

January 14, 2016

Mr. Dave Higgins Jr.
Jesuit High School
1200 Jacob Lane
Carmichael, CA 95603

Transmitted via email: klondike15@gmail.com

Subject: Jesuit High School Football Field Speaker Sound Evaluation – Sacramento County, CA.

Dear Mr. Higgins,

Pursuant to your request, Bollard Acoustical Consultants, Inc. (BAC) has completed an evaluation of the sound system output of the Jesuit High School Football Stadium Public Address (PA) system. The purposes of the evaluation were to quantify the sound emissions of the current PA system at representative residences to the immediate west of the football stadium, to compare those levels against Sacramento County noise criteria, and, if needed, to recommend measures to reduce PA system sound levels at the nearest residences as appropriate. This letter and the corresponding attachments contains the results of BAC's evaluation.

Sacramento County Noise Standards

Chapter 6.68 of the Sacramento County Code pertains to Noise Control and is referred to in this study as the Noise Ordinance. The purpose of the Noise Ordinance is to assess complaints of noises alleged to exceed the ambient noise levels. The following provides the pertinent sections of the County Noise Ordinance.

6.68.070 Exterior Noise Standards

- a. The following noise standards, unless otherwise specifically indicated in this chapter, shall apply to all properties within a designated noise area.

Noise Area	County Zoning Districts	Time Period	Exterior Noise Standard
1	RE-1, RD-1, RE-2, RD-2, RE-3, RD-3, RD-4, R-1-A, RD-5, R-2, RD-10, R-2A, RD-20, R-3, R-D-30, RD-40, RM-1, RM-2, A-1-B, AR-1, A-2, AR-2, A-5, AR-5	7 a.m.-10 p.m. 10 p.m.-7 a.m.	55 dBA 50 dBA

- b. It is unlawful for any person at any location within the County of Sacramento to create any noise which causes the noise levels on an affected property, when measured in the designated noise area, to exceed for the duration of time set forth following, the specified exterior noise standards in any one hour by:

Cumulative Duration of the Intrusive Sound	Allowance Decibels
1. Cumulative period of 30 minutes per hour	0
2. Cumulative period of 15 minutes per hour	+ 5
3. Cumulative period of 5 minutes per hour	+10
4. Cumulative period of 1 minute per hour	+15
5. Level not to be exceeded for any time per hour	+20

- c. Each of the noise limits specified in subdivision (b) of this section shall be reduced by five dBA for impulsive* or simple tone** noises, or for noises consisting of speech or music.

* "Impulsive noise" means a noise characterized by brief excursions of sound pressures whose peak levels are very much greater than the ambient noise level, such as might be produced by the impact of a pile driver, punch press or a drop hammer, typically with one second or less duration.

** "Simple tone noise" or "pure tone noise" means a noise characterized by the presence of a predominant frequency or frequencies such as might be produced by whistle or hum.

- d. If the ambient noise level exceeds that permitted by any of the first four noise-limit categories specified in subdivision (b), the allowable noise limit shall be increased in five dBA increments in each category to encompass the ambient noise level. If the ambient noise level exceeds the fifth noise level category, the maximum ambient noise level shall be the noise limit for that category.

6.68.080 Interior Noise Standards

- a. In any apartment, condominium, townhouse, duplex or multiple dwelling unit it is unlawful for any person to create any noise from inside his unit that causes the noise level when measured in a neighboring unit during the periods ten p.m. to seven a.m. to exceed:
1. Forty-five dBA for a cumulative period of more than 5 minutes in any hour;
 2. Fifty dBA for a cumulative period of more than 1 minute in any hour;
 3. Fifty-five dBA for any period of time.
- b. If the ambient noise level exceeds that permitted by any of the noise level categories specified in subdivision (a) of this section, the allowable noise limit shall be increased in five-dBA increments in each category to encompass the ambient noise level.

6.68.090 Exemptions

The following activities shall be exempted from the provisions of this chapter:

- a. School bands, school athletic and school entertainment events;
- b. Outdoor gatherings, public dances, shows and sporting and entertainment events, provided said events are conducted pursuant to a license or permit by the County;
- c. Activities conducted on parks, public playgrounds and school grounds, provided such parks, playgrounds and school grounds are owned and operated by a public entity or private school;

- d. Any mechanical device, apparatus or equipment related to or connected with emergency activities or emergency work;
- e. Noise sources associated with construction, repair, remodeling, demolition, paving or grading of any real property, provided said activities do not take place between the hours of eight p.m. and six a.m. on weekdays and Friday commencing at eight p.m. through and including seven a.m. on Saturday; Saturdays commencing at eight p.m. through and including seven a.m. on the next following Sunday and on each Sunday after the hour of eight p.m. Provided, however, when an unforeseen or unavoidable condition occurs during a construction project and the nature of the project necessitates that work in process be continued until a specific phase is completed, the contractor or owner shall be allowed to continue work after eight p.m. and to operate machinery and equipment necessary until completion of the specific work in progress can be brought to conclusion under conditions which will not jeopardize inspection acceptance or create undue financial hardships for the contractor or owner;
- f. Noise sources associated with agricultural operations, provided such operations do not take place between the hours of eight p.m. and six a.m.;
- g. All mechanical devices, apparatus or equipment which are utilized for the protection or salvage of agricultural crops during periods of adverse weather conditions or when the use of mobile noise sources is necessary for pest control;
- h. Noise sources associated with maintenance of residential area property, provided said activities take place between the hours of six a.m. and eight p.m. on any day except Saturday or Sunday, or between the hours of seven a.m. and eight p.m. on Saturday or Sunday;
- i. Any activity, to the extent provisions of Chapter 65 of Title 42 of the United States Code, and Articles 3 and 3.5 of Chapter 4 of Division 9 of the Public Utilities Code of the State of California preempt local control of noise regulations and land use regulations related to noise control of airports and their surrounding geographical areas, any noise source associated with the construction, development, manufacture, maintenance, testing or operation of any aircraft engine, or of any weapons system or subsystems which are owned, operated or under the jurisdiction of the United States, or any other activity to the extent regulation thereof has been preempted by state or federal law or regulation;
- j. Any noise sources associated with the maintenance and operation of aircraft or airports which are owned or operated by the United States. (SCC 254 § 1 (part), 1976.)

According to exemptions a. and c. above, noise generated by the PA system at Jesuit High School is exempt from the requirements of the County Noise Ordinance. Therefore, the noise level limits of the Noise Ordinance are inapplicable to the PA system. Nonetheless, Jesuit has undertaken this analysis in response to the County's request for measurement of the noise levels being generated by the PA system for information purposes.

Noise Measurement Survey

On November 13, 2015, BAC conducted a site visit during which time a series of sound level measurements were conducted while music and speech was broadcast on the PA system under various volume settings. Attachment A shows the seven (7) outdoor noise measurement

locations utilized during the sound survey, three of which were positioned within the stadium and four of which were located in the residential community to the immediate west of the stadium. In addition, interior sound level measurements were made within two of the residences to the west (inside the residences corresponding to Sites 1 and 2).

The survey was conducted using a combination of Larson Davis Laboratories (LDL) Model 820 and 831 precision sound level meters which were calibrated in the field before use with an LDL CA-200 acoustical calibrator. The microphones were positioned on tripods at a height of 5 feet above ground and fitted with manufacturers windscreens. Attachment B shows representative photos of the noise monitoring site locations.

The sound level meters at Sites 1-3, 5 and 7 ran continuously from approximately 11:30 am until 2 pm as a variety of tests utilizing speech and music were conducted at various volume settings. The results of the two of the tests at these 5 locations are shown by Attachments C-1 and C-2. These attachments show that ambient (baseline) noise levels were approximately 40 dBA at the 5 measurement sites prior to a typical "cheer" song being played through the PA system. Once the song started, the sound levels increased appreciably for a period of approximately 1 minute before dropping again when the song was stopped.

Attachment C-1 represents sound levels played at maximum volume through the school P/A system. Sound levels recorded while the song was being played ranged from approximately 75 to 83 dBA in the Piccadilly Circle residential neighborhood west of the Football stadium. Jesuit representatives then made downward adjustments to the P/A settings to reduce overall system volume to the lowest levels which could reasonably be expected to provide intelligible information to the stadium crowds.

Attachment C-2 represents the levels measured at each location after the adjustments were made. Comparison of Attachment C-2 against C-1 indicates that the adjustments resulted in a reduction of approximately 10 dB at each location. The resulting maximum noise levels in the exterior areas of the nearby residences were approximately 70 dB L_{max} or less, which would comply with the County's daytime maximum (L_{max}) noise limit if that limit did apply to the school, i.e., if the school were not otherwise exempt from the Noise Ordinance. Compliance with the other standards, if applicable, would depend on the duration of the hour during which the sound was present.

P/A System Sound Levels within Residences

The results of the interior sound level measurements conducted within the residences represented by Sites 1 and 2 indicate that the building façade noise reduction provided by those residences was approximately 30 dB with windows in the closed positions. Provided exterior maximum noise levels do not exceed 70 dB within the nearest residential backyards, the interior sound level within those residences with windows closed would be approximately 40 dB.

Although the noise level limits of section 6.68.080 of the County's Noise Ordinance are intended to apply to sound generated within a multifamily dwelling which affects a neighboring dwelling, and therefore not technically applicable to this project, the specified maximum noise level of 55 dB L_{max} within residential dwellings during nighttime hours provides insight into reasonable interior noise levels within residences. Assuming the P/A system sound levels can be maintained at 70 dB L_{max} or less within the nearest residential backyards, the predicted level of 40 dB L_{max} within residences would be within compliance with the standard cited above if the school were not exempt from the Noise Ordinance.

Conclusions and Recommendations

According to the County's Noise Ordinance, Jesuit High School's activities at the stadium are exempt from the requirements of the County Noise Ordinance under Section 6.68.090.a. and 6.68.090.c. Nevertheless, as shown herein, the operation of the PA system under the lowest levels which could reasonably be expected to provide intelligible information to the stadium crowds would otherwise satisfy the County Noise Ordinance L_{max} noise limits if they were applicable to the campus.

This concludes BAC's assessment for the Jesuit High School speaker sound evaluation. Please contact BAC at (916) 663-0500 or paulb@bacnoise.com with any questions regarding this assessment.

Sincerely,

Bollard Acoustical Consultants, Inc.



Paul Bollard
President, INCE Board Certified

Attachment A

Noise Measurement Locations

Jesuit High School Speakers - Sacramento County, California



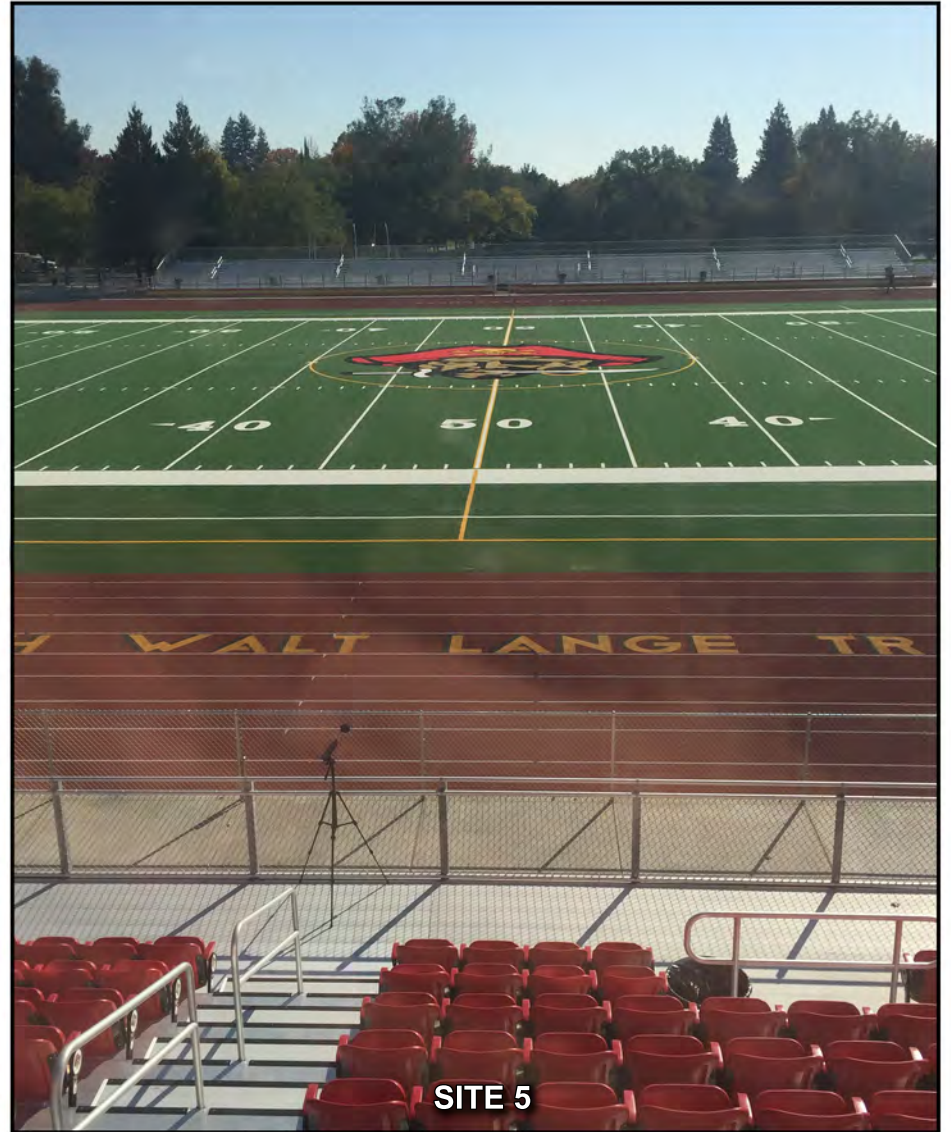
Appendix B-1
Noise Measurement Site Photos
Jesuit High School Speakers - Sacramento County, California



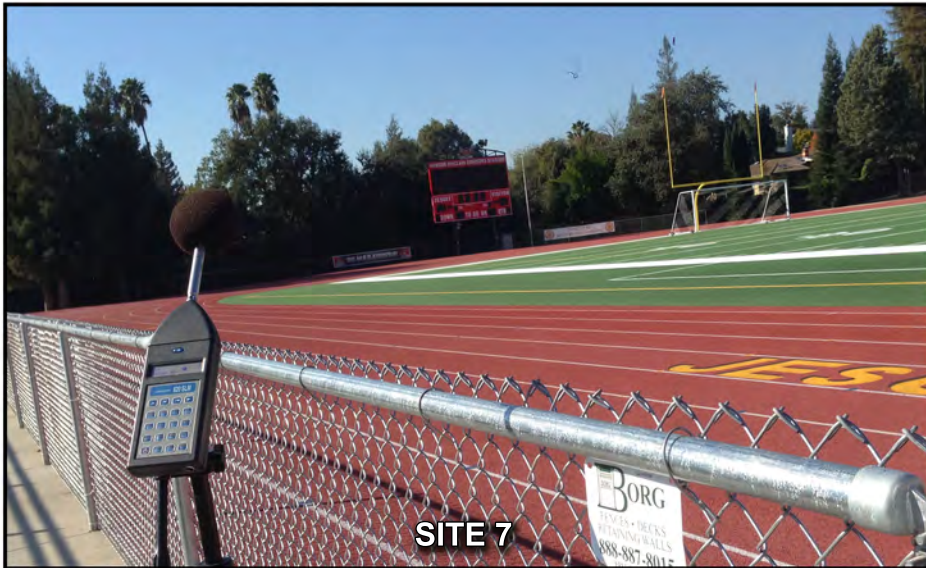
Attachment B-2
Noise Measurement Site Photos
Jesuit High School Speakers - Sacramento County, California



SITE 4



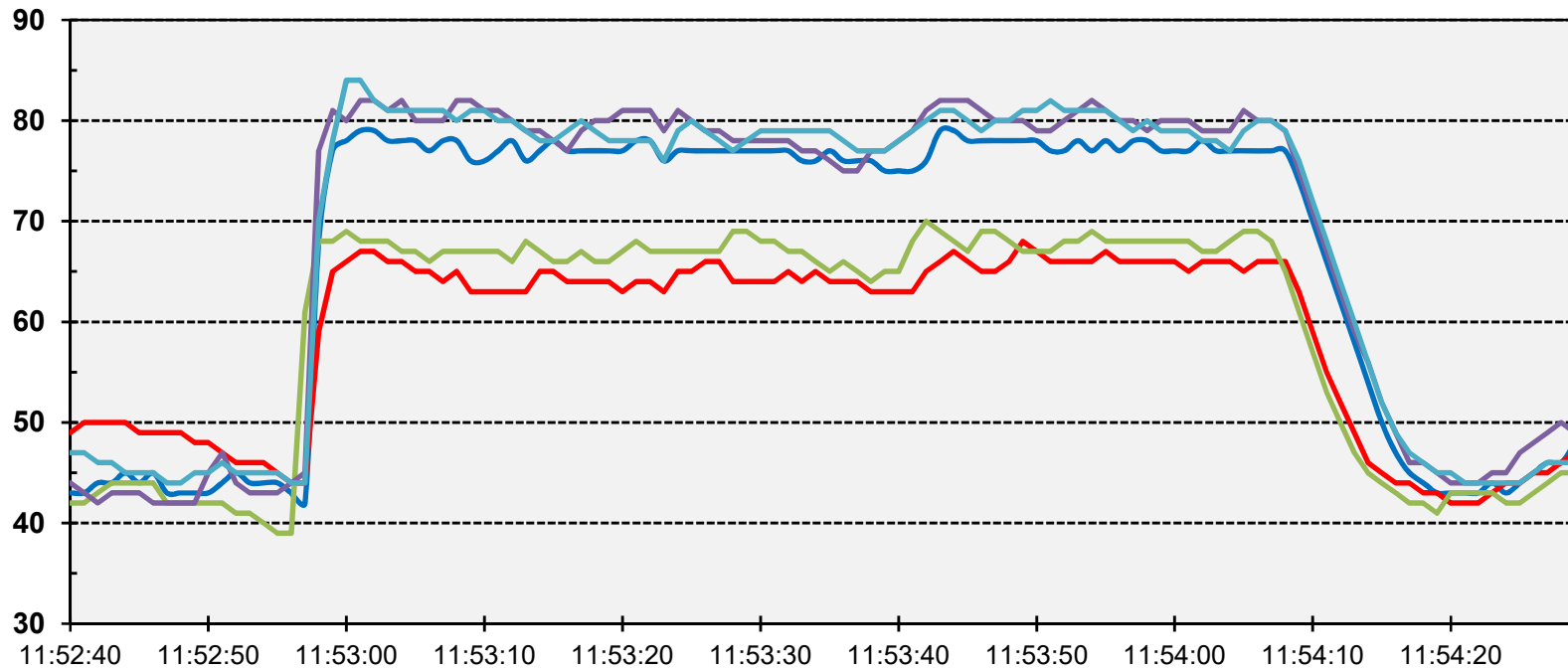
SITE 5



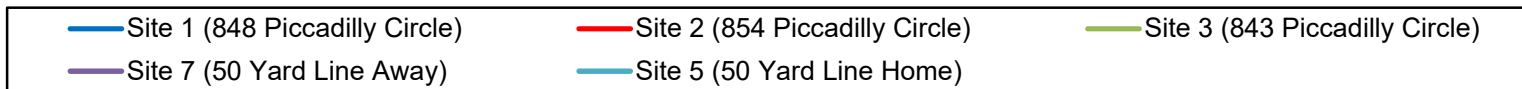
SITE 7

**Attachment C-1
 Jesuit High School Speakers
 Noise Monitoring Results - Maximum Volume Setting
 Friday, November 13, 2015**

Sound Level, dBA

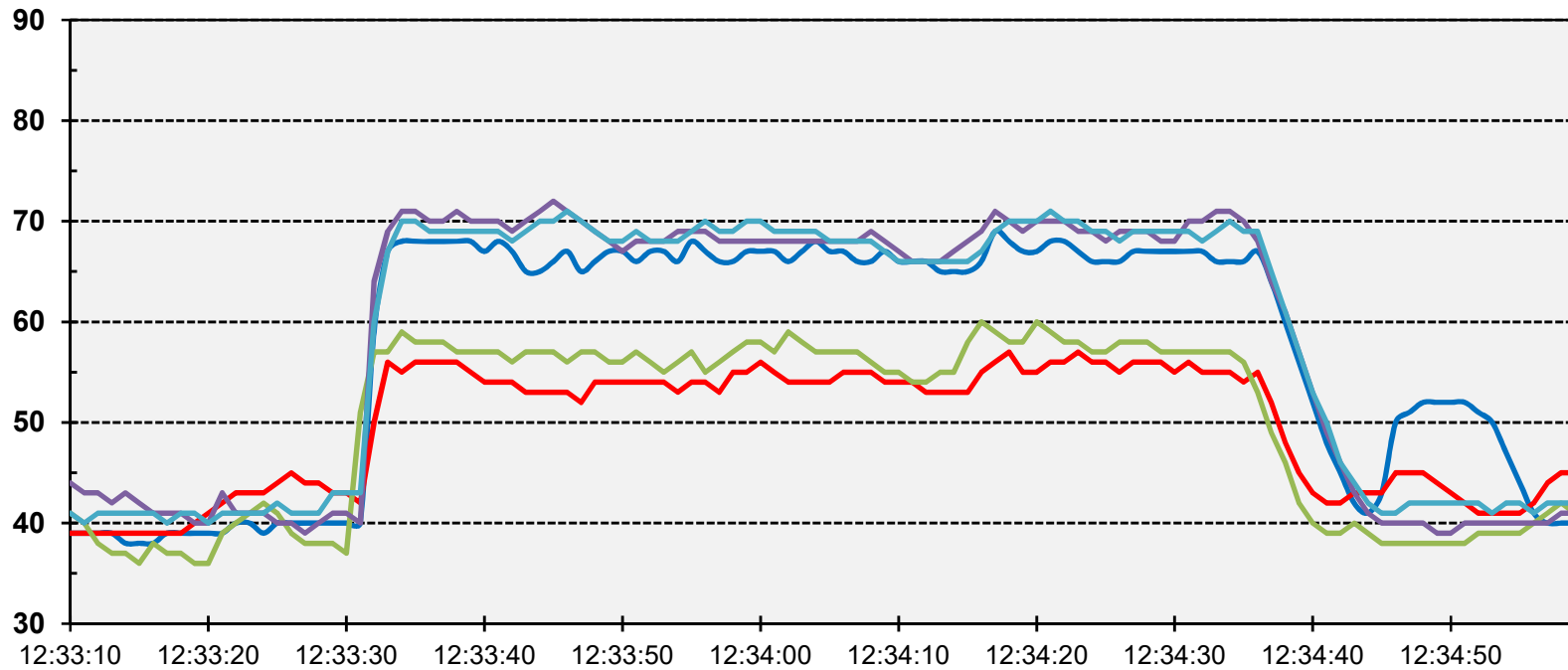


Hour of Day



Attachment C-2
Jesuit High School Speakers
Noise Monitoring Results - Typical Volume Setting
Friday, November 13, 2015

Sound Level, dBA



Hour of Day

