

November 6, 2014

Aaron Feldman  
Maryland-National Capital Park and Planning Commission (M-NCPPC)  
9500 Burnett Avenue  
Silver Spring, MD 20901

Re: Rockwood Manor  
Acoustical Review

Mr. Feldman:

Hush Acoustics LLC has evaluated even noise emissions during special events from Rockwood Manor Park in Montgomery County, Maryland.

## 1. Overview of Facility

Rockwood Manor Park includes a main two-story building plus many outbuildings, with residential communities to the north, east, and south, and MacArthur Blvd to the west. The site is rented out for special events such as weddings, bar mitzvahs, church retreats, etc. The main building has an upper level with four main event rooms and an office, and a lower level with two event rooms adjoining a patio and a kitchen. Temporary tents are often used during special events on the patio adjoining Brooke Hall (in the lower level). Figure 1 is a plan of the lower level provided by Montgomery County Parks staff.

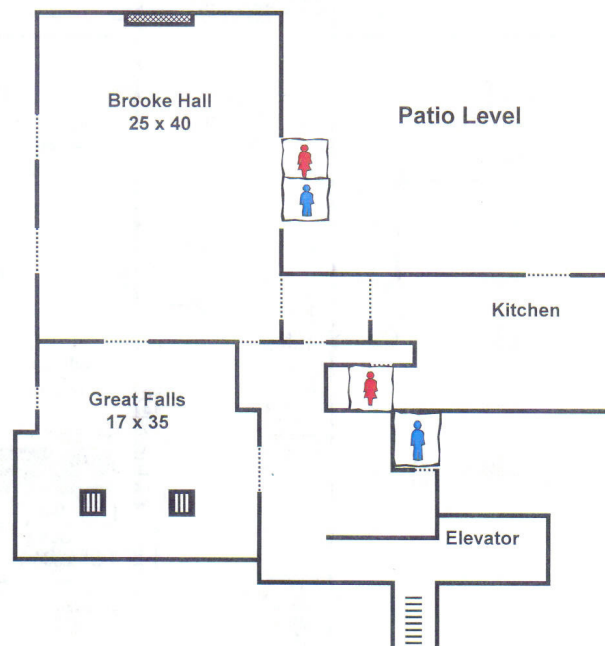


Figure 1. Lower Level Plan

## 2. Noise Ordinance

The Montgomery County Noise Ordinance (Chapter 31B of the County Code) limits noise emissions from one property to surrounding properties. The maximum allowable A-weighted noise level at surrounding residential areas is 65 dB during the daytime (7am to 9 pm on weekdays, and 9 am to 9 pm on weekends and holidays) and 55 dB during the nighttime. There is a grace of 2.5 dB allowed beyond these sound levels before a noise ordinance violation is established. There is a Montgomery County code enforcement officer that can measure sound levels and determine whether there is a noise ordinance violation. Considering the grace, it would be necessary to reach a noise level of 67.5 dB during the daytime or 57.5 dB at night to establish a violation.

In addition, per the Montgomery County Environmental Protection website: “Noise events may occur at random, on occasions when a code enforcement officer with a sound level meter is not available. For those occasions, the ordinance has a provision establishing a noise disturbance violation. The noise disturbance criteria are more subjective, and dependent upon the observations and testimony of witnesses and/or a code enforcement officer.” The noise disturbance clause can only be invoked when there are at least two people complaining about the noise. If two people register a noise complaint, the code enforcement office will contact the noise making entity and request that they submit a plan for reducing noise emissions, and either issue a warning or a fine. If that warning or fine is challenged in court, it would be up to a judge to determine if there is a true noise disturbance.

The noise ordinance also has more complex provisions regarding sounds that have prominent discrete tones or an impulsive nature. An example of a sound with discrete tones would be a transformer, and examples of sound with an impulsive nature would be fire arms, punch presses, and pile driving. The main noise sources from Rockwood Manor Park are music and voices, and occasionally idling buses. Clearly, these sources are not impulsive. We considered the possibility that they might be considered tonal, using the criteria spelled out in the noise ordinance. However, in a conversation with Steve Martin of the code compliance staff we understand that they typically only apply the tonal and impulsive provisions to stationary noise sources. As such, we have assumed these provisions do not apply for Rockwood Manor.

Sound level meters have several settings that affect the output. For instance, one setting is the frequency weighting network. As mentioned above, the code limits are in terms of the A-weighted sound level. This means that the sound level meter must be set for a frequency weighting on the “A” scale. Sound level meters have another setting for the time weighting. These can be “fast,” “slow,” and “impulsive.” Typically, “slow” response is used for relatively steady sounds such traffic, aircraft, and mechanical equipment, “fast” response is used for relatively quickly varying sounds, and “impulsive” is used for instantaneously-varying sounds like gunfire. The noise ordinance does not explicitly say how noise levels are to be measured in this regard. Per a conversation with code compliance staff, we learned that they would use “slow” response for situations such as Rockwood Manor.

Per our conversation with code enforcement staff, we understand that they do not enforce the noise ordinance with regard to unamplified human voices such as cheering of the crowd at a wedding. If there is a “noise disturbance” claimed, it must be for the music and not the crowd cheering.

### 3. Site Visits

Site visits were performed on June 29 and October 25, 2014. On both of these occasions there were wedding receptions at Rockwood Manor. Both events had tents on the patio with music generated in Brooke Hall. The Montgomery County Parks policy regarding use of the facility changed between the two site visits. For the first site visit the rules of use stated that speakers must be located in Brooke Hall, and not in the tent, but they could be located at the door to the tent. Prior to the second site visit the rules were tightened to require the music to be fully within Brooke Hall with the main two pairs of double doors between Brooke Hall and the tent are not to be propped open. For the first site visit there was dancing under the tent, while for the second site visit all dancing was indoors in Brooke Hall.

Rockwood Manor Park does not have its own audio equipment. During the June 29 wedding music was played by a DJ using speakers in the doorways of Brooke Hall facing into the tent. During the October 25 wedding music was played by a live band with much larger, louder audio equipment but with the two sets of double doors closed (except when people came in or out). However, Brooke Hall is open to Great Falls, and the single door between Great Falls and the tent was open on October 25.

Sounds levels were measured in various locations on each of these dates using a Norsonic Precision Sound Analyser Nor140 serial number 1402854 with a Norsonic Type 1233 microphone serial number 08609 fitted with a windscreen sitting on a tripod approximately 5 feet above the ground. The sound level meter was calibrated using a Quest Technologies QC-20 Calibrator serial number QOF07008. Figure 2 shows a bird's eye view photo downloaded from the website Bing.com marked up with various notes including measurement locations A through E, road names, and noise source locations.

During the June 29 site visit, sound levels were measured under the tent approximately 5 yards from the speakers, in location A which is on top of the berm at the corner of Belfast Road and Whiterim Terrace, in location B which is at the corner of the Rockwood Manor main building beside the tent at the corner of the sidewalk, in location C which is along the paved access road that leads to the Rockwood Manor cabins, and in location D which is in the woods approximately 15 yards from the rear fence line of houses along Laurel Leaf Drive. For this entire site visit sound levels were measured using the "fast" response setting on the sound level meter. [This visit was performed prior to our conversation with code enforcement staff.]

During the October 25 site visit, sound levels were measured at the rear of Brooke Hall, in locations A, B, C, and D, as well as in location E which is along the north side of Belfast Road due south of the main Rockwood Manor building. For this site visit, sound levels were measured with a mixture of "fast" response (to compare to the prior site visit) and "slow" response (to compare to the noise ordinance).

For both site visits, the sound level meter was programmed to automatically store various sound levels each second for the duration of the measurement sample. The measurement sample duration varied from approximately 30 seconds to approximately 20 minutes. The sound level data collected included the average and maximum A-weighted sound level each second, as well as the average sound level spectrum each second (i.e., the average sound level in each one-third octave band).

On June 29, the main sound sources were cars on Belfast Road and MacArthur Blvd, aircraft, birds, insects, and sounds from the Rockwood Manor event. Rockwood Manor event sound included music from the wedding and cheering under the tent; of the two, cheering produced higher A-weighted sound levels than did the music, but clearly the music produced more low-frequency noise which is not factored into the A-weighted sound level as much. On October 25, the main sound sources were cars on Belfast Road, Laurel Leaf Drive, and MacArthur Blvd, aircraft, insects, and music from the Rockwood Manor event. Cheering was not an issue since there was no dancing under the tent. Crickets were typically the loudest sound source, although at location E the shuttle bus and truck or bus idling were as significant as the crickets.



Figure 2. Marked-up Bird's Eye View Photo

## 4. Measured Sound Levels

### 4.1 Close to Music

Sound levels were measured close to the music (either under the tent on June 29 or in Brooke Hall on October 25) solely to document how loud the sound source was for reference to other events and not to evaluate compliance with the noise ordinance.

On June 29, the A-weighted sound level with the meter set on “fast” response measured under the tent for two minutes approximately 5 yards from the speaker was 96.1 dB on average with a range of 81.4 to 109.3 dB. The highest sound levels were actually due to cheers as the wedding party danced. Most of the time, the sound level was approximately 88 to 93 dB.

On October 25, the A-weighted sound level with the meter set on “slow” response measured at the rear of Brooke Hall for 40 seconds was 102.3 dB on average with a range of 94.4 to 105.3 dB. Most of the time, the sound level was approximately 101 to 104 dB. In our estimation, the sound levels from the June 29 wedding were fairly typical for a wedding in which a DJ was present, while the sound levels from the October 25 wedding were higher and more typical of what one might experience during a concert.

### 4.2 Location A

Sound levels were measured at location A on top of the approximately 4-foot high berm along Belfast Road near Whiterim Terrace. On June 29, the A-weighted sound level with the meter set on “fast” response measured for 20 minutes was 49.5 dB on average with a range of 37.1 to 66.2 dB. In this location, the average sound level is not meaningful since cars on Belfast Road were by far the loudest sound source. Figure 3 presents a graph of the maximum sound level each second at location A with notes to indicate dominant sound sources at different times. Not counting times when traffic and aircraft were the dominant sound sources, the sound level due to cheering had maximum sound level spikes up to 50 to 56.4 dB at times, with one spike up to 59.5 dB. Other ambient sound sources not noted in Figure 3 include kids playing in the street farther down Whiterim Terrace, people in their garages, and people working in their yards. On one occasion the song was identifiable but not most of the time.

On October 25, the maximum A-weighted sound level with the meter set on “slow” response over six minutes is presented in Figure 4, and with the meter set on “fast” response over approximately six minutes is presented in Figure 5. Figure 4 shows that the main sound sources were cars, planes, insects, and aircraft, with occasional noises from the parking lot (a shuttle bus and truck loading at the kitchen). The typical maximum sound level was quite steady in the range of approximately 48 to 49 dB. Figure 5 shows that the same main sound sources, with an additional event from people talking in the parking lot. Again, the typical maximum sound level was steady in the range of approximately 48 to 49 dB. The music was audible, although it typically was not possible to identify the song. Given the other sound sources, the music was never the dominant sound source. The main sound sources emanating from Rockwood Manor Park activities were shuttle bus and truck engines, backup beepers, brakes, and lift gates, occasional dumpster use, and occasional individuals talking.

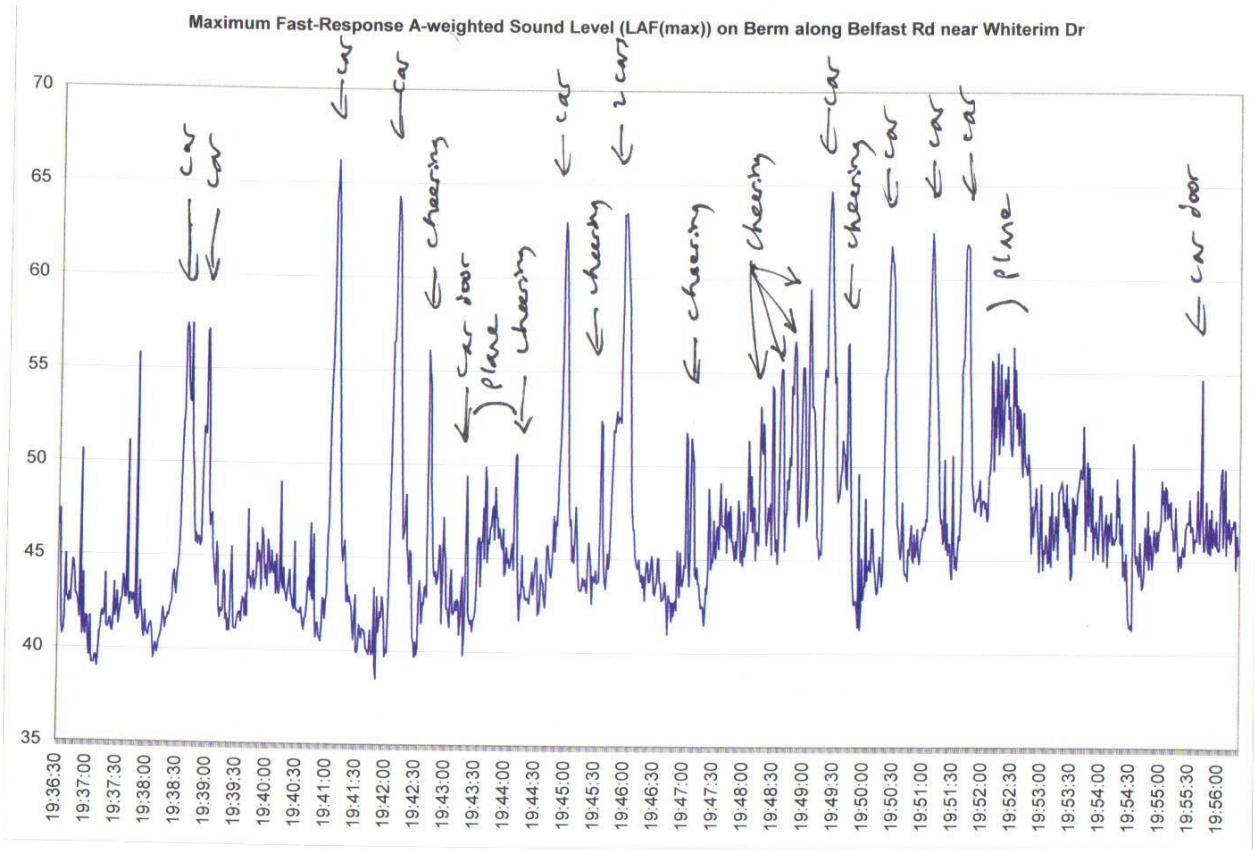


Figure 3. Maximum Sound Levels with “Fast” Response at Location A on June 29, 2014

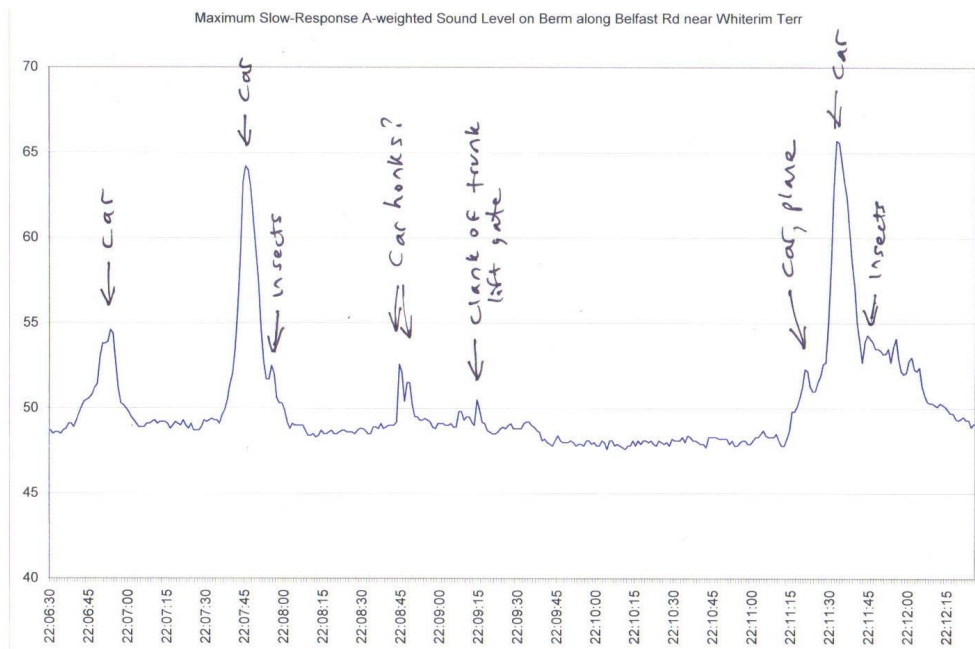
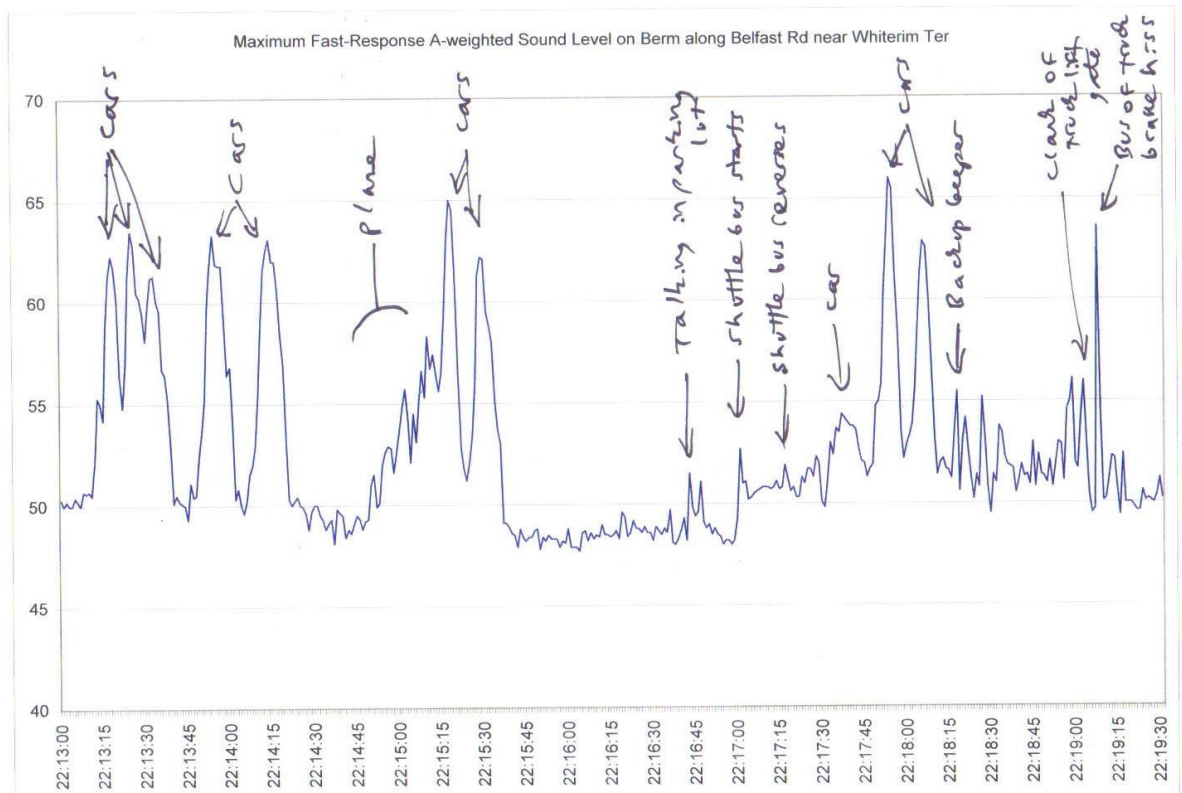


Figure 4. Maximum Sound Levels with “Slow” Response at Location A on October 25, 2014



**Figure 5. Maximum Sound Levels with “Fast” Response at Location A on October 25, 2014**

### 4.3 Location B

Sound levels were measured at location B immediately beside the tent solely to document how much sound was being emitted by the facility, and not to evaluate compliance with the noise ordinance. On June 29, the A-weighted sound level with the meter set on “fast” response measured for ten minutes were 73.0 dB on average with a range of 55.2 to 88.9 dB. Most of the time, the maximum sound level was approximately 65 to 78 dB. All of the sound was from the wedding.

On October 25, the maximum A-weighted sound level with the meter set on “slow” response measured for two minutes as a speech was occurring in Brooke Hall were typically in the range of approximately 53 to 58 dB. The speech was not even audible; this sound level was due solely to guests talking over dinner under the tent. With music playing and the meter set on “slow” response the sound level measured for two minutes was 68.7 dB on average with a range of 64.4 to 72.4 dB. With music playing and the meter set on “fast” response the sound level measured for two minutes was 68.1 dB on average with a range of 58.1 to 77.8 dB. In summary, the sound levels immediately outside the facility during the June 29 wedding were a bit higher than during the October 25 wedding (despite the opposite being true near the speakers) both in terms of the average sound level as well as maximums during cheering. This is clearly because the music and dancing were moved indoors instead of being under the tent.

#### 4.4 Location C

Sound levels were measured at location C within Rockwood Manor Park solely for comparison with sound levels at location D which is near the property line. It was thought that it might not be obvious where the highest sound level was toward the north given the dramatic topography. The ground elevation drops off dramatically between the main building and location C, and flattens out between locations C and D.

On June 29, at location C the A-weighted sound level with the meter set on “fast” response over 10 minutes was 51.2 dB on average with a range of 40.0 to 65.7 dB. The highest sound level was due to cheering (one spike to 65.7 dB), aircraft (one event to 56.7 and one to 58.1 dB), and birds (multiple spikes to 56 to 58 dB). Other than during these events, most of the time the maximum sound level was approximately 50 to 53 dB and most of this sound was due to music; before the song started the maximum sound level was approximately 41 to 43 dB.

On October 25, at location C the A-weighted sound level with the meter set on “slow” response over 4 minutes was 49.6 dB on average with a range of 47.9 to 53.7 dB, and the sound level with the meter set on “fast” response over 4 minutes was 49.8 dB on average with a range of 47.2 to 55.8 dB.

#### 4.5 Location D

Sound levels were measured at location D which is in the woods approximately 15 yards from the rear fence line of houses along Laurel Leaf Drive. On June 29, the A-weighted sound level with the meter set on “fast” response measured for 10 minutes was 50.4 dB on average with a range of 40.4 to 62.0 dB. Figure 6 presents a graph of the maximum sound level each second at location D with notes to indicate dominant sound sources at different times. Not counting times when aircraft were the dominant sound sources, the sound level due to the event had spikes up to 56.8 dB (DJ talking), 57.2-60.1 dB (cheering), and 54.0 dB (music).

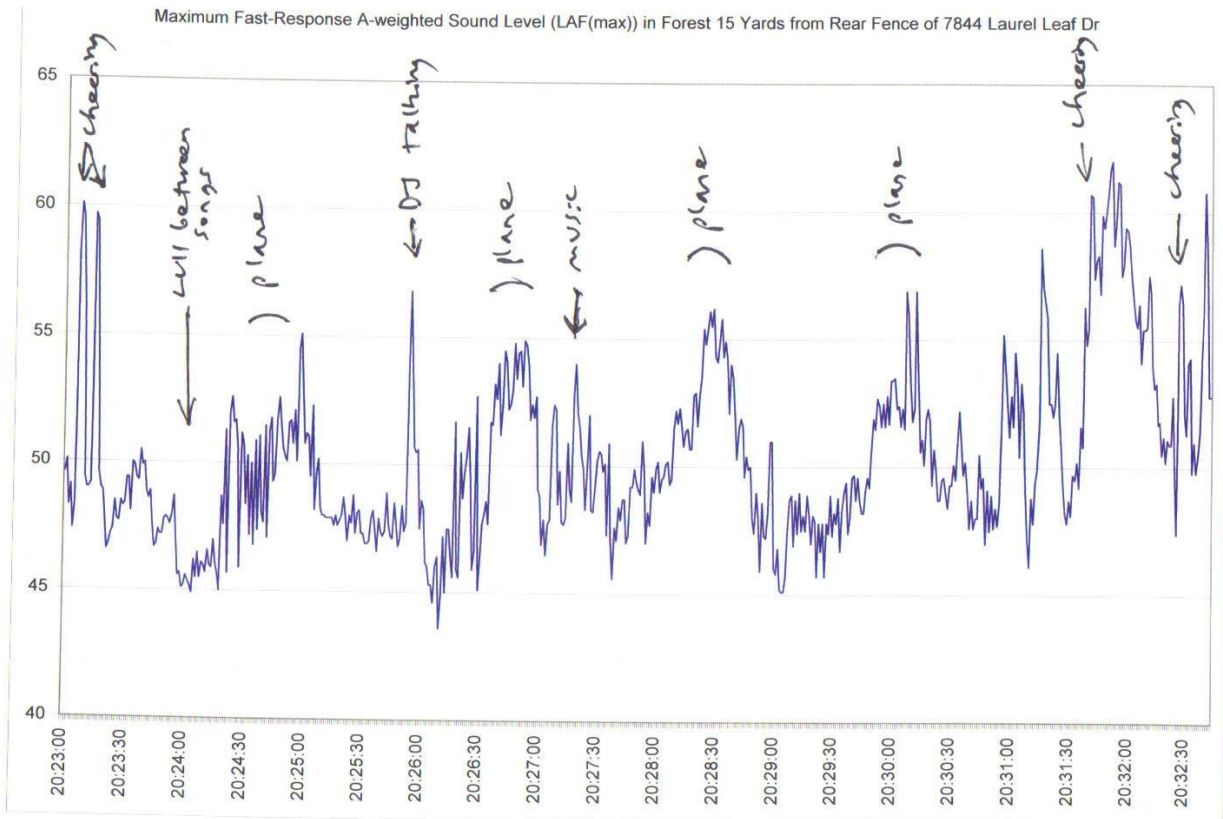
On October 25, at location D with A-weighted sound level with the meter set on “slow” response over 6 minutes was 47.4 dB on average with a range of 45.8 to 50.2 dB, and the sound level with the meter set on “fast” response over 2 minutes was 48.1 dB on average with a range of 45.5 to 53.0 dB. As would be expected, sound levels were a bit higher at location C than at location D. However, crickets were as significant if not more significant than the music, meaning the sound levels cannot be considered to solely represent sound emanating from the Rockwood Manor Park event. Figures 7 and 8 are graphs of the maximum sound level each second at location D on October 25. The loudest noise events from Figure 7 were clunks heard from the direction of Rockwood Manor; based on subsequent observations we believe these were when truck lift gates hit the pavement near the kitchen loading area. The sound levels reached 52.0 and 53.0 dB at these times. No specific loud noise events were noted for Figure 8.

#### 4.6 Location E

Sound levels were measured at location E which is along Belfast Road between Whiterim Terrace and MacArthur Blvd. Sound levels were measured for 5 minutes with the meter on fast response, and for 6-



1/2 minutes with the meter set on slow response. The sound level in this location was quite steady during these times. The maximum sound level each second was in the range of approximately 50 to 53 dB the entire time, with the exception of when aircraft flew by, when cars passed when the sound level reached approximately 65 dB, and one time when a truck with a dropping lift gate produced a sound level of 54.8 dB. Aside from these brief periods, the dominant sound sources were crickets and a shuttle bus idling.



**Figure 6. Maximum Sound Levels with “Fast” Response at Location D on June 29, 2014**

### 5. Comparison of Measured Sound Levels to Noise Ordinance

The sound levels measured at property line locations A, D, and E can be compared to the noise ordinance limits of 65 dB during the daytime and 55 dB at night. On June 29, the noise ordinance limit was 65 dB since it was still daytime. On October 25, the noise ordinance limit was 55 dB since it was nighttime.

At location A on June 29, the measured sound level (see Figure 3) attributable to the event was mostly caused by cheering, but this is not enforced under the noise ordinance. The sound level of the music was well less than 50 dB, so this clearly did not reach the 65 dB noise ordinance limit, nor would it have reached the nighttime limit of 55 dB. Nevertheless, the recent change to have wedding dancing indoors and not under the tent will reduce noise emissions from crowd cheering.

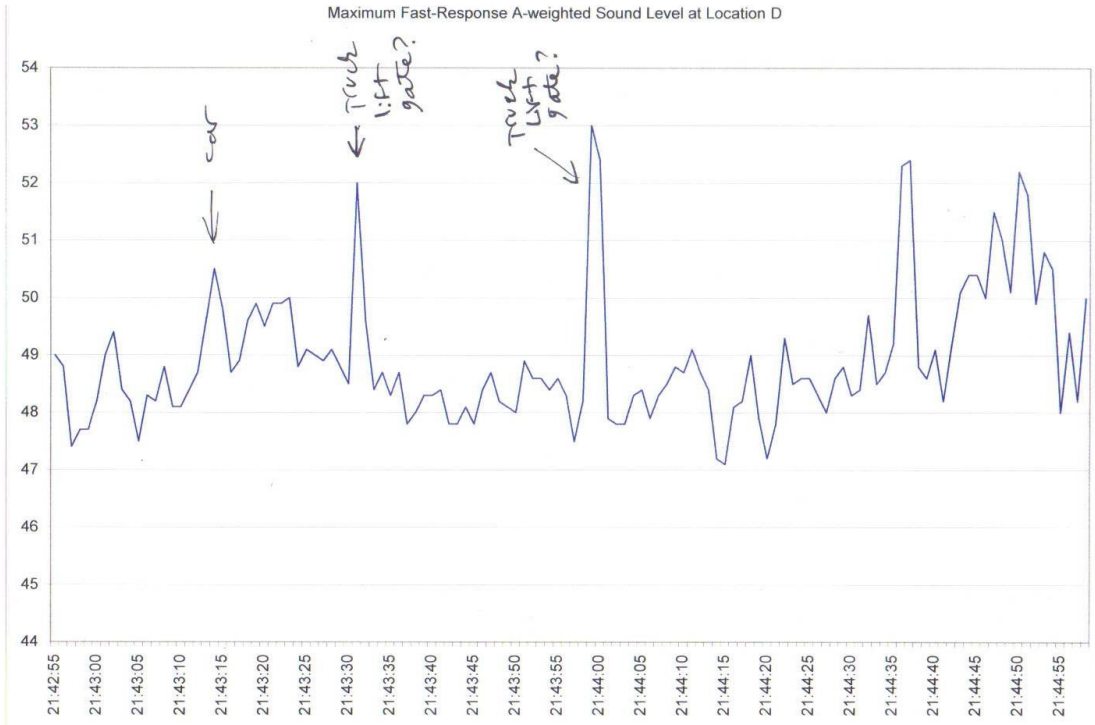


Figure 7. Maximum Sound Levels with “Fast” Response at Location D on October 25, 2014

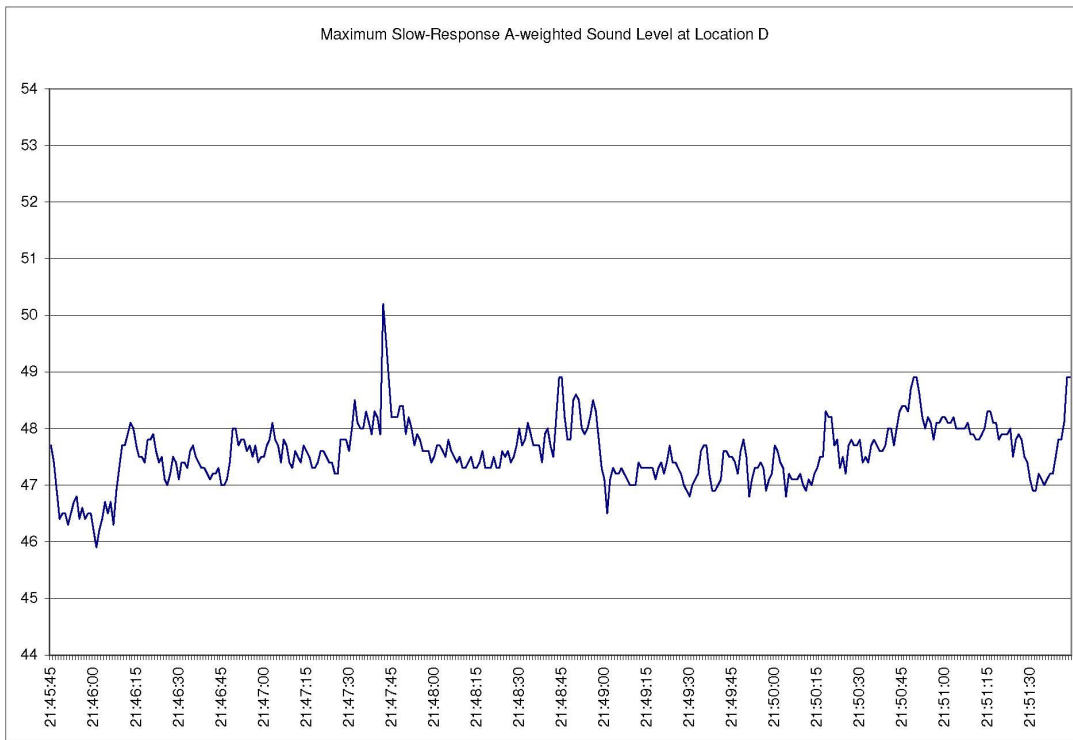


Figure 8. Maximum Sound Levels with “Slow” Response at Location D on October 25, 2014

At location A on October 25, 2014, the noise ordinance limit was 55 dB since it was already nighttime. Per Figures 4 and 5, again the sound level of music was well less than 50 dB so there was no noise ordinance violation for the music. Incidental noises associated with the facility were shuttle bus and truck engines, backup beepers, brakes, and lift gates, and occasional individuals talking. A car honk (or similar sound of some sort) reached 52.1 dB, an individual talking reached 51.5 dB, a lift gate reached 50.5 and 56.0 dB, a shuttle bus starting reached 52.7 dB, a backup beeper reached 55.5 dB, and a bus brake hiss reached 63.6 dB. It should be noted that these sound levels are the combination of background sound and dominant sounds; when the background sound is subtracted out the sound level attributable to the identified sound alone would be lower. It is unclear if the noise ordinance would be applied to sounds such as these, since they are associated with the operation of motor vehicles (and in one case an unamplified voice). But since the activity is occurring on private property, it is possible that they would be applicable for the noise ordinance (other than the voice). Of these sounds, the only ones higher than the noise ordinance threshold of 55 dB were the lift gate, backup beeper, and brake hiss. However, shuttle bus idling and driving could be causing some annoyance due to the greater duration of occurrence.

At location D on June 29, there were sound level spikes (see Figure 6) up to 56.8 dB (DJ talking with a microphone), 57.2-60.1 dB (unamplified cheering), and 54.0 dB (music). As noted above, cheering is not enforceable under the ordinance. Although none of these other events exceeded the noise ordinance limit of 65 dB, had it been nighttime the DJ talking with a microphone would have exceeded the 55 dB limit slightly for one moment.

At location D on October 25, the loudest noise events were truck lift gates producing sound levels of 52.0 and 53.0 dB (see Figures 7 and 8). These sound levels do not exceed the noise ordinance limit of 55 dB.

At location E on October 25, there was constant truck idling sound below the noise ordinance limit and a dropping lift gate produced a sound level of 54.8 dB. These sound levels did not exceed the noise ordinance limit, especially considering that sound from insects was contributing to these sound levels and the sound from the lift gate by itself would have been lower than 54.8 dB.

## 6. Noise Mitigation Measures

To date, Montgomery County Parks staff has already taken some major steps toward mitigating noise emissions including:

1. Limiting the hours of events. We understand that the requirements for events through July 1, 2014, were to stop playing music at 12 am and to end the event by 1 am. After July 1, 2014, the requirement was to end events by 11 pm.
2. Moving dancing and amplified music indoors. For the June 29 visit, the DJ was allowed to face speakers out an open door, but by the October 25 visit the requirement was that amplified music must be entirely indoors with the two pairs of double doors not propped open while amplified music is playing indoors. This also reduced noise from cheering since that is at the dance floor.
3. Scheduling dumpster pickups late. We understand dumpsters are picked up after 9 am.

One of the complaining neighbors mentioned that she heard generators and refrigeration trucks. This facility has enough electrical power and refrigeration capacity, so we do not believe that there are normally generators or refrigeration trucks present. We believe she was hearing other sounds such as idling trucks and was not actually hearing generators or refrigeration trucks. But to address that complaint, perhaps the rental agreement for the facility could include a prohibition on generators and refrigeration trucks.

It has been a relatively recent development that the music has been brought fully indoors. If the bass of the music all indoors still causes complaints in the future, one further measure that would help is building a vestibule between Brooke Hall and the tent as well as between Great Falls and the tent, such that there is never a truly open door to let sound escape.

One noise mitigation measure that was considered briefly was constructing a noise barrier. This would not be effective for several reasons. Noise barriers are only effective when they break the line of sight from the noise source to the listener. In this case, the music is indoors and is emanating through open doors and possibly through the roof as well. In the case of the roof, it clearly is not feasible to construct a noise barrier tall enough to shield the roof from the community. And for open doors, these face to the north and the existing topography is already acting as a noise barrier in that direction; a constructed noise barrier would have to be taller than the natural berm and would have to be extraordinarily tall to be of any use. Such a barrier would not be feasible.

One option we evaluated at the start of this project was having Montgomery County Parks provide a sound system which has a built-in controller that prevents it from being turned up above a certain volume. After seeing how the facility is used, we believe this solution likely is unpractical given the wide range of musical uses (requiring a relatively large and complex sound system), and the complexity of maintaining such a system.

Noise from shuttle buses was often audible, even if it was not that loud. Likewise, noise from kitchen trucks was audible and often loud. This includes the idling engine, driving, backup beeper, brake hiss, and lift gate hitting pavement. The dumpster was also audible at times, although this was not nearly as loud as the lift gate noise. We believe that the clank of lift gates hitting the pavement is the sound that a complainant thought was dumpster noise. With regard to these types of sound, a noise wall or berm could be effective if it fully breaks the line of sight from the noise source to the community to the south and southeast. During the master planning of the facility we recommend considering the use of some sort of wall such as a carpet with a screen wall to the south. Another strategy that could be used is reconfiguring the driveway for the kitchen to make it so that it is never necessary to backup. Finally, for the lift gate issue, one strategy is to provide an elevated loading area to obviate the need to lower a lift gate to the pavement.

We believe the above measures will sufficiently mitigate noise emissions from the facility. If complaints are still received in the future, one further measure that could be taken is to establish a maximum allowable sound level at the back of Brooke Hall for use in rental agreements.

If you have any questions, please contact me at 703/534.2790 or [Gary@HushAcoustics.com](mailto:Gary@HushAcoustics.com).

Sincerely,



Gary Ehrlich, P.E.  
Principal