



Cross-Spectrum Acoustics Inc.

Massachusetts
Utah
California

August 31, 2021

Alec MacMartin
46 Collins Rd.
Wilton, NH 03086

Project Reference: J2021-1320 - Review of Proposed Stepping Stones Farm & Event Center
Wedding Venue

Dear Mr. MacMartin:

I understand that you own property adjacent to the Stepping Stones Event and Farm Center ("Stepping Stones") in Temple, New Hampshire. The owners of Stepping Stones have proposed to expand the use of their facility to offer evening events that will include playback of pre-recorded music and/or live music. Based on your past experience dealing with events held at Stepping Stones, you are concerned that this expanded use will generate unreasonable noise levels at your property. At your direction, I examined relevant documentation related to this proposal to assess the potential for noise impact.

The Town of Temple Zoning Ordinance includes noise limits based on the land use of the zoning district, the time of day, and the character of the sound being generated. Specially, noise at a receiving property is limited to 45 dBA (10th percentile level, L_{10}) during the daytime course of 7:00am to 7:00pm and 35 dBA (L_{10}) during the nighttime hours of 7:00pm to 7:00am. These limits are reduced by five decibels for sounds that contain either "low frequency" sounds or "tones."

Reuter Associates conducted a sound study¹ on behalf of Stepping Stones. The study concluded that events held in the barn could meet Temple Zoning nighttime limits at the closest residential property line provided that interior sound levels are limited to 80 dBA. The study also recommends that interior sound levels be monitored in real time during events. Stepping Stones representatives have subsequently proposed monitoring event levels using the iOS-based AudioTools² application and iTestMic³ microphone from Studio Six Digital. Stepping Stones have also submitted documentation that will be provided to venue guests regarding noise control requirements, and protocols to be followed in the event of a noise exceedance.

We have the following comments and recommendations on the aforementioned noise study that was submitted by Stepping Stones:

¹ Letter from Eric Reuter, Reuter Associates to John Kieley, Town of Temple Zoning Board of Adjustment, June 28, 2021

² <https://studiosixdigital.com/audiotools-modules-2>, retrieved August 18, 2021

³ <https://studiosixdigital.com/audio-hardware/itestmic2>, retrieved August 18, 2021

- The study applies a limit of 35 dBA, presumably because of the designation of the zoning district as Rural and Agricultural, and because events will occur in the evenings. However, it is our understanding that many (if not most) events are likely to have popular or rock music, either from a live band or recordings. Modern music tends to contain a lot of low frequency (bass) energy, and these low frequencies can be heard over longer distances compared to higher-frequency sounds. **Therefore, it would be appropriate to include the -5 dB adjustment for “Low Frequency” and the applicable limit would be 30 dBA.**
If the Town Zoning Board of Adjustment decides against reducing the applicable limit to 30 dBA and leaves the 35 dBA limit in place, any amplified audio events held at Stepping Stones should be required to include a high-pass audio filter (minimum of -6 dB per octave roll-off below 160 Hz) inline with the control board or amplifier to reduce the loudness of bass music.
- The study mentions that the noise reduction the barn walls was measured, but no details were provided about the conditions of the testing. Specially, there is no information regarding the configuration of doors and windows of the facade (open or closed) and whether those conditions would be representative of actual conditions during the test. These details should be provided. **If the conditions of the test are not representative of anticipated conditions, the test should be repeated with these conditions,** or (preferably) a live demonstration should be conducted under actual operating conditions to better represent future settings (see below).
- The study includes prediction of noise levels at the closest facade (along Webster Road) based on the measurement of the barn wall noise reduction described above. While these theoretical predictions are useful in circumstances where the proposed noise source cannot be directly observed under realistic conditions, in this case it is fully possible to conduct a live demonstration under actual expected operating conditions (in the evening, with doors and windows open/closed, etc.) as evidenced by the daytime tests conducted in May and June.⁴ **A live *in-situ* evening or night demonstration would allow for both objective and subjective observations of noise exposure from a variety of locations abutting Stepping Stones and would provide clarification to you, your neighbors and the Zoning Board members regarding future affects.**
- While the proposal includes commitment to noise monitoring inside of the barn during events, no details regarding placement of the sound meter is referenced. **The meter should be placed in a position to record accurate sound levels from music events** (as opposed to, for example, inside a stall where noise levels would be artificially low).
- In addition to monitoring noise levels inside the barn, it is essential that noise levels are measured at the abutting properties, at least during the first few events with rock/pop/dance music, to validate the predictions. This is especially important as AudioTools does not log noise level values in Traffic Light mode, so any post-event analysis will need to be conducted using additional equipment. **Monitoring of event sound levels at neighboring properties is also consistent with the “Noise Compliance” section ⁵of the Town of Temple NH Zoning Ordinance**
- No mention was made regarding calibration of the proposed noise monitoring system. **The system should be calibrated before and after every event using a commercially**

⁴ “Report for noise level testing on 5/24/21 at Stepping Stones Farm and Event Center, LLC,” letter from Ben Rogers, Loud Sun Studio, to Stepping Stones Farm and Event Center, LLC,

⁵ “Town of Temple, N.H. Zoning Ordinance (As amended through March 12, 20219), Section 31, Part 8 “Noise Compliance”

available acoustical calibrator. The acoustical calibrator should be evaluated for accuracy periodically, but at least once per year by a qualified facility.

- Note that the Town limit is based on the 10th Percentile limit (L_{10}). The AudioTools software does not directly measure L_{10} in real time. L_{10} can be estimated using the equation⁶ $L_{10} = L_{eq} + 3$ dB. Because AudioTools can only measure L_{eq} , **the sound monitor must be set to an interior limit of 77 dBA (L_{eq}) to meet the exterior 35 dBA limit, or 72 dBA (L_{eq}) to meet an exterior 30 dBA limit.**

Based on a review of the material in support of the expanded use of the Stepping Stones Event and Farm Center, I believe that a live demonstration during a representative evening time period, under representative conditions would be a fair process to confirm the validity of the noise study – without a live demonstration, you, your neighbors and town staff may be caught off guard and it will be too late to revisit any approvals granted by the town. A live demonstration is the most direct way of assessing the potential for impact and will remove any residual doubt that may linger from the sound study.

If a live demonstration is not carried out, then it is vital that monitoring be conducted at neighboring properties during events to validate the noise predictions and provide data to assess noise levels generated from the event. **Noise compliance monitoring, upon direction of appropriate authorities, is listed as a requirement of the Town of Temple Zoning Ordinance.** It is in the interest of all parties to accurately determine the level of noise generated by the proposed events.

If the Stepping Stones proposal is approved, the recommendations described above regarding calibration, monitor placement, alert settings and limits are essential to ensuring compliance with Town limits. If these recommendations are not adopted, I expect that noise level exceedances will occur and the ability for you to engage in peaceful enjoyment of your property will be disrupted.

If you have any questions or comments about this analysis, please feel free to contact me at (413) 315-5770 ext. 701 or via email at hsingleton@csacoustics.com.

Sincerely,



Herbert Singleton Jr, INCE Bd. Cert
President

⁶ The relationship between L_{eq} and L_{10} can vary depending on the type of noise source. Relationships found in the literature range from $L_{10} = L_{eq} + 2$ dB to $L_{10} = L_{eq} + 3.6$ dB. The +3 dB relation used above represents a mid-range value between the two extremes and is commonly used in community noise assessments.



Herbert L. Singleton Jr, P.E., INCE Bd. Cert – President

Employment History

Cross-Spectrum Acoustics Inc.

2011 to Present

Cross- Spectrum Labs

2003 – 2011

Harris Miller Miller & Hanson Inc.

1995 – 2003 Consultant

Education

B.S. Mechanical Engineering,
Massachusetts Institute of
Technology, Cambridge, MA – 1995

MSc coursework, Audio Acoustics,
University of Salford, Salford, U.K. –
2001-2004

Registrations and Affiliations

Professional Engineer, MA #46867;
CO #PE.0056123; GA #PE037731;
MN #56348

Board Certified Member, Institute of
Noise Control Engineering

Member, National Council of
Acoustical Consultants

Featured Projects

High-Voltage Direct Current Converter Station Noise Assessment, New Haven VT

CSA was retained by the town of New Haven, Vermont to analyze the potential for noise impact from a proposed high-voltage direct current (HVDC) converter station located in a rural environment. Mr. Singleton and CSA staff conducted long-term ambient noise measurements at five locations over a two-week period to thoroughly document existing noise conditions. CSA also modeled future noise levels from the HVDC station using data obtained at similar facilities. Mr. Singleton presented the results and audio demonstrations of future noise at public hearings to allow town residents to make an informed decision about the project.

Camp Walt Whitman Community Noise Assessment and Litigation Support, Piermont NH

Mr. Singleton worked with a group of citizens and environmental experts to quantify the effects of noise generated from a seasonal campground on an exceptionally quiet rural environment. Mr. Singleton performed numerous measurements to document the increase of noise over low background levels in the vicinity of Lake Armington in the White Mountains of New Hampshire. Mr. Singleton also performed audibility and detectability analyses that allowed for the comparison of time periods when campground noise was dominated compared periods when the community could experience natural quiet. Finally, Mr. Singleton provided litigation support for the legal team assisting the community in public hearings and court proceedings.

As co-founder of Cross-Spectrum Acoustics Inc., Mr. Singleton has over 25 years of acoustical engineering experience. His specialties include acoustical measurements and modeling. He has applied these skills to sound and vibration analyses for transportation, construction, and architectural projects. Mr. Singleton conducts field survey measurements and environmental assessments for private firms and public agencies across the United States. He also works with transducer manufacturers and vendors to evaluate the performance of audio equipment for development and quality control purposes.

Mr. Singleton is familiar with a broad range of sound and vibration measurement tools including sound level meters, unattended monitoring hardware and digital acquisition systems. His expertise lies in the implementation of cost-effective acoustical measurement solutions and he applies his knowledge of signal processing tools and data analysis techniques to solve problems at minimal cost. Mr. Singleton has also instructed clients from public and private firms in the use of sound and vibration measurement tools for environmental assessments. Furthermore, Mr. Singleton has presented measurement results to the lay public via public meetings and workshops.

Mr. Singleton actively participates in professional organizations. He is a past member of the Institute of Noise Control Engineering Board of Directors and a member of the INCE Certification Board. He contributes to working groups in the development of acoustical standards and guidelines and has held organizational roles in acoustical associations and conferences.



Representative Projects

- Race Track Noise Compliance Measurements and Expert Witness Testimony, Palmer Motorsports Park, Palmer MA (2020-2021)
- Deerfield Wind Farm Noise Compliance Measurements, Vermont Department of Public Safety, Deerfield VT (2018-2021)
- Gravel Pit Noise Assessment and Expert Witness Testimony, RB Enterprises, Palmer, MA (2017-2019)
- Ski Resort Snowmaking Noise Modeling, Gorgoza Park, Salt Lake City, UT (2017-2018)
- Cyclone Dust Collector Noise Assessment, Attorney Greil Roberts, Newington CT (2016-2017)
- Lumberyard Public Housing Development, Valley Community Development Corporation, Northampton MA (2016)
- Outdoor Shooting Range Noise Assessment, Norfolk MA, (2015—2016)
- Biomass Energy Facility Noise Assessment, Roberts Lumber, Ashfield MA (2015)
- Gravel Pit Noise Review and Litigation Support, Simonda, Winslow, Willis & Abbott P.A., Plymouth MA (2014)
- Gravel Pit Noise Assessment and Expert Witness Testimony, No Asphalt Defense Fund, Sheffield, CT (2011-2012)
- Wind Turbine Background Noise Assessment, Senie & Associates P.C., Dartmouth MA (2011)
- Wind Turbine Reference Noise Measurements, Town of Falmouth, MA (2010)
- Outdoor Shooting Range Noise Measurements and Expert Witness Testimony, Whispering Pines Campground, Newton NH (2007– 2008)
- Noise Measurements and Analyses for Proposed Car Washes, F.L. Roberts Inc., Springfield, MA (2004-2007)
- Public Housing Chiller Noise Analysis and Mitigation Design, Chelmsford Housing Authority, Chelmsford, MA (2006 – 2007)

Representative Publications and Presentations

- Herbert Singleton Jr. and Scott Edwards, “Modeling the effects of structure mass in reducing ground-borne vibration and ground-borne noise in rail transit systems,” Presented at Inter-Noise 2015, August 2015
- Herbert Singleton Jr., “Community Perceptions and their Role in Noise Control: A Tale of One City,” Proceedings of the 35th Inter-Noise, December 2006
- Dr. Carl Hanson and Herbert Singleton Jr., “Performance of Ballast Mats on Passenger Railroads: Measurement vs. Projections,” Journal of Sound and Vibration, June 13 2006
- Herbert Singleton Jr., “Vibration Transfer Mobility Measurements Using Maximum Length Sequences,” Proceedings of the 150th Meeting of the Acoustical Society of America, October 2005
- Herbert Singleton Jr., “Ground-Borne Vibration Characteristics of TransRapid TR08 Maglev,” Presented at the 82nd Transportation Research Board Annual Meeting, January 2003
- Dr. Carl Hanson and Herbert Singleton Jr., “Acela Noise and Vibration Measurements,” Transportation Research Board Annual Meeting, January 2000

Media Appearances

- Cindy Atoji Keene, “Acoustical engineer sounds off about noise,” *Boston Globe*, March 24, 2013
- Lisa Iannucci, “Soundproofing Solutions,” *Multi-Housing News*, June 1, 2010
- Garret Keizer, *The Unwanted Sound of Everything We Want: A Book About Noise*. New York, NY: PublicAffairs, 2010. 204-209, 234, 236
- WBZ-TZ News, “Are Your Child's Loud Toys Damaging To The Ears?,” April 12, 2007
- Mac Daniel, “MBTA readies a garble-free pa system,” *Boston Globe*, May 9, 2006
- Matt McDonald, “Sudbury neighbors squawk about chickens,” *Boston Globe*, December 19, 2004