

20 January 2022

Nicholas Solley
Chair, Town of Washington Zoning Commission
Bryan Memorial Town Hall
P.O. Box 383
Washington Depot, CT 06794

RE: Mayflower Inn & Spa – Event Tent
Acoustic Peer Review

Dear Nicholas,

SH Acoustics (SHA) has conducted a peer review of the documentation associated with the special permit application for the Event Tent at the Mayflower Inn & Spa in Washington, CT, related to sound transmission to the neighboring properties. The relevant documentation includes the Brooks Acoustics Corporation (BAC) report, Subject: Hospitality Tent Acoustical Design, and the Powerstation Events white paper, “Mitigation plan, elements, and procedures for sound control and localization,” both dated 12 November 2021.

The goal of this review was to provide a professional, third-party perspective as to whether all information related to acoustics outlined in these documents are valid – that the procedures and calculations performed were thorough and accurate, and that the recommendations and conclusions provided are sustainable.

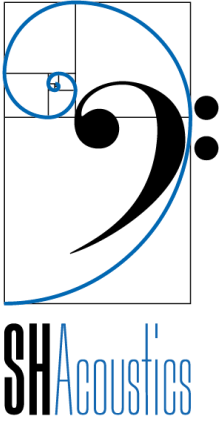
Document Summaries

[BAC Report Summary](#)

The BAC report summarizes their acoustical evaluation to determine the potential noise impact of the Mayflower Inn Event Tent on the surrounding neighborhood and develop a “sound management program” to minimize this impact. The report outlines a three-pronged approach to minimizing noise transfer to the neighboring properties:

1. Constructing a “Music Shed” intended to channel sound toward event guests and away from the neighboring residences to the north and west.

SH Acoustics LLC
263 Tresser Blvd, Floor 9
Stamford, CT 06901
T: (203) 877-6340
F: (203) 286-1427
www.shacoustics.com



2. Upgrading the Event Tent to include “sound absorbent material panels” and additional “roll-up sound barrier panels” around the perimeter.
3. Instituting a “musical entertainment management program” to ensure that the sound level limits set forth by the Regulations of Connecticut State Agencies (RCSA Section 22a – 69) are not exceeded.

To inform these solutions, BAC measured the sound levels of a wedding DJ performing for a crowd of 50-60 guests and scaled the results to what they felt better represents the expected levels of the musical entertainment in the Event Tent – a facility suited for 150 guests. With this data they performed an acoustic analysis to determine the resultant levels at the nearest neighboring property, accounting for regular sound attenuation and their sound mitigation approach. Page 10 of the BAC report includes a tabulation of these calculations.

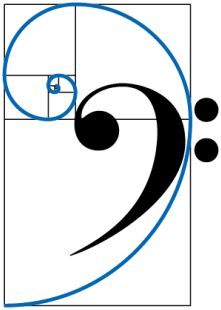
BAC also chose to establish a criterion (“target level”) more stringent than those required by the State of Connecticut in order to “maintain good relations with the neighbors”

Based on this analysis, BAC concluded that the sound level produced by musical entertainment in the Event Tent at the property of the nearest neighbor “well below the sound level limit of the Regulations of Connecticut State Agencies (RCSA Section 22a – 69)”, and their target level. Furthermore, “musical entertainment under [their] Sound Management Program will not cause an impact on neighboring residents.”

[Powerstation Events White Paper Summary](#)

The Powerstation Events white paper summarizes their proposal for a sound mitigation plan to reduce sound levels from the Event Tent at the northern section of the Mayflower Inn & Spa property. The Paper outlines this mitigation plan as a three-phase approach:

1. Procurement and installation of a permanent distributed audio system consisting of multiple small format speakers and digital signal processing for sound level control.
2. Inclusion of barriers behind the “band stage” and “on the southwest ridge of the hill leading to the property line.”



SHAcoustics

3. Engagement of a professional audio contractor to control the house system and ensure sound levels are within the established limits with a monitoring system.

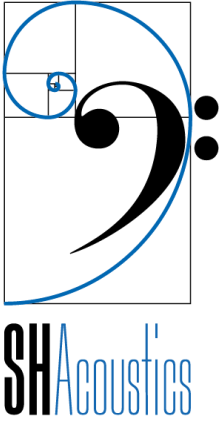
It should be noted that, though the BAC report and Powerstation white paper were submitted together, the contents of the two documents did not appear to be coordinated, suggesting differing sound mitigation strategies. Therefore, rather than commenting on the discrepancies between the two documents, we have reviewed them as being completely independent and presenting two sound mitigation options for the Mayflower Inn & Spa Event Tent.

SHA Comments

Having reviewed all documentation related to sound transmission from the Event Tent and performed several cursory calculations to validate analysis outlined in the relevant documents, we have provided the following comments (with references to the document section titles, in order of appearance).

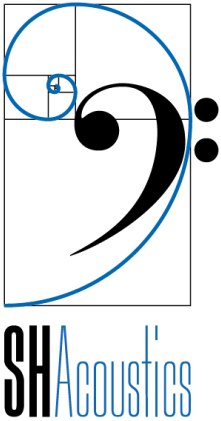
BAC Report

1. In “Sound Management Program, Discussion, Musical Entertainment Shed” BAC outlines their design for a three-sided structure to direct sound towards event guests and away from the neighboring residences to the north and west. However, it should be noted that sound energy at many frequencies, including the lower range of speech frequencies, is not highly directional. Therefore, it would tend to “wrap” around the side walls of this structure and transmit toward the neighboring properties in some capacity, depending on the specific loudspeakers / subwoofers chosen. Compounding this is the fact that the loudspeaker components would need to be located toward the front of the proposed Music Shed (to avoid acoustic feedback for performers on Stage) – thus allowing the less-directional sound to more easily wrap around instead of being fully shielded by the high-performance barrier walls and ceiling.
2. With this in mind, the structure should be considered a barrier and should be analyzed as such. It should be noted that the provided Sound Transmission Class (STC) value of STC 74 is irrelevant as this metric is used for characterizing a demising assembly between two enclosed spaces. In general, for a barrier to



be effective, the sound transmission loss of the structure must be at least 10 dB greater than the insertion loss of the barrier at all frequencies.

3. BAC notes that they include sound isolation calculations with a detailed description of the Shed assembly at the end of the report. However, there does not appear to be a separate line item for the Shed performance in their Calculation Summary table on page 10 of the report. Rather, it appears to be combined with “Outdoor Transmission” and reduces the noise by a seemingly arbitrary 52 dB at each frequency.
4. BAC then claims that the Musical Entertainment Shed, “wall assembly is designed to contain the sound that the band or DJ may generate inside the Hospitality Tent, and prevent it from reaching the outside in the direction of the neighbors,” when in fact some sound energy will wrap around the Shed towards the closest neighbors.
5. In the final paragraph of this section, BAC notes that the interior of the Music Shed will be treated with “sound absorbing panels” that will “reduce the sound build-up inside the shed and improve the sound isolation performance of the wall.” However, this improvement does not appear in any calculations.
6. In “Sound Management Program, Discussion, Sound absorbent material panels” BAC notes the inclusion of absorptive panels throughout the “upper panels” of the tent; however, the effect of these panels, noted as 8-10 dB in the body of the report, does not appear in any calculations. Furthermore, it is unlikely that the absorptive panels will have this significant of an effect on transmission loss in the field.
7. BAC then notes the inclusion of “additional transparent roll-up sound barrier panels...installed around the tent sides.” With these panels only located at the sides of the tent and not fully sealed (which we assume given that these panels are operable) that STC 26 is not a fair representation of the expected transmission loss of the Tent. It should be noted that this erroneously generous performance is reflected in the analysis.
8. Furthermore, it should be noted that the material specified for these roll-up sound barrier panels, a 1 PSF mass loaded vinyl, may not be feasible to operate



depending on the size each panel is cut. For instance, a 10' x 8' panel would weigh 80 lbs.

9. In "Sound Management Program, Discussion, musical entertainment management program" BAC mentions the installation of a "house system." While we agree that this can be an effective approach, it does not appear to be fleshed out to the point where quantitative improvement can be judged. Speaker types, dispersion characteristics, locations, and orientations must be provided to determine the effectiveness of the Music Shed and other mitigation measures. Specific methods of level control must also be specified, namely in-line limiters, to guarantee the control BAC conceptually mentions.

10. BAC then indicates that a monitoring system will be implemented to ensure that the sound level limits set by the State of Connecticut "at the nearest neighbor (~500 feet distance)." This presents a few issues:
 - a. The Regulations of Connecticut State Agencies (RCSA Section 22a – 69) states that "measurements taken to determine compliance...shall be taken at about one foot beyond the boundary of the Emitter Noise Zone within the receptor's Noise Zone." Based the Town of Washington parcel map below (Figure 1), the nearest relevant boundary (property line of a residential property) appears to be located approximately 170 feet north of the Event Tent.

 - b. The next closest residential property line, that of the neighbor considered in BAC's study, is approximately 450 feet northwest of the Event Tent.

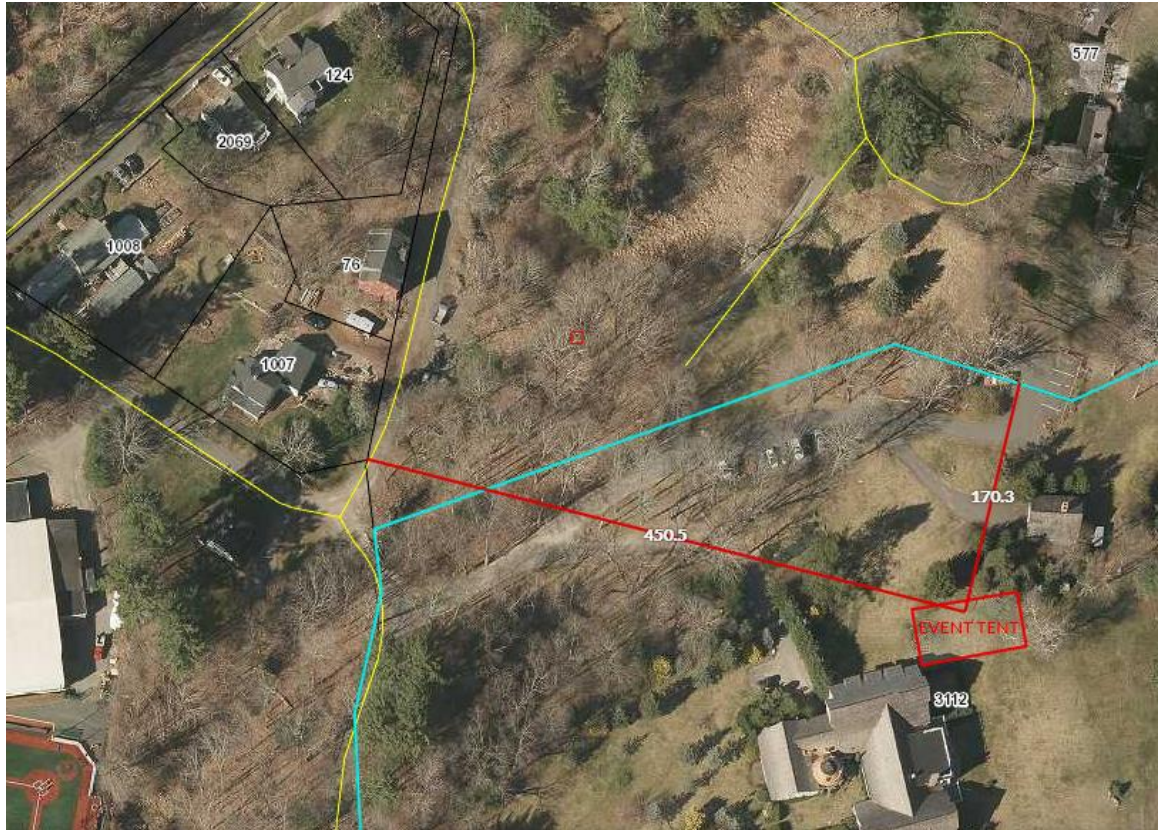
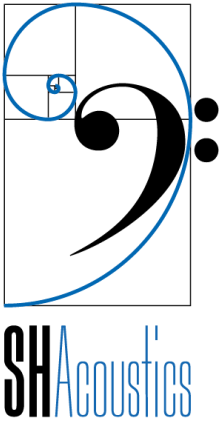
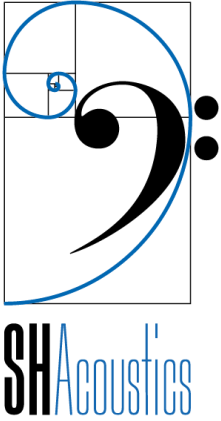


Figure 1 Parcel map of the area surrounding the Mayflower Inn & Spa

- c. BAC indicates in the following section of the report that they have considered a more stringent “design target level” as compared to the State of Connecticut regulations to “maintain good relations with the neighbors.” However, this more stringent criterion (45 dBA) would not be guaranteed as the designed monitoring system would only indicate exceedance above the Connecticut State regulation (55 dBA during the day and 45 dBA at night).
11. In “Sound Level Standards,” BAC indicates the more stringent design target level as discussed above. Though the purpose of this lower limit is intended to benefit the neighbors, it should be noted that simply lowering the overall maximum noise level at the property line to 45 dBA does not guarantee that the Event Tent will have little to no impact on the neighboring properties.

To fully assess noise impact, the noise source needs to be compared to the ambient environment. In a particularly quiet environment, noise that might not be considered intrusive elsewhere could be deemed objectionable. Generally, for a noise source to be inaudible the source levels must be at least 10 dB below



the ambient noise levels. For there to be minimal impact, we recommend that the source levels do not exceed the ambient noise levels.

In order to complete this aspect of the analysis, long term sound level measurements must be taken at the relevant property lines. Then a statistical analysis of the octave band noise levels must be performed to determine L90 and ascertain background levels. This is typical best practice to help characterize the ambient environment and is required by RSCA Section 22a-69-4. We have not seen an indication that this survey and analysis has been done.

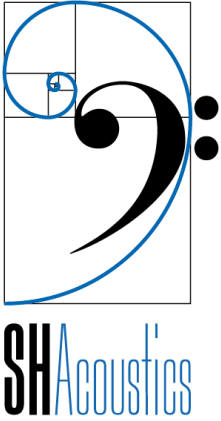
Lastly, it should be noted that viewing criteria in terms of overall A-weighted values tends to undermine the effects of low frequency noise, prevalent in DJ and live music. Octave band noise levels must be considered throughout the analysis, including when establishing design criteria.

12. In “Acoustical Engineering Calculations – Hospitality Tent sound levels,” BAC summarizes in this section how source sound level measurements were taken and used in their analysis; however, it is unclear under what conditions the levels were taken and what analytical parameters were considered.

The report does not indicate the type of performance (DJ, live music, etc.) measured. BAC also uses the same measured data, without any adjustment, to represent both DJ sound sources and live band music when the sound spectra of these two types of musical entertainment tend to differ. For this analysis, the worst-case spectrum should be used.

Additionally, the report does not discuss what measurement statistic was used to develop the source sound spectrum. Often we find that equivalent continuous sound pressure level (Leq) is used in this type of analysis though L10 tends to be more accurate considering the transient nature of music.

13. Prior to providing the results of their analysis, BAC references the calculations tabulated on page 10 of the report. We have noted several issues with the calculations shown:
 - a. The analysis only considers the property to the northwest on Wykeham Road even though there appears to be a residential property closer to the Event Tent. The property line separating the Mayflower Inn & Spa and this



closer residential property is located further from the road and would likely display different ambient noise characteristics as compared to the property to the northwest that has been considered.

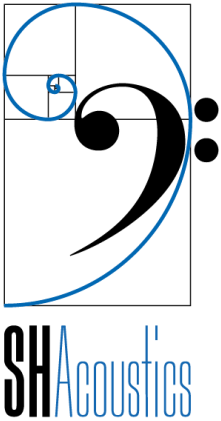
- b. BAC notes an ambient criterion on Wykenham Road of NC-65; however, NC (Noise Criteria) is not an appropriate metric to use in this scenario as it is used to characterize noise levels of HVAC systems – not outdoor noise. When assessing noise impact, source levels should be compared to the ambient noise levels.
- c. Element 4 of the Calculation Summary shows the rated Transmission Loss of the 1 PSF mass loaded vinyl specified. However, it is unlikely that this method will be fully effective as the Tent is not entirely encapsulated in this material and it is very likely that the enclosure will be fully sealed. This likely deficiency should be accounted for in the calculations.
- d. Element 5 of the Calculation Summary shows a noise reduction of -52 dB across the frequency spectrum. It is unclear how BAC arrived at this performance. We understand that they incorporated the performance of the Music Shed, absorption from acoustic treatment throughout the Tent, and distance loss into their calculations from the body of the report; however, these elements are indistinguishable in such a broad analysis. A breakdown of the items incorporated into Element 5 should be provided to assess the validity of the calculations.

Given the lack of technical information noted above, we believe that there is insufficient information to calculate an expected noise level of 35 dBA, shown in the Calculation Summary.

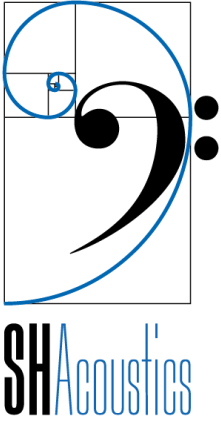
Furthermore, though many aspects of BAC’s proposal for noise control and mitigation seem reasonable in concept, we believe the information provided in the BAC report to be insufficient in determining code compliance and impact on the neighboring residences.

Powerstation White Paper

1. In the second paragraph, Powerstation notes that two site surveys have been conducted where they collected physical and acoustical measurements; however, this information is not provided.



2. Furthermore, they note that they developed a report based on their findings to create a design plan that “will fulfill the audio and technical needs for current and future events while satisfying the sound level parameters set forth.” We have not seen said report nor have sound level parameters been indicated.
3. In “Phase 1 – System design, procurement and installation” Powerstation discusses, at a conceptual level, the implementation of house audio system to provide control over noise levels through digital signal processing, limiting, and monitoring. They note a “design plan” though this does not appear to be provided. That said, Powerstation does not offer specifics on speaker types, locations and quantities, or digital signal processors. These details must be further developed and reviewed to confirm that the house system will effectively support a heightened level of control over the sound levels to minimize noise impact at the neighboring properties.
4. Powerstation then notes the use of a portable “fill system” for live performances. Having part of the audio system only temporarily installed poses the risk of errors during setup which may contribute to a higher noise level at the neighboring properties. Still, this portable system specifics should also be reviewed.
5. In “Phase 2 – Physical mitigation through barriers and absorption” Powerstation discusses the implementation of two barriers – one behind the “band stage” that will be deployed during live band events and another barrier outside the event tent. Plans indicating the precise location, dimensions, and materials of each barrier - all factors which will affect acoustic performance - have not yet been provided. Powerstation claims that the first barrier will aid in the localization and containment of the musical entertainment, and the second will limit any residual sound transmitting to the property line. This is not an acceptable claim as no calculations, details, or other pertinent information has been provided. Additional analysis must be performed and reviewed to determine the objective sound reduction of the two barriers.
6. In “Phase 3 – System setup, control and monitoring” Powerstation discusses engaging an outside professional audio contractor to support every event and ensure “the parameters set forth” are maintained; however, such “parameters” have not been established.



7. Powerstation notes that it would be the responsibility of this contractor to monitor the noise levels at the property line using a “multi-point measurement system.” The specifics of this system must be disclosed for further review to ensure any established maximum noise levels are truly maintained.

Overall, the Powerstation Events white paper is lacking in information that would show that appropriate sound levels will be maintained at the nearest neighboring property lines. Measurements, analysis, and established criteria to inform design decisions have not been provided. Specifics related to audio system design, including system monitoring, and acoustic barriers have also not been provided. With the provided information in this white paper, it is impossible to confirm that the Event Tent musical events will not impact the neighboring properties or comply with Connecticut State regulations.

Conclusion

SHA has conducted a thorough review of both documents included in the Special Permit Application for the Mayflower Inn & Spa Event Tent related to noise transmission to the neighboring properties. We believe that neither document provides sufficient accurate information to guarantee that the Event Tent musical performances will comply with Connecticut State noise regulations and have little to no impact on the neighboring residences.

This concludes our comments at this time. Please do not hesitate to reach out with any additional questions or comments you may have.

Kind regards,

Peri Chain
Acoustic/Audio Consultant