

March 31, 2022

Bill Guinee
DLR Leasing
252 Rowley Bridge Road
Topsfield, MA 01983

SUBJECT: Connemara House Farm Wedding Tent, Topsfield, MA
Music Noise Evaluation

Dear Bill,

Cavanaugh Tocci has recently completed a study to understand community sound exposure from music produced by DJ sound systems serving the Connemara House Farm Wedding Tent. You requested this study to determine what the venue can do to limit event music sound at nearby residences. Although the town of Topsfield has not required any specific action by the venue at this time, we understand that you and the other owners are interested in taking reasonable steps to reduce the sound neighboring residents can hear during weddings and other tent events.

Part I. Existing Conditions Evaluation

Site Overview

Attached Figure 1 is an aerial photograph depicting the Connemara House Farm property and wedding tent location. The tent is a temporary structure which is installed in the spring and removed in late fall at the end of the wedding season. The tent is installed on a concrete slab, with a removable dance floor surface positioned at the center of the tent on the west side. Figure 1 also shows the nearby residential locations we evaluated for this study, with approximate distances from the event tent to each property.

Background Sound Levels

The perceived loudness of music is a function of the music volume level compared to the background noise level at the listening location. The first step in our study was installing sound monitors at representative locations to understand the background noise conditions at nearby residences. Attached Figure 2 shows the three sound monitor locations marked on an aerial photograph of the site. The sound monitors recorded hourly sound level data for ten days, including data for two weekends.

We focused our analysis on the tent event operating hours, which stop at 9pm on Sundays and 10pm on other days. Despite the relative proximity to interstate highway I95, background sound at nearby residences can vary over a significant range throughout the day and is sometimes quite low during the evening hours when many wedding events take place. The table below shows the range of sound levels measured during event operating hours at each of the three monitor locations.

Measured Background Sound Level Range	
SM1 (English Commons)	40-49 dBA
SM2 (northwest residences)	43-53 dBA
SM3 (southwest residences)	45-59 dBA

All figures are average lowest and highest 1-hour LAF₉₀ measured during tent event operating hours

Monitor location SM1 represents the background sound at the English Commons residences to the East. Since it also represents the lowest background sound measured at any location, we used the lowest background sound at SM1 as a conservative basis for our recommended design criteria. In practice, using this value will result in an even more conservative design goal since background sound typically increases during the summer months when the tent events take place.

Music Sound Levels

The Connemara tent venue has been operating for approximately two years. During that time, some nearby residents have complained about music from tent events. Given the proximity of the nearest residential properties and relatively low background sound that can occur during evening tent event hours, it is understandable that amplified music from the Connemara event tent is sometimes audible at those properties. With the variability that is inherent in music, and changes in playback volume over the course of some functions, it is likely that music sound has also “spiked” at times during past events, and we suspect that some of those spikes may have resulted in complaints.

For this study we calculated the range of music sound at nearby residences based on our experience measuring wedding music at other venues including other wedding tents. To calculate sound levels at residences, we built a 3D acoustic model using outdoor sound evaluation software that accounts for environmental factors affecting sound propagation.

Attached Figure 3 shows the results of the existing conditions calculations, representing the range of wedding DJ music sound that the community has likely experienced during past events. The ranges shown account for typical differences between DJs as well as the variety of music played over the course of each event. The table below compares the music range during past events with the measured background sound level range at four representative locations.

Past Music Range vs. Background Noise Range		
Location	Measured Background Noise Range (dBA)	Music Range During Past Events (dBA)
R3 (English Commons)	40-49	41 – 56
R6 (English Commons)	40-49	45 – 60
R15 (west of event tent)	43-53	32 – 47
R11 (southwest of event tent)	45-59	34 - 49

Music range is predicted based on 80-95 dBA range at tent dance floor

Design Criteria

Although the Town of Topsfield bylaws do not include a noise ordinance, the Massachusetts Department of Environmental Protection (MassDEP) noise policy is applicable. The MassDEP policy stipulates that sound sources must not increase the broadband sound level by more than 10 dB(A)

above the ambient (background) sound level. It is likely that this criterion was exceeded during past tent events. However, tent music volume can be managed to comply with MassDEP limits, which will result in a much lower range of music levels in the community. The mitigation recommendations outlined in the next section were developed to ensure DJ music compliance with the MassDEP guidelines during Connemara House Farm tent events.

As noted above, the perceived loudness of music is a function of the music volume compared with the background noise at the listening location. Given the proximity of the adjacent residences, tent venue music will still be audible at times at some properties. However, the recommended controls will establish a consistent maximum sound limit that cannot be exceeded. We expect that with an appropriate tent volume limit in place, the music volume experienced by nearby residents will be restricted to an acceptable range.

Part II. Recommendations to Control Tent Event Music

House Sound System

To meet the criteria above, we recommend installing a semi-permanent “house” sound system for use by wedding DJs. Currently DJs use their own sound system equipment which cannot be controlled by the venue. A semi-permanent house system would offer the following benefits:

1. Gives the venue direct control of the sound system
2. Provides consistent operating conditions for every event
3. Enables use of electronic limiting to set maximum music volume

The house sound system would be installed at the beginning of each wedding/event season and removed and stored during the off-season. We recommended a system that includes the following components and features:

1. High-directivity loudspeakers, mounted semi-permanently, and aimed to focus sound energy within the tent, minimizing sound that escapes the tent
2. Audio Digital Signal Processor (DSP) programmed with the following:
 - Limiter to limit maximum loudspeaker output to **85 dBA** (at tent dance floor)
 - Multi-band compression to limit maximum volume of low frequency “bass” sounds, applied over a frequency range of approximately 25 Hz – 150 Hz
3. Inputs for guest DJs to connect their mixing equipment
4. Locked controls on DSP, amplifiers, and all other components, to prevent users from overriding the limiting functions described above
5. Loudspeakers positioned where portable loudspeakers are setup for the current DJ location on west side of the tent

House Sound System Location

We also explored positioning the new sound system at other locations within the tent. While alternative locations would benefit some neighboring residences, they would result in louder music at others. Consequently, we recommend installing the new house system at the existing DJ location.

Expected Results

The new house sound system outlined above will reduce the tent music volume range experienced by nearby residents and prevent it from exceeding MassDEP regulations. The table below compares the current and new maximum music sound levels at selected residential locations along with the MassDEP limits. The MassDEP limits are based on the lowest measured background sound level at each location. Attached Figure 4 is an aerial map annotated with the new maximum music levels at all property locations included in the study.

Maximum Music Levels with House Sound System				
	Current Max Music Level (dBA)	New Max Music Level (dBA)	MassDEP Limit (dBA)	Min Background (dBA)
R3 (English Commons)	56	45	50	40
R6 (English Commons)	60	49	50	40
R15 (west of tent)	47	32	53	43
R11 (southwest of tent)	49	37	55	45

Current max music levels based on 95 dBA at tent dance floor, new max based on 85 dBA limit at tent dance floor.

The table above and the attached figure demonstrate that with the recommended sound system limiting in place, the maximum tent music sound levels at nearby residences will be lower and in compliance with MassDEP regulations.

Operational Controls

In addition to the electronic limiting for the sound system, some operational measures can be established to manage the music sound from the tent venue. We recommend the following:

1. Require event planners to select from a list of qualified DJs who understand the importance of sound level control, and who will agree contractually to work and operate their music systems through the Connemara House Farm tent sound system and within the established limits.
2. Regularly inspect the house sound system to ensure it is not modified or tampered with, including any movement, adjustment, or re-aiming of the loudspeakers.
3. Monitor tent sound levels periodically during events using a suitable sound level meter. Affordable sound level meters that can accurately measure sound for this application are readily available. If exceedances are measured, take appropriate steps to reduce music volume until established limit is maintained.

Live Music Considerations

The recommended house sound system cannot control the unamplified natural sound generated by musical instruments played by live bands or other musical ensembles. However, the recommended sound system could provide limited amplification for vocals and quieter instruments such as acoustic

guitars. To ensure the recommended sound limits are maintained during live music performances, we recommend the following operational measures:

1. Require live bands to sign a contract that includes compliance with the recommended 85 dBA sound limit within the tent.
2. Require live bands to forego use of their own PA system. For vocals and quieter acoustic instruments that rely on amplification, require them to use the house sound system. Live bands can connect their mixing console to the house sound system for this use, which will provide the same limiting as it does for DJs.
3. Monitor tent sound levels periodically during events with live music using a suitable sound level meter. Affordable sound level meters that can accurately measure sound in this range are readily available.

Conclusion

With the measures recommended above in place at the Connemara House Farm tent venue, tent event music exposure to the surrounding community will be reduced by ensuring the music sound always remains below the MDEP limit, even at the maximum allowable tent music volume.

I trust this report provides the information you need to move forward. With the completion of this Evaluations and Recommendations phase we should revisit the tentative second phase of work outlined previously and determine a suitable scope to assist you with implementing these recommendations.

Please feel free to contact me with any questions.

Sincerely,

CAVANAUGH TOCCI



John T. Foulkes

JTF/TJF/jtf/22010 - Connemara House Wedding Tent Noise Study

Figures



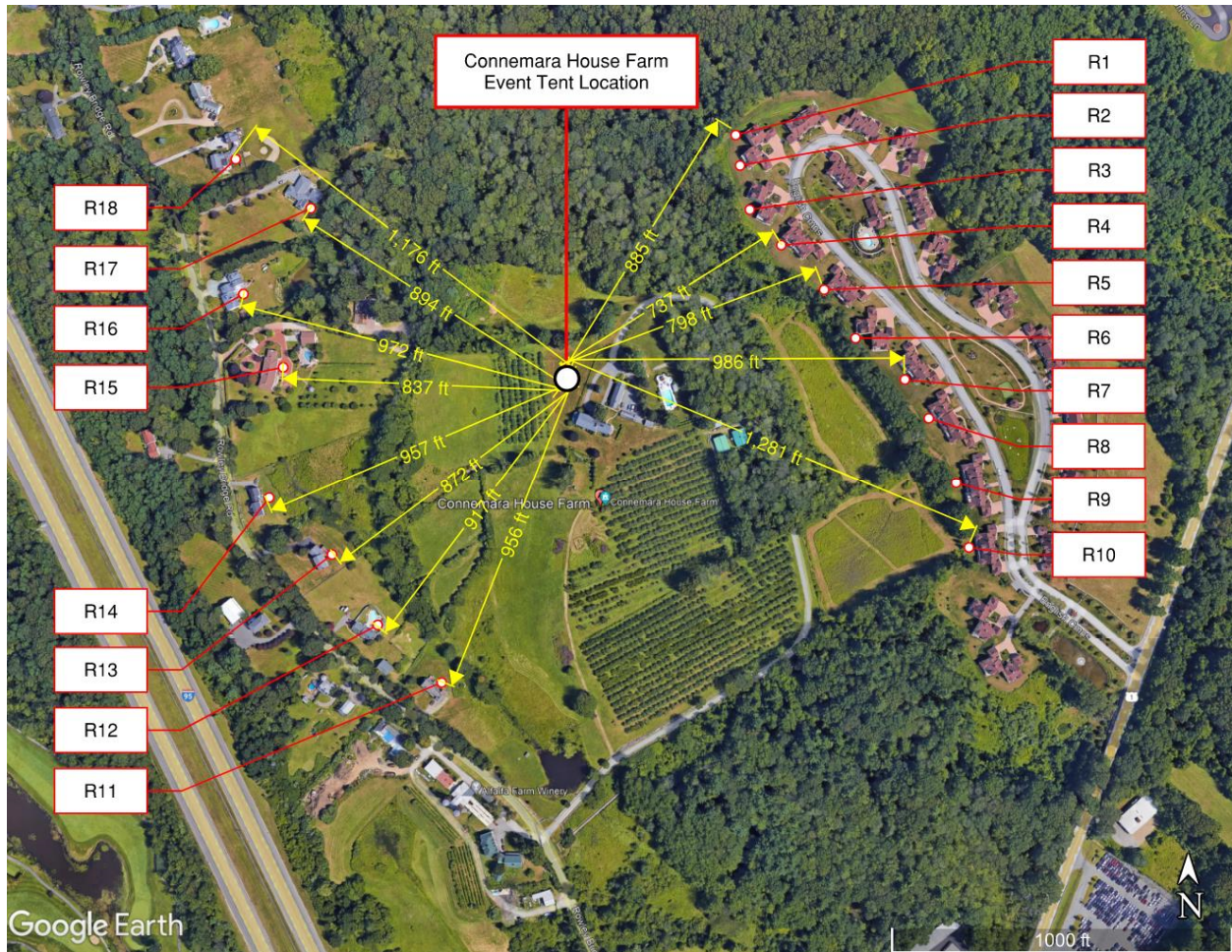


Figure 1: Connemara House Farm Site and Nearby Residences



Figure 2: Background Sound Monitor locations

Note: Background sound levels reported above are average lowest 1-hour LAF₉₀ measured during tent event operating hours.



Figure 3: Music Ranges at Residences During Past Events



Figure 4: Maximum Music Levels with Recommended House Sound System