

# **APPENDIX E**

*Noise Analysis of Alternatives for  
Bonita Vista High School Field: Band  
Noise and Lowering Field  
Elevation Impacts*



## MEMORANDUM

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**To:** Josh Saunders, Dudek  
Carey Fernandes, Dudek

**From:** Christopher Barnobi, Environmental Acoustician  
Jonathan Leech, Acoustics and Air Resources Manager

**Subject:** Noise Analysis of Bonita Vista High School Band Practice Relocation and Lowered Field Elevation Design

**Date:** June 30, 2017

**Attachments:** Figure 1, Vicinity Map (Noise Measurement Locations)

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This memorandum presents Dudek’s analysis of sound levels generated by the Bonita Vista High School (BVHS) marching band during practices, and potential impacts associated with the relocation of band practices from the adjacent-campus parking lot on East H Street to the athletic field as proposed under the Bonita Vista High School Track and Field Project (project). In addition, a site layout that would entail lowering the elevation of the athletic field is examined for potential reduction in noise impacts from sporting events (i.e., football games) and band practices on residences adjacent to the project site. Noise impacts on residences are documented in Section 4.2, Noise, of the Draft Environmental Impact Report (EIR) for the proposed project. The Chula Vista Municipal Code sets maximum allowable noise limits based on receiving land use. For single-family residential property, maximum exterior noise exposure must not exceed 45 A-weighted decibels (dBA) (1-hour equivalent sound level ( $L_{eq}$ )) from 10 p.m. to 7 a.m., and 55 dBA (1-hour  $L_{eq}$ ) from 7 a.m. to 10 p.m.

The first section of this memorandum summarizes noise measurements of the BVHS marching band that were conducted by Dudek staff. These measured marching band noise levels were used to calculate noise impacts on nearby residences. The calculations examine increases in marching band sound levels at the residences, comparing the current band practice area in the parking lot along East H Street with expected levels generated by the band at the new athletic field. Sound-level calculations were also conducted to analyze the potential noise reduction at neighboring residences that could be achieved with lowering the field from the existing elevation.

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**Bonita Vista High School Marching Band Sound Levels**

Dudek staff visited BVHS to conduct field measurements of the marching band. The sound level measurements were conducted by Connor Burke on May 31, 2017, to provide a sample of the school marching band sound levels. Due to other end-of-school-year commitments, the full band was not available to participate on May 31. Approximately 60 students comprise the full BVHS band, but the measurements were conducted with 25 students. All of the major band sections were represented during the May 31 field measurements. Based on the increased number of students in the full band, Dudek expects that the full band would produce sound levels approximately 4 decibels (dB) higher than the measured sound levels of the partial band. The increase is based on the logarithmic nature of sound. Usually a doubling of sound sources equates to a 3 dB increase in the sound pressure level.

The measurements were made during the marching band practice using a Rion NL-52 sound level meter and a Piccolo sound level meter. The NL-52 sound level meter meets the current American National Standards Institute (ANSI) standard for a Type 1 (Precision) sound level meter, and the Piccolo meets the ANSI standard for a Type 2 instrument. The sound level meters were calibrated before measurements. The measurements were conducted with the microphone positioned approximately 5 feet above the ground and covered with windscreens.

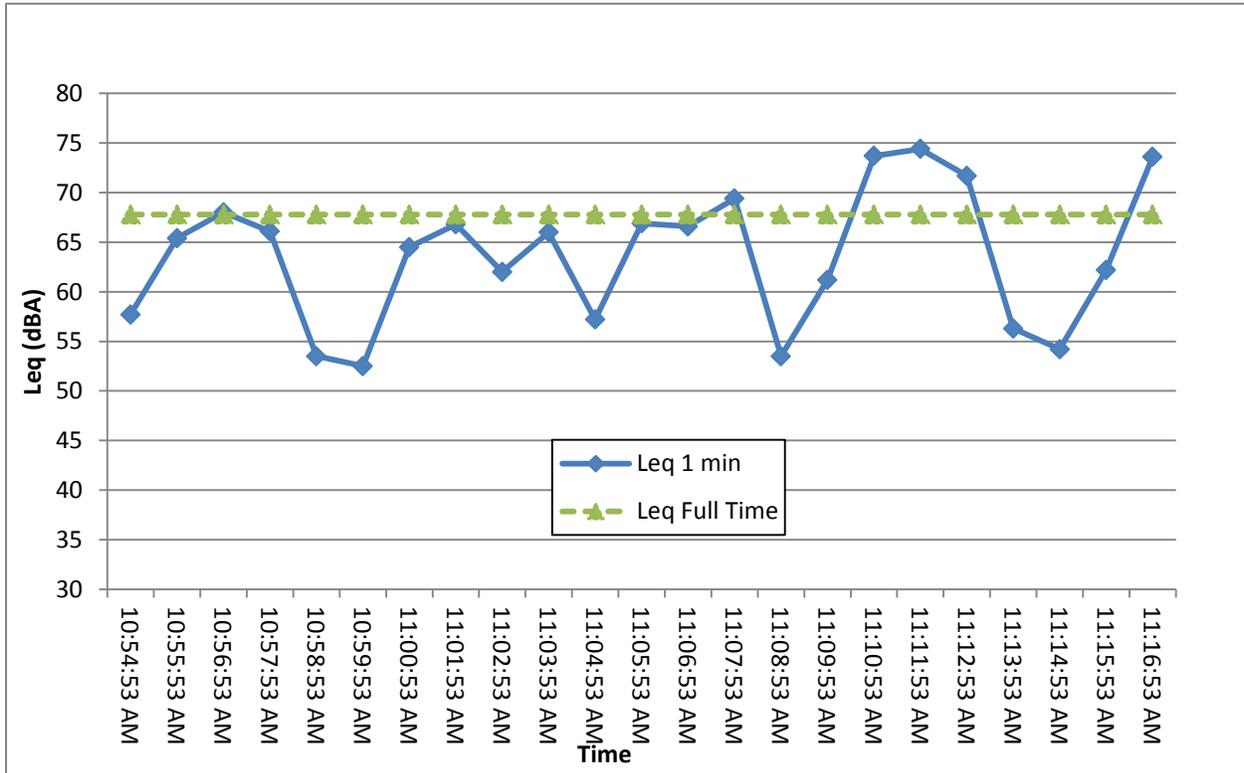
Dudek staff expected some variability depending on if the band was facing toward or away from the receivers. Consequently, the NL-62 was used to conduct measurements at different locations around the band while they practiced. Since the band was marching, the distance between the band and the sound level meter also varied during the measurements.

The Piccolo remained stationary for the duration of the marching band practice, and was located at the property line between the school and the adjacent residences. An elevation gain of approximately 20 feet occurs near the residential property line. Table 1 shows the time history of the measured 1-minute  $L_{eq}$  at this location, along with the  $L_{eq}$  for the entire measurement period.

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**Table 1: Property Line Time History During Marching Band Practice on Field**



Resulting 1-minute  $L_{eq}$  at the property line during this practice session ranged from 53 to 74 dBA. The band occasionally took breaks from playing during these measurements. Measurement results with  $L_{eq}$  below 60 dBA are from minutes when the band was not playing or was only playing for part of the minute. As shown in Table 1, during minutes when the band was playing, measured  $L_{eq}$  ranged from the mid-60s up to 74 dBA. Across the entire observed practice time, the averaged measured  $L_{eq}$  was approximately 68 dBA.

Spot measurements were conducted during the practice at varying distances from the band. These measurements were conducted between approximately 130 feet and 220 feet from the band. After normalizing the measurement results to 200 feet (the approximate distance from the center of the existing football field to the property line of residences to the east), a range of expected levels for the band was calculated. The  $L_{eq}$  for the partial marching band at 200 feet was approximately 69 dBA. With the addition of 4 dBA to account for the full band practicing, the typical 1-minute  $L_{eq}$  for the full practicing band at 200 feet would be approximately 73 dBA.

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**Noise Impact Analyses**

***Existing Practice Location vs. Proposed Stadium Practice Location***

The existing practice space for the marching band is the BVHS campus parking lot located north of East H Street. The center of the parking lot is approximately 520 feet from the nearest residential property line, which occurs to the northeast. Existing full marching band practice noise levels were calculated to be 65 dBA at the closest adjacent residential property line (reduced from 73 dBA at 200 feet, using a standard outdoor attenuation rate of 6 dBA per each doubling of distance for a point noise source).

Beyond the distance attenuation, the proposed athletic field would include spectator stands that could act to block the line-of-sight from the practicing band and other event noise sources to the residential property lines. The line-of-sight between the band and a residential receiver at the property line must be blocked for the stands to have a barrier effect and lower the band sound levels at the residences. Calculations to verify that the stands would interrupt the line-of-sight between the center of the football field and the backyard of adjacent residences were conducted. Based on the site plan and bleacher plan that were reviewed by Dudek staff, the proposed visitor side stands would not be tall enough to block the line-of-sight from the center of the football field to the residential property line. Typical band sound source height and receiver height were assumed to be 5 feet above the ground. Without blocking the line-of-sight, the stands would provide no attenuation. Since the center of the football field is approximately 200 feet from the residential property line, and the stands would provide no noise attenuation, the expected 1-minute  $L_{eq}$  from a full band practice at residential property lines to the east of the proposed athletic field would be 73 dBA. Table 2 summarizes these results.

**Table 2**  
**Existing vs. Proposed Band Practicing Location Sound Levels**

<b>Situational Details</b>	<b><math>L_{eq}(1 \text{ min})</math></b>
Calculated full band practice in parking lot (existing practice location) – sound levels at the adjacent residential property line to the northeast	65 dBA
Expected band practice at proposed athletic field – sound levels at adjacent residential property line 200 feet to the east	73 dBA

The analysis shows that marching band practice sound levels would increase approximately 8 dBA at the residential property lines when the practices are moved from the existing practice location (i.e., the campus parking lot along East H Street) to the proposed athletic field. Based on the measured levels and the existing ambient noise levels, the marching band would exceed the 55 dBA 1-hour  $L_{eq}$  at the nearby residential property lines if it practices in the proposed stadium.

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Band practices at the new athletic field would result in the exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance. In addition, band practices would result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project. Impacts would be potentially significant.

***Noise Level Impacts from Lowering the Field Elevation***

Lowering the field elevation of the proposed athletic field was also considered as a site layout alternative that could potentially reduce the sound levels at adjacent residential properties anticipated to be experienced during events (i.e., BVHS athletic games) and band practices. Dudek staff conducted calculations to determine if the line-of-sight between the center of the football field and the residential property line would be blocked if the field elevation of the proposed athletic field were to be lowered by 20 feet. Even at this lower elevation, the line-of-sight between the center of the football field and the residential property line to the east would remain unobstructed by the proposed spectator stands. Thus, no noise reductions at the residential property lines would occur based on lowering the elevation of the field by 20 feet. To block the line-of-site, the field elevation would need to be lowered more than 26 feet from the existing elevation.

Without blocking the line-of-sight from the center of the proposed athletic field to the residential property line to the east, the proposed spectator stands would not provide any noise barrier attenuation. Even if the spectator stands did block the line-of-sight, the currently selected stands do not have a solid, continuous face or backing. Instead, the stands are designed to be open such that, at certain viewpoints, they can be seen through. To achieve noise reduction for the residences, the stands would need to include a solid, continuous paneling system.

If the field were lowered just more than 26 feet and a solid backing was added to the spectator stands, approximately 2 dBA of noise reduction would be achieved for the marching band noise. Other football game noise sources would not be significantly reduced.

In addition to noise generated by the BVHS marching band, event noise (i.e., crowd noise and the public address (PA) system noise) was considered in this analysis. As with band practice noise, lowering the elevation would not achieve any reductions in noise as it relates to crowd or PA system noise from future on-campus events at the BVHS athletic field. Lowering the elevation of the new athletic field would not avoid or substantially reduce noise impacts associated with operation of the proposed project as analyzed in the EIR. PA system and event noise, and noise generated during relocated band practices, would result in the exposure of people to or generation of noise levels in excess of standards established in the local general plan or noise ordinance. In addition, PA system and event noise, and noise generated during band practices, would result in a substantial temporary or

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periodic increase in ambient noise levels in the project vicinity above levels existing without the project. Impacts would be potentially significant.

The following mitigation measure would minimize noise impacts at neighboring residential properties associated with band practices. However, even with this mitigation measure employed, band practice noise associated with generation of noise levels in excess of standards established in the local general plan or noise ordinance would remain significant and unavoidable:

- Band practices shall not be permitted on the new athletic field. Band practices shall continue to be held on the southern parking lot of the BVHS campus.

**CONCLUSION**

The analysis summarized in this memorandum shows that, at the residential property lines adjacent to BVHS, clearly audible sound pressure level increases would occur due to the relocation of the band practice site from the campus parking lot adjacent to East H Street to the proposed athletic field. Attenuation due to the proposed spectator stands and noise-level reductions from lowering the field elevation were also examined. As currently designed, the spectator stands would not block the line-of-sight from the center of the field to the residential property line to the east, and therefore would not provide any noise attenuation. In addition, if the elevation of the proposed athletic field were to be lowered 20 feet below ground level, the line-of-sight from the center of the field to the residential property line to the east would also remain unobstructed. Thus, the addition of new spectator stands and lowering the field elevation of the proposed athletic field up to 20 feet below ground level would not achieve any noise reduction as it relates to operational noise associated with the BVHS athletic events and band practices at the proposed athletic field, and anticipated noise effects at residential properties. An approximate reduction of 2 dBA in sound levels from marching band activity at the stadium could be achieved by lowering the playing field elevation by more than 26 feet. Even with implementation of mitigation measures identified in Section 4.2, Noise, of the EIR, and the band practice relocation restriction measure listed above, PA system and event noise, and noise generated during parking lot band practices would be significant and unavoidable.



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