noise Level at West PL	Meets Criteria?	Contributing Peak Noises
Max. 1-minute	51	76	61	67	Y	Score, Whistle, Spectator Noise
Max. 5-minute	48	73	58	64	N	Whistles, Spectator Noise

5.0 Conclusions

The current Chapter 9.32 of the Sierra Madre Municipal Code does not address noise generated from a school. The following conclusions are based on the proposed noise limits contained in Ordinance No. 1467 (detailed in Section 2.0). Should the criteria be modified before the final submission, we would need to revise this report to reflect the new criteria.

- Noise from the future sports courts are considered part of the school day and exempt from noise limits.
- Noise levels on the future sports courts range from 60 dBA to 70 dBA at the two closest property lines along Michillinda Avenue and West Highland Avenue.
- The City’s proposed 5-minute event noise limit criterion of 70 dBA is expected to exceed along the south property line (adjacent to the sidewalk and West Highland Avenue) for short time periods for spectator noise and for whistles during games. The 70 dBA noise limit is not expected to exceed at the homes on the south side of West Highland Avenue.
- We understand that City staff are requiring additional box trees and vegetation at the site of the future sports courts. AHA will perform additional noise monitoring at the property line when the courts are completed and will consider implementing additional noise mitigations as warranted based on the City's noise ordinance.

This concludes our noise impact analysis for the future sports courts at Alverno Heights Academy in Sierra Madre, CA. Please do not hesitate to contact us with questions.

Appendix A: Definitions of Acoustical Terms

A-Weighted Sound Level: A decibel scale for sound level measurements using the “A” weighted network of a sound level meter and is denoted as “dBA.” The A-weighted network is shaped to correspond to the response of the human ear so that the results correlate approximately with human perception. It is the accepted standard for environmental noise measurements.

Decibel (dB): A scale that measures sound level pressure defined as 20 times the logarithm of the ratio of the sound level pressure to a standard reference pressure level of 20 μ Pa.

L_{eq} : The A-weighted equivalent continuous sound exposure level for a defined period of time.

Sound Pressure Level (SPL): The amplitude of sound when compared to the reference sound pressure level of 20 μ Pa. SPL is measured in dB.