The YouTube channel "City of Franklin WI" will be live streaming the Common Council meeting so that the public will be able to view and listen to the meeting.
https://www.youtube.com/c/CityofFranklinWIGov

CITY OF FRANKLIN
COMMITTEE OF THE WHOLE MEETING
FRANKLIN CITY HALL – COMMON COUNCIL CHAMBERS
9229 WEST LOOMIS ROAD, FRANKLIN, WISCONSIN
AGENDA*

TUESDAY, APRIL 9, 2024 AT 6:30 P.M.

A. Call to Order and Roll Call.

B. ROC Ballpark Commons Noise-Related Updates; the Rock Sports Complex Sound Study report prepared for Milwaukee County.

C. Adjournment.

*Supporting documentation and details of these agenda items are available at City Hall during normal business hours

[Note Upon reasonable notice, efforts will be made to accommodate the needs of disabled individuals through appropriate aids and services For additional information, contact the City Clerk's office at (414) 425-7500]

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APPROVAL	COMMITTEE OF THE WHOLE	MEETING DATE 4/9/2024
REPORTS & RECOMMENDATIONS	**ROC Ballpark Commons Noise-Related Updates; the Rock Sports Complex Sound Study report prepared for Milwaukee County**	ITEM NUMBER B.

BACKGROUND

This has been a recurring agenda item in our Common Council meetings since 2023 to keep the Council informed regarding the ROC Sports Complex and related sound concerns. Council members received the electronic link for the "Rock Sports Complex Sound Study," commissioned by Milwaukee County, using an independent consultant, RSG, to perform the study. The report consists of 240 pages, including Section J, the summary of the relevant monitoring results, prepared by Attorney Dennis Grzezinski.

For ease of accessibility and print cost savings, staff has added a link for the County information to the existing ROC material on the City's website at City Of Franklin (franklinwi.gov). It is typical for the Council to acknowledge receipt of such information by motion to "receive and place on file." As a result of the March 5, 2024, Council meeting, this Committee of the Whole meeting has been designated to discuss this sound study.

As of the March 5, 2024, Common Council meeting, the Council adopted resolution 2024-8109, A resolution to confirm internal procedures on entertainment events and the required permitting and processes municipal officials and staff shall apply to obtain uniform application for the protection of the health, safety, and well-being of the community" to address the ongoing noise concerns.

Additionally, staff have included the following related memo from the Department of City Development:

City of Franklin
Department of City Development

Date: March 29, 2024
To: Kelly Hersh, Director of Administration
From: Régulo Martínez-Montilva, Principal Planner
RE: Rock Sports Complex Sound Study (dated May 22, 2023)

The Rock Sports Complex Sound Study recommends improved regulations in Chapter 11.2, including maximum permissible sound levels. It's worth noting that tables 10 and 11 for recommended permissible sound levels are more specific than the current table of the Unified Development Ordinance (UDO) Section 15-3.1107. The sound study tables have different sound levels for three types of sound (perpetual, intermittent, and impulsive*) and indicate the variable to use for each of them (5-minute Leq for perpetual, 1-minute Leq for intermittent, and Lsmax for impulsive**), while the current UDO noise regulations are not clear into what specific variable to use for enforcing noise regulations:

"The Code does not indicate the type of sound level or metric (i.e., maximum sound level, average sound level) or averaging time associated with the sound limits." Rock Sports Complex Sound Study, page 9.

City Development staff is considering the recommendations of this sound study for the Unified Development Ordinance rewrite project. Updating noise regulations was added to the project schedule as extra work per the Common Council's direction. The agreement amendment was approved on January 16, 2024, and the budget amendment was approved on February 21 by the Common Council.

COMMITTEE OF THE WHOLE ACTION

Directions as the Committee deems appropriate.

MAYOR – JRN

STATE OF WISCONSIN: CITY OF FRANKLIN: MILWAUKEE COUNTY

RESOLUTION NO. 2024-8109

A RESOLUTION TO CONFIRM INTERNAL PROCEDURES ON ENTERTAINMENT EVENTS AND THE REQUIRED PERMITTING AND PROCESSES MUNICIPAL OFFICIALS AND STAFF SHALL APPLY TO OBTAIN UNIFORM APPLICATION FOR THE PROTECTION OF THE HEALTH, SAFETY, AND WELL-BEING OF THE COMMUNITY

WHEREAS, the City of Franklin Mayor, John R. Nelson, is determined to ensure City ordinances and procedures are followed and enforced; and

WHEREAS, zoning regulations are set forth to protect the right to quiet enjoyment and property use without interference from nuisance, trespass, encroachment, and harm and to preserve quality of life assurances as a common law right to all individuals; and

WHEREAS, the Council desires and has expressed that solutions are needed to equally apply Event and Use laws within the permitting process, each intended to avoid conflicting land uses, and such data exists that identifies certain noises are more intrusive, annoying, and harmful to the peace and welfare of residents in the community; and

WHEREAS, Municipal Code §183-40 Noise disturbances prohibited, is very clear on prohibiting noise crossing property boundaries and noise disturbance of loudspeakers; and

WHEREAS, Municipal Code §121-9 Extraordinary entertainment and amusement (special) events, E. Regulations, (7) Noise, states: "[n]o licensee shall permit any sound created by the special event activity to carry unreasonably beyond the boundaries of the special event premises"; and

WHEREAS, Municipal Code §183-41 Noise regulated, A. Permit required, (1), prohibits the operation or use of anything that makes or causes a sound between 70 dBA and 79 dBA without a permit; and.

NOW, THEREFORE, BE IT RESOLVED, that the Mayor and Common Council of the City of Franklin, Wisconsin, recognize the need to equally protect the public's health, comfort, safety, and well-being from adverse impact and to further preserve public peace and order by applying the related Municipal Code and Unified Development Ordinance (UDO) event and use provisions, and for City departments and Officials to have clear directives when carrying out the permitting process and review process for community harmony.

BE IT FURTHER RESOLVED, that the below procedures and directives are to be applied for each operation, activity, use, and event located at any venue with a potential to produce outdoor noise that may carry beyond the structure, building, or premises in which the activities occur, excepting events held by the Municipality itself, school events held on school property, and

religious or strictly charitable events, and that such directives and procedures are hereby established upon the adoption of this Resolution by the Mayor and Common Council:

Application Type:

1. The provisions of Municipal Code Chapters 1, 83, 121, 169, 178, and 183, with fees as amended from time to time, shall be the guiding (but not complete) resource to establish the details and compliance required for an Extraordinary Entertainment & Special Event Application Permit.

2. Using the above application form: Municipal Code §121-4 Definitions, "Entertainment and Amusement [i]ncludes, among others, the following: circuses, motion-picture shows, shows of all kinds, dance halls, all sporting contests and athletic events, including exhibitions, concerts, lectures, vaudeville, bowling, dancing, golf, swimming and bathing, side shows, amusement parks and all forms of recreation therein, operatic performances, theatrical performances and any other form of diversion, sport, pastime or recreation." Municipal Code Chapter 83, Assemblies, and Mass Public shall also use this application.

   "Permitted Use and Special Use" are zoning classifications and zoning use categories and are not to be used in determining permits that are not required.

3. As stated on the current Extraordinary Entertainment & Special Event Application, the application must be received at least 30 working days before the event. Notice will be provided on the application or to the applicant that any advertising of an event before approval does not guarantee approval and will be done so at the applicant's risk.

4. The existing and most current Vendor Information/Fee Schedule for Mobile & Temporary Events document shall be revisited by the Health Department for consistency with the Fees established in Municipal Code Chapter 169 with suggestions to the Common Council for possible fee amendments. Other fee amendments shall be reviewed for update as soon as practicable.

5. Extraordinary Entertainment & Special Event Application requirement of Municipal Code §121-9F (3)(s): Providing plans for sound control and amplification, including numbers, locations, and power of amplifiers & speakers. Permit events in which noise is expected to create decibel levels that may be disruptive to adjoining properties or types of noises that may be more annoying to the surrounding district, i.e., horns, sirens, chainsaws, shall be conditioned within the permit upon the applicant taking technologically reasonable steps to minimize the noise and considering the type of noise per Municipal Code §183-41A.(2), with the burden of proof of compliance upon the licensee, user, or operator. The sound control plans shall be included in the application, including the proposed event or use maximum decibel level at the property line, which, per hazard abatement performance

standards UDO §15-3.1107, is determined by the receiving district. Plans shall include methods to substantially control and contain the noise within the premises to create harmony and protect the health, safety, and well-being of the attending public and the community.

6. Fireworks Permit Application: The application and permitting process shall conform to Wisconsin State Statute §167.10, Regulation of fireworks, (3)(a) Use. No person may possess or use fireworks without a user's permit from the mayor of the city, president of the village or chairperson of the town in which the possession or use is to occur or from a person designated by the mayor, president or chairperson to issue a user's permit. (f) A permit under this subsection shall specify all of the following: 1. The name and address of the permit holder. 2. The date on and after which fireworks may be purchased. 3. The general kind and approximate quantity of fireworks which may be purchased. 4. The date or dates and location of permitted use. 5. Other special conditions prescribed by ordinance. Fireworks require a separate application for each event. Specific loud events that include fireworks, chainsaws (not for the purpose intended), or helicopters may need additional conditions added to the permit as they pertain to the number of events and hours of operation.

7. The Temporary Entertainment & Amusement License Application shall not be used for any purposes listed under Municipal Code §121-4 Entertainment and Amusement Definitions, except as it relates especially to amusement machines, slot machines, and gaming devices.

License Fees:

1. Municipal Code Chapters 83 and 169, and §121-9I. shall be applied to determine a license fee(s), including provisions when any Police, Fire, or Public Health Officer incurs review and service costs.

Process of Review:

1. Municipal Code §121-9J. will define the application review approval or denial process. After receipt of the completed application, the City Clerk shall submit the application to the Council, which shall review, approve, conditionally approve, or deny the license within 20 working days. The Council may choose to receive the License Committee or other reviewing bodies' input before acting. The Council shall modify the time and place or other specified event activities to offset concerns or facilitate crowd control to relieve congestion and promote public safety.

2. The Clerk is not to accept the application until the Clerk determines it is complete and sufficient under Municipal Code §121-9F., including the specific plans of sound control. Once complete, the Clerk will distribute the application to the Police, Fire, Health, Planning, Building Inspection, and Engineering Departments for comment. The application fee, plus any estimated police or fire costs, is to be paid within ten days pre-event, usable on default. The Common Council shall require a bond, letter of credit, or cash deposit approved by the City Attorney, ensuring payment for anticipated police and fire services at special events. The Health Officer shall specifically receive the application when food licensing review and fees are involved. The application review process should consider any existing complaints, non-compliance issues, and unpaid fees relating to the applicant and/or the subject event use and/or the subject property.

3. The event noise level at the property line shall be set as a required condition of review and approval. The maximum noise levels to be contained on the premises are found in Municipal Code Chapters 83, 121, 169, 178, and 183, and UDO §15-3.1107, in addition to other regulations to protect public health and peace.

4. For any events that have resulted in past complaints or are likely to produce high noise levels, the event application, plans, and comments from Staff shall be included as part of the public agenda packet to allow adequate decision-making by the reviewing body. Any event or series running continuously for weeks or months shall require a permit conditioned upon language for Council and Staff review of immediate mitigative or corrective action.

License and Permit Compliance:

1 Municipal Code §121-9J. and §169-2 contain important language for compliance, approval or denial of an application, suspension or revocation of a permit or license, etc., concerning the application. More specifically, Municipal Code §121-9J.(6) addresses the conduct of the special event as a consideration if contrary to law, including noise regulations. Other pertaining codes and regulations may also be used for this consideration for compliance.

2. License compliance shall also include noise regulation standards, and the event permit shall include and make clear the maximum decibel allowance allowed at the property line.

Penalties and Enforcement:

1. City Officials and Staff may consider Municipal Code §1-19 Penalty provisions, §121-9L. Enforcement, §169-2 Compliance; denial of application; suspension or revocation, §178-8 Abatement of public nuisances, the Comprehensive Master Plan, any element thereof and any other applicable law, regulation, ordinance, code, order, action, or requirement established by the Common Council to protect further the quality of life and wellbeing of the residents of the community.

Noise Monitoring Compliance and Complaints:

1. Complaints shall be considered during the review process for any event or use on the same property or premises. When necessary, a condition to solve additional concerns will be a condition of the permit.

2. To reduce staff time to review time and noise complaints, each monitor shall be calibrated to record at the appropriate decibel to ensure compliance with the maximum decibel level of the receiving district. The device will be programmed to establish an alarm or alert an independent consultant to investigate as soon as practical and remedy the issue. *Alternatively, the Noise Pollution Clearinghouse (NPC) has analyzed noise ordinances from the 500 largest communities in the United States with respect to how they regulate low-frequency noise Of the 500 ordinances, 304 included "plainly audible" standards "Plainly audible" was defined as any sound detected by someone using unaided hearing at 50' from the property line This "plainly audible" standard allows noise disturbances to be easily determined without a specific monitoring device*

3. Staff shall ensure that the independent noise monitoring consultant calibrates and maintains monitoring devices regularly as determined by the contract.

4. Whenever an independent consultant is required for monitoring, the cost of monitoring shall be the responsibility of the property owner for which the monitoring is required.

5. Under circumstances when repeated or a series of events continues over weeks or months, the permit shall provide for a periodic review as included in the permit. Periodic review is a condition of the permit. Review of compliance with permit compliance shall include noise complaints and any event complications or documented exceedances of decibel levels.

6 The burden of proof of compliance with the noise ordinances, permit conditions, and operations of activities and events shall be on the operator; complaints are not required to be filed to have a violation of noise regulations or permits.

Introduced at a regular meeting of the Common Council of the City of Franklin this 5th day of March 2024.

Passed and adopted at a regular meeting of the Common Council of the City of Franklin this 5th day of March 2024.

APPROVED:

John R. Nelson, Mayor

ATTEST

Shirley J. Roberts, City Clerk

AYES 6 NOES 0 ABSENT 0

23-616

RSG
the science of insight

ROCK SPORTS COMPLEX SOUND STUDY

May 22, 2023

Prepared for Milwaukee County

RSG
the science of insight

Report Title:

Rock Sports Complex Sound Study

Report Prepared by:

RSG

Report Prepared for:

Milwaukee County

For additional information regarding this report, or for questions about permissions or use of findings contained therein, please contact:

RSG (Headquarters)
55 Railroad Row
White River Junction, VT 05001
(802) 295-4999
www.rsginc.com

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EXECUTIVE SUMMARY

The Rock Sports Complex ("ROC") is located in Franklin, WI on what was formerly the Milwaukee County ("the County") owned Crystal Ridge landfill. The ROC is a privately owned recreational facility, that includes noise-generating events such as:

- Milwaukee Milkmen baseball games and other events held at Franklin Field Baseball Stadium,
- Live amplified music at the Umbrella Bar,
- Fireworks,
- The Hills Have Eyes Halloween event, and
- Snowmaking at the Rock Snowpark.

A Luxe Golf facility opened in August 2022. Based on the data analysis, ROC activities such as drive-in movies at the Milky Way Drive-In Theater, indoor corporate events held at the Lodge, and recreational baseball at the ball fields, do not substantially contribute to the sound environment in the residential areas. A map of the ROC is given in Figure ES-1.

In response to community complaints about sound levels generated by ROC events, Milwaukee County retained the services of RSG to perform a comprehensive sound study for the ROC. This report:

1) Documents the sound levels generated by ROC activities during the sound monitoring survey,
2) Compares the ROC event sound levels with background sound levels (i.e., sound levels occurring without ROC events) and to existing applicable regulatory noise thresholds,
3) Makes recommendations to reduce the noise exposure of facility activities in the surrounding residential areas,
4) Proposes clarifications to the noise thresholds for use in updated municipal code documents.

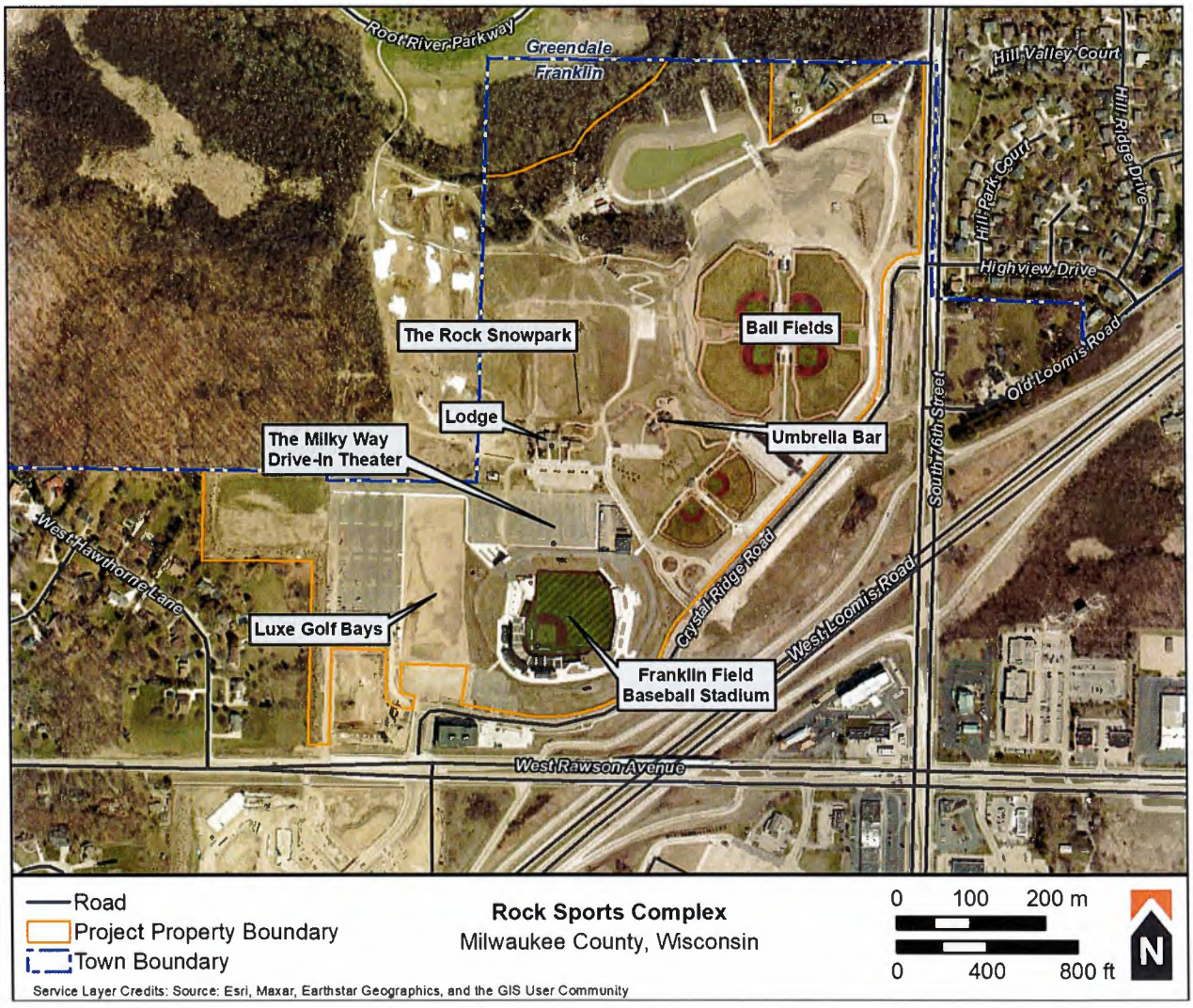

FIGURE ES-1: ROCK SPORTS COMPLEX AREA MAP

Sound levels were documented through a combination of short-term attended and long-term continuous sound monitoring. Short-term attended sound monitoring was conducted for six events to quantify sound levels generated by individual activities. Field staff attended each site for a period of approximately 30 minutes and then moved to the next site, for a total of three to seven sites per monitoring visit. Long-term continuous monitoring was used to assess the overall sound levels occurring during event and non-event times over a six-month period from July 2022 to January 2023. Three long-term monitors were installed; one of the three monitors was a reference location on the ski hill (North Monitor), and the other two monitor locations (East and West Monitors) were representative of the two closest residential neighborhoods. These RSG installed monitors are separate from the three on site ROC monitors (referred to in

this document as ROC North, East, and West Monitors), which are located on-site and maintained by the ROC.

Figure ES-2 shows the long-term hourly average sound level results during Milwaukee Milkmen Baseball games occurring over the six-month monitoring period, compared to levels occurring over periods without any ROC events. Notable increases in Event sound levels occurred around 21:00 (9 PM) at all meters on weekends, coinciding with increases in sound levels from live music at the Umbrella Bar. Event Only sound levels for Milkmen Baseball Games ranged from 45 to 53 dBA L_{eq} at the three monitor locations (see Figure ES-3). Sound levels during baseball games were, on average, similar to or below background levels, resulting in increases in the overall sound level of 2 to 4 dB above background at the monitor locations. Although event sound levels did not substantially raise the overall sound level, the sounds were distinctly noticeable in the Hawthorn Neighborhood to the west, either because they rose and fell (for example, cheering at baseball games) or they had a distinct sound (like music or speech from the public announcement system).

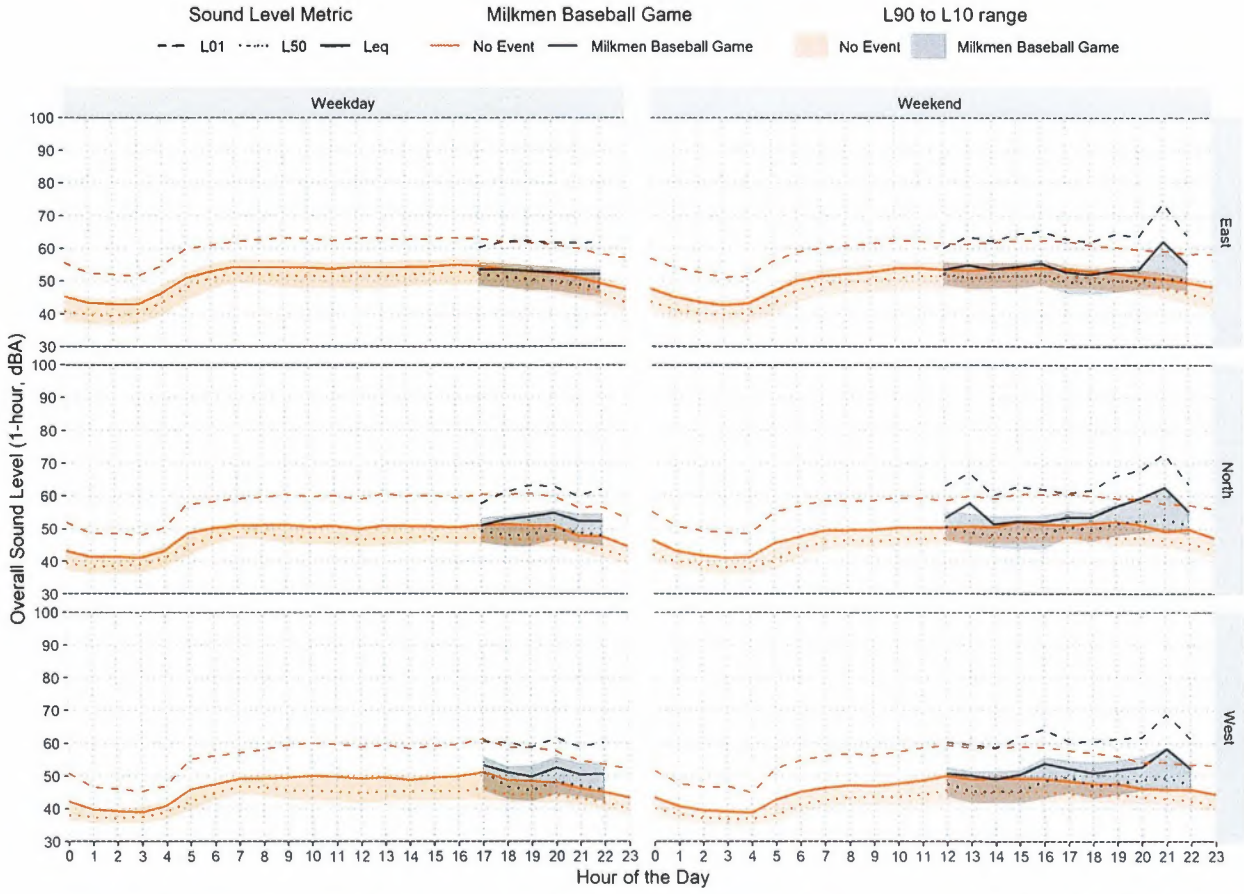

FIGURE ES-2: LONG-TERM SOUND LEVELS FOR MILWAUKEE MILKMEN BASEBALL (ONE-HOUR)

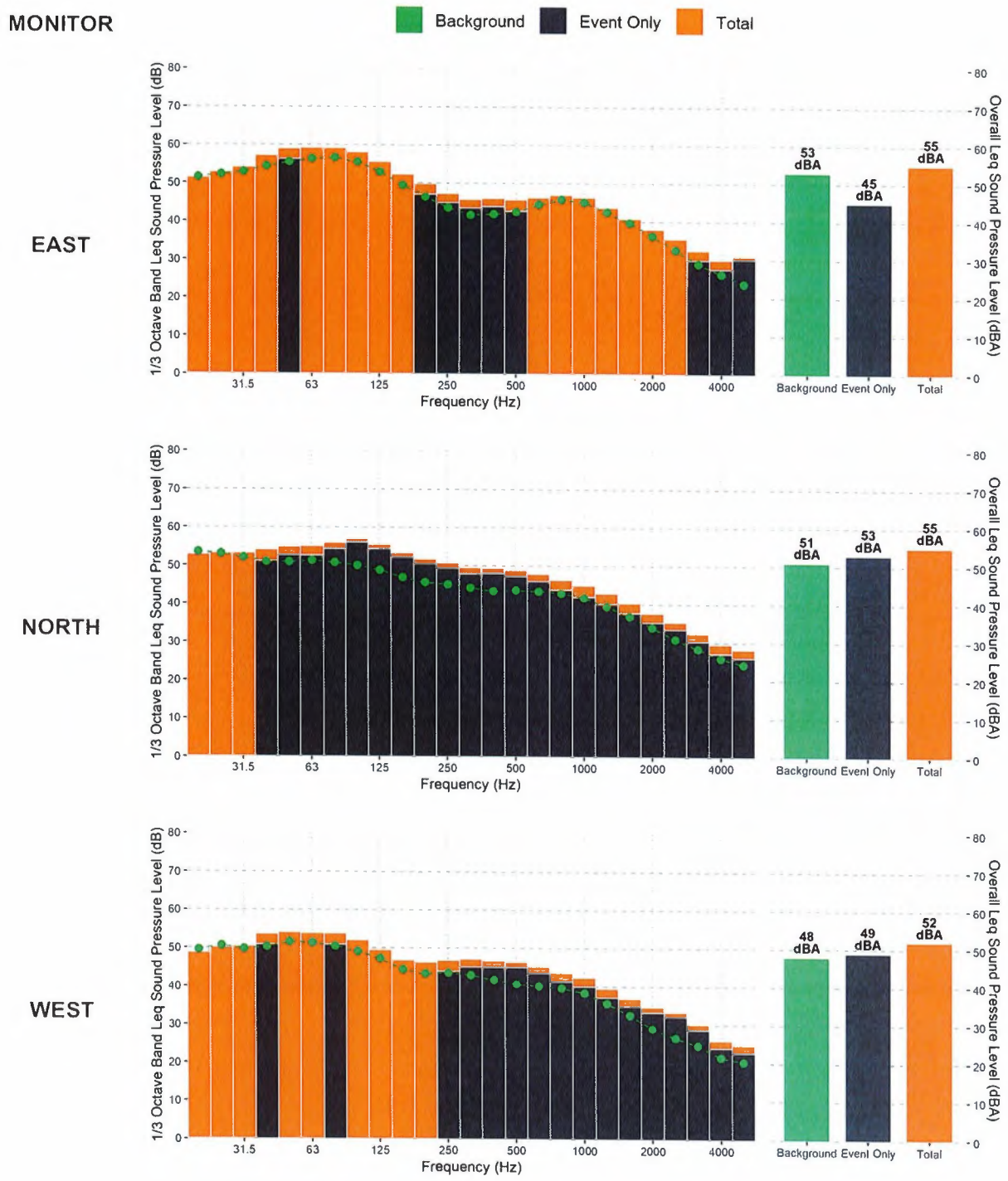

FIGURE ES-3: SPECTRAL RESULTS FOR MILWAUKEE MILKMEN BASEBALL

Low frequency sounds are the primary sound source in the surrounding communities during live music at the Umbrella Bar. During periods when background sound levels were low, music and speech were also audible in some locations. As shown in Figure ES-4 for the Hawthorn Neighborhood, low frequency sounds are clearly identifiable in the spectrogram during the period when the band was playing and drop off when the band goes on break (the spectrogram shown also includes a baseball game).

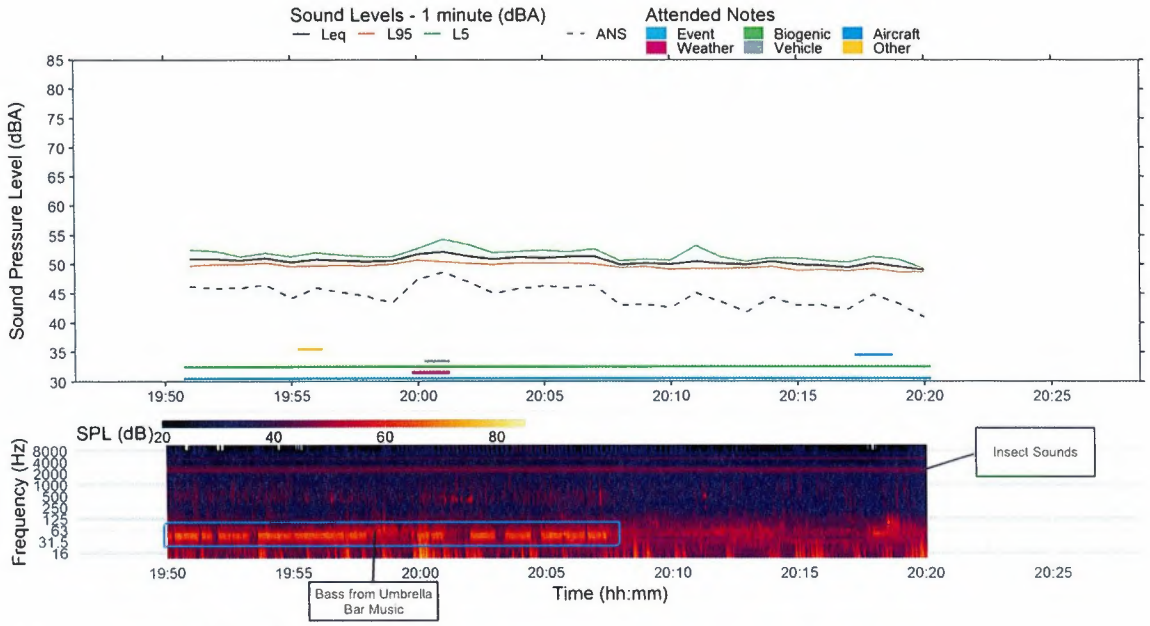

FIGURE ES-4: SPECTROGRAM DURING AND AFTER AN OUTDOOR PERFORMANCE AT UMBRELLA BAR IN HAWTHORN NEIGHBORHOOD

Fireworks generated sound levels of 77 to 84 dBA L_{10m}, which dominated the sound environment at all monitor locations and were 30 to 35 dB above comparable No Event periods. An example spectrogram from the Hawthorn Neighborhood which includes an outdoor performance at the Umbrella Bar and a period with fireworks is given in Figure ES-5. From this example, the elevated sound levels during fireworks are clearly observed.

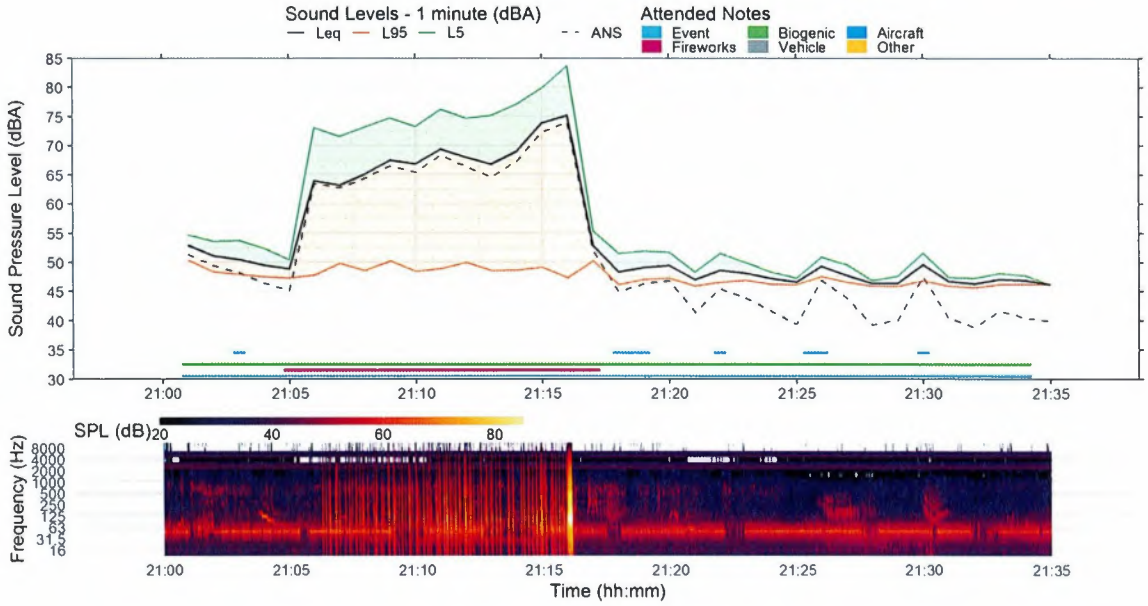

FIGURE ES-5: SPECTROGRAM OF FIREWORKS OCCURRING DURING OUTDOOR PERFORMANCE AT UMBRELLA BAR IN NEIGHBORHOOD E

Sound levels generated by the Hills Have Eyes event were not distinguishable in the sound level data, but the events were audible at locations to the east and more than a mile to the north due to the characteristics of the sounds generated by the event, which included low frequency content and sounds such as speech, music, and a chain saw.

Snowmaking did not have an appreciable effect on sound levels at the East and West Monitors during the daytime but resulted in an increase on the overall sound levels of 2 to 4 dB at the East and West Monitors at night. High sound levels associated with snowmaking occurred at the North Monitor due to the monitor's close proximity to the snow making equipment.

Sound propagation models were developed and then used to adjust the long-term monitoring measured data for use in identifying exceedances of noise limits. Sound exceedances above applicable regulatory thresholds were assessed at the worst-case exposed residence and property boundaries in each of the five nearest neighborhoods. Both ground and second floor receptors were assessed against the City of Franklin and Village of Greendale noise limits, as well as against the ANSI S12.9 Part 4 threshold for low frequency sound. Firework sounds exceeded all three limits (Franklin, Greendale, and ANSI).

Live music at the Umbrella Bar exceeded the City of Franklin limits at the H Section Neighborhood and the Village of Greendale's limits in the H Section and Hawthorn Neighborhoods. No other events exceeded the Franklin or Greendale limits. The low frequency ANSI limits exceeded during fireworks in all surrounding neighborhoods and during live music at the Umbrella Bar in the Hawthorn Neighborhood. However, the World Health ANSI

acknowledges that "low-frequency sound sources characterized by rapidly fluctuating amplitude, such as rhythm instruments for popular music, may cause annoyance when these octave-band sound pressure levels are lower" than the given limits.

Note that although average events did not exceed the thresholds in many cases, there is still potential for louder than average events to exceed thresholds. In addition, this report does not include an evaluation of the characteristics of the sound (i.e., use of a penalty to account for speech and / or music sounds) or the impact associated with event generated sound level increases over background sounds.

To help the City of Franklin in applying the noise limits to be used to identify violations, clarifications of the existing City Code are provided, along with recommendations for improved regulation of ROC event sounds.

This study includes recommendations to reduce community sound exposure while allowing for recreational use of the ROC facility. These recommendations include:

- Facility design improvements for Franklin Field,
- A sound system calibration methodology for the Umbrella Bar,
- Notification and limiting of events for fireworks and helicopter usage,
- Sound mitigation strategies for the Hills Have Eyes,
- Changes to the compliance monitoring locations and available sound data that will help ROC and surrounding towns improved ability to respond to exceedances, and
- Recommendations on what information should be requested in the case of proposals for future uses to be constructed at the site.

These recommendations are detailed in Section 11.0 of this report.

1.0 BACKGROUND

The Rock Sports Complex ("ROC") is located in Franklin, WI on what was formerly the Milwaukee County ("the County") owned Crystal Ridge landfill. Crystal Ridge landfill opened in 1955 and was formally closed in the 1990s. In 1983, the County entered into an agreement with a ski hill operator for the portion of the site that is now being operated as a ski hill. In 2012, the County leased additional land to be developed as an outdoor sports recreational facility, the ROC. In 2017, the County approved the sale of the recreational facility portion of the Crystal Ridge landfill to the operator of the facility, BPC County Land, LLC (the "Developer"), in conjunction with a new lease agreement for the ski hill, a development agreement, and a contribution and participation agreement with the Developer. These agreements enabled the Developer to construct the Ballpark Commons, which includes a minor-league baseball stadium, an umbrella bar, a drive-in movie theater, recreational baseball fields, and other amenities. During the course of the sound study, a golf driving range was also constructed on the site. The Rock Snowpark is located in Greendale and continues to be owned by the County. The ROC leases the Rock Snowpark property from the County and then the ROC subleases it to the Rock Snow Park, LLC.

The 2017 agreements are structured so that the Developer was granted an option to purchase certain portions of the ROC contingent upon certain requirements, including noise requirements. As part of the 2017 contracts, three sound monitors ("ROC monitors") were installed on ROC property. The ROC monitors are meant to assess whether the facility conforms with the noise requirements.

Despite the noise requirements, County and City elected officials have received numerous complaints regarding noise emanating from the ROC. In response to community complaints, Milwaukee County has retained the services of RSG to perform a comprehensive sound study for the ROC in order to quantify the noise from certain activities, assess the impact of these activities, and make recommendations to reduce those impacts. RSG performed the sounds study with assistance from Bowlby and Associates, Inc., Beth Foy Associates, and the Law Office of Dennis M Grzezinski.

A glossary of terms and the fundamentals of acoustics are provided in Appendix A. The approved workplan for the study is provided in Appendix B.

2.0 ROCK SPORTS COMPLEX DESCRIPTION

At the start of the sound study in June 2022, the ROC included a 4,000-seat professional minor league baseball stadium (Franklin Field Baseball Stadium), an outdoor performance venue (Umbrella Bar), a drive-in movie theater (Milky Way Drive-In Theater), recreational baseball fields (Ball Fields), and a ski hill (Rock Snowpark). During the study, a golf driving range (Luxe Golf Bays) was also constructed on the site. A map of the ROC is shown in Figure 1.

The facility is adjacent to suburban neighborhoods. A map showing the facility and the surrounding residential neighborhoods, identified by letters A through E, is given in Figure 2.

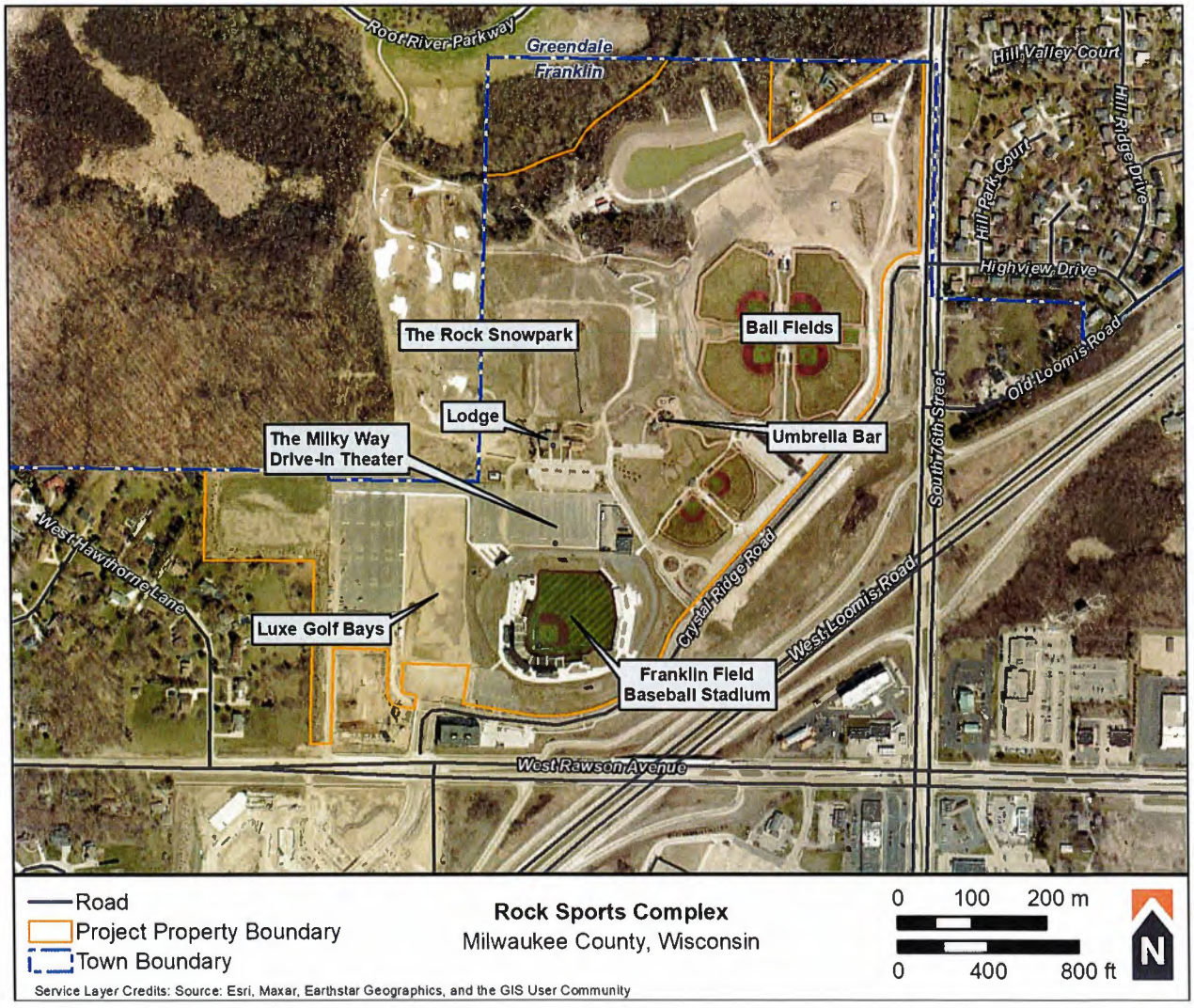

FIGURE 1: ROCK SPORTS COMPLEX AREA MAP

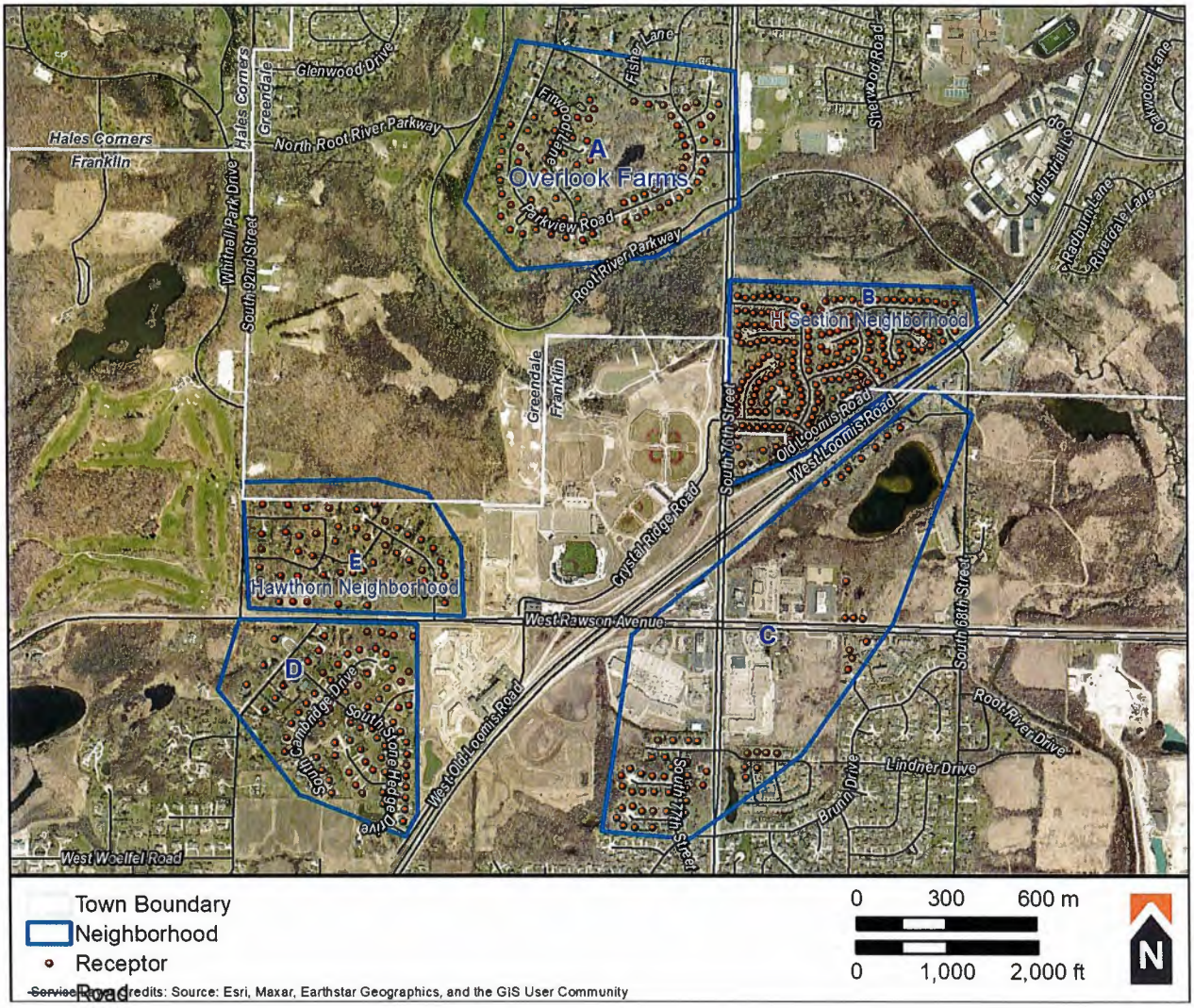

FIGURE 2: MAP OF SITE AND SURROUNDING RESIDENTIAL AREAS

2.1 SOUND GENERATING ACTIVITIES

Sound generating activities at the ROC that were monitored by RSG included 1) Milwaukee Milkmen baseball games and other events held at Franklin Field Baseball Stadium, 2) live amplified music at the Umbrella Bar, 3) fireworks, 4) The Hills Have Eyes Halloween event, and 5) snowmaking at the Rock Snowpark. During the study, a golf driving range (Luxe Golf Bays) was also constructed on the site. The sound data demonstrated that other ROC activities, such as drive-in movies at the Milky Way Drive-In Theater, indoor corporate events held at the Lodge, and recreational baseball at the ball fields, did not substantially contribute to the sound environment in the residential areas during the sound monitoring.

Below is a description of ROC activities and event facility schedules occurring over the 2022 season. Event schedules are provided in Appendix D.

Milwaukee Milkmen Baseball Game

The Milwaukee Milkmen baseball season lasted from May 13th to September 5th, 2022. Home games occurred regularly throughout the season, starting at 6:35 pm on Tuesdays through Thursdays, at 6:00 pm on Saturdays, and at 1:00 pm on Sundays. No games were scheduled for Mondays. Games lasted approximately 3 to 4 hours.

The RSG team did not receive permission to access ROC facilities. Based on aerial mapping, site observations, and available photographs of Franklin Field, the stadium includes approximately eight speaker clusters. Most of the speakers appear to point towards the field or the spectator stands. However, the speakers on the north side of the stadium appear to point north towards the parking lot and west towards residential Neighborhood E. Graphics showing the speaker locations and positioning are included in Appendix D.

Except for the May 14 and 28, 2022 games, which occurred prior to the start of RSG's sound monitoring, all Saturday night baseball games occurred concurrent to live bands playing at the Umbrella Bar.

Summer Concert Series

Outdoor amplified music performances occurred at the Umbrella Bar every Saturday night starting at 6:30 pm, June 4 through September 17, 2022. The concerts ended at approximately 10:00 pm.

It is our understanding that each band brings their own amplification system to use at the Umbrella Bar. A GoogleEarth image showing one example of a speaker setup at the Umbrella Bar is included in Appendix D.

Fireworks

Fireworks occurred on select Saturday nights throughout the baseball season, including June 4, July 9, July 23, August 6, August 20, and August 27, 2022. The firework launch area was

located to the north of the Lodge. Fireworks occurred at the completion of baseball games, typically around 10.00 pm, and lasted for about 10 minutes.

The Hills Have Eyes Event

The Hills Have Eyes is an annual Halloween haunted house type of event which was held on Friday, Saturday, and Sunday nights from 6:00 pm to 12:00 am between September 30 and October 30, 2022. The event was located on 45 acres in the northern portion of the site.

Snowmaking

Snowmaking equipment at the Rock Snowpark included ten Techno Alpin T40 snow guns. The snow guns are moved around the ski hill as needed. Over the course of the sound monitoring for the 2022 / 2023 season, snowmaking occurred on the days of November 12, 13, 14, 17, 18, 19, 20, 21, 22, and 30, December 1, 3, 4, 5, 16, 17, 18, 19, 20, 21, 30, and 31, and January 6 and 7.

Helicopter Candy Drop

Helicopter candy drops were scheduled for June 25 and August 28, 2022. The June 25, 2022 event occurred prior to the start of the sound monitoring and the August 28, 2022 event was cancelled due to weather.

Luxe Golf

The Luxe Golf facility opened for business towards the end of August. Based on review of the website, the facility is currently open year-round on weekdays from 11 AM to 'Close' and on weekends from 10 AM to "Close".

3.0 PURPOSE OF THE SOUND STUDY

The purpose of the sound study is to:

1) Document sound levels generated by ROC activities,
2) Compare the ROC event levels with background sound levels (i.e., sound levels occurring without ROC events) and to appropriate sound thresholds,
3) Make recommendations to reduce the exposure of sounds generated by facility activities on the surrounding residential areas, and
4) Develop sound thresholds for use in municipal code documents.

This report describes the methodology and findings from the comprehensive sound study of the ROC conducted by RSG for Milwaukee County. The comprehensive sound study included:

1) Six months of unattended sound monitoring,
2) Attended sound monitoring of events during six site visits,
3) Public outreach,
4) Sound propagation modeling,
5) An evaluation of the existing on-site ROC compliance monitors,
6) Review of the existing applicable noise policies, and
7) Drafting of proposed noise limits to balance community concerns with use of the facility.

A glossary of terms and the fundamentals of acoustics are provided in Appendix A. The approved workplan is provided in Appendix B.

4.0 PUBLIC OUTREACH

The RSG team conducted a virtual public meeting for the ROC sound study on Monday, August 29, 2022. The objective of the meeting was to share information on the purpose of the sound study and receive input from the public.

The meeting was a three-hour long event, with repeating presentations occurring on each hour (4:00, 5:00, and 6:00 pm). Presenters included Regina Flores (Milwaukee County), Beth Foy (Beth Foy Associates), and Dana Lodico (RSG). Following each presentation, the public was given the opportunity to provide comments. Presenters responded to comments, as time allowed.

Notice of the meeting was mailed in a post card format to owners and occupants of properties closest to ROC and to the primary operators of the ROC. The meeting was also posted on the Milwaukee County Events page. The City of Franklin and County Supervisors also shared meeting information.

Attendance at the meeting included four County Supervisors, the Mayor of Franklin, the Franklin Director of Administration, County staff from Procurement, Parks, and Economic Development, developer Mike Zimmerman and managers of sites at the ROC, and approximately 15 to 20 residents, with some representing more than one resident. In addition, two residents that were unable to attend the meeting asked that statements be read by others.

Input was received by residents adjacent to the ROC and those up to a mile and a half from the facility. All reported being disturbed by sound from the ROC, with some discussing the negative impact of these sounds on their quality of life. One resident requested that the ROC inform nearby residents when louder events, such as fireworks and helicopter activities, are to take place. Several residents negatively commented on the placement of the speakers along the outfield edge of the baseball stadium. Some of these speakers point from the stadium and in the direction of neighborhoods (see Appendix D). These residents asked that the speaker be turned toward the stadium and that the volume be turned down.

A summary of the feedback received from the meeting was provided to the County on September 7, 2022. This summary, along with the public outreach meeting materials and feedback are provided in Appendix C.

5.0 NOISE STANDARDS AND GUIDELINES

The sound study included a review of existing applicable standards and guidelines. A glossary of terms and the fundamentals of acoustics are provided in Appendix A.

Noise standards and guidelines that are relevant to the Project are described below, including the Ballpark Commons development agreement, and local standards for the City of Franklin and the Village of Greendale. The Village of Greendale ordinance is relevant, not because it directly regulates noise coming from the ROC, but because it bears on the issue of whether noise from ROC constitutes a nuisance to residents of nearby Greendale neighborhoods. Otherwise, there are no County, State, or Federal noise standards applicable to the ROC.

To supplement the local standards and guidelines, we provide community noise guidelines and a summary of quantitative limits from cities throughout the US to address low frequency sound, and community noise guidelines from the World Health Organization (WHO) and the American National Standards Institute (ANSI).

5.1 BALLPARK COMMONS DEVELOPMENT AGREEMENT

The Ballpark Commons Development Agreement, dated December 20, 2017, includes the following text in its Noise and Light Compliance Plan:

> "Continuous noise monitoring data shall be kept for twelve months. Upon reasonable request by the County, City of Franklin, or the Village of Greendale, noise monitoring data and reports, and a record of complaints, shall be provided to the County, City or Village, evidencing the status of compliance. A violation will be considered material if it represents a complaint filed with the operator or the City of Franklin and is evidenced in the monitoring data logs by an exceedance ("Trigger Event") that is not permitted and is not corrected and remediated within 30 minutes of the Trigger Event. The City shall have the right to enforce payment of the penalties specified in the Noise and Light Standards, which may include payment of a double permit fee for any material violation. If the operator has more than four unpermitted material violations in a calendar year, the operator shall be subject to stepped-up enforcement measures as specified in the Noise and Light Standards. If the City declines to take enforcement action, the County, under the terms of this agreement, shall have the right to impose penalties on the operator, in the County's reasonable judgment given the severity and duration of the violation and the number of violations, which shall not exceed $1,000 for an individual violation and $10,000 in aggregate for a calendar year."

Note that the agreement does not specifically set a noise limit, but rather specifies the amount of time in which a violation is required to be corrected and remediated (30 minutes).

The Noise and Light Addendum, Exhibit C to the Agreement, also states:

> As further mitigation, the operator will install a dedicated sound system to ensure that the sound at the Umbrella Bar is directionally controlled to minimize the spillover effect beyond the property boundary.

5.2 LOCAL STANDARDS

Both the City of Franklin and the Village of Greendale have quantitative noise ordinances. The ROC is located in the City of Franklin. The Village of Greendale directly abuts the ROC property to the east. Therefore, the Village of Greendale's noise ordinance is also relevant to the Project.

City of Franklin

Section 178-1 of the Franklin ordinances prohibits public nuisances, defined as acts or conditions that "substantially annoy, injure or endanger the comfort, health, repose or safety of the public."

Article XII of the City of Franklin Noise and Vibration Code applies to all sound and vibration originating within the City limits. Sections 183-41 states the following:

> "No person shall operate, permit the operation or allow his or her property to be used for such operation of anything which makes or causes a sound at a level between 70 dBA and 79 dBA as measured at the real property boundary of the noise source or beyond 50 feet from the noise source when operated in a public space without a permit."
>
> "The City Council may issue variances for single events which create noise from 80 dB to 89 dB measured at the real property boundary or 50 feet from the source if the noise originates on public space consisting of special public events."

The Code does not indicate the type of sound level or metric (i.e., maximum sound level, average sound level) or averaging time associated with the sound limits.

Village of Greendale

The purpose of Chapter 9 of the Village of Greendale's Code is to "regulate the creation of noise, which adversely affects adjoining properties in order to prevent the creation of nuisances and to promote the general welfare of the public." The Village sets maximum sound levels depending on the receiving land use and the type of sound generated. The ROC generates several types of sound, including the following (as defined in the Code):

- Perpetual Noise: Any noise whose level varies less than 3 dBA during a period of at least 30 minutes.
- Continuous Noise: Any noise whose level varies less than 3 dBA during a period of at least five minutes.

- Intermittent Noise: Any noise which goes on and off during a course of measurement of at least five minutes, but which exceeds 10 seconds in duration each time it is on.
- Impulsive Noise: Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.

Maximum permissible sound levels for each type of sound are provided in Table 1.

TABLE 1: VILLAGE OF GREENDALE PERMISSIBLE SOUND LEVELS

	PERMISSIBLE SOUND LEVEL BY RECEIVING LAND USE, DBA					
	Residential, agricultural, historic, and park districts		**Businesses and office districts**		**Manufacturing districts**	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
Perpetual (i.e., Snowblowers)	50	45	55	50	60	55
Continuous (i.e., Concerts)	50	45	55	50	60	55
Intermittent (i.e., Baseball)	60	55	65	60	75	70
Impulsive (i.e., Fireworks)	70	60	80	70	90	80

*Daytime is defined as the hours of 7am to 8 pm and nighttime is defined as 8pm to 7am.

An example of perpetual noise would be the snowblowers, live music at the Umbrella Bar would typically be considered continuous, baseball game activity sounds would typically be intermittent, and fireworks would be impulsive.

The Village exempts parades, concerts, festivals, fairs, or similar activities, subject to any sound limits established in the approval by the Village and approved by the appropriate Village departments.

5.3 COUNTY STANDARDS

Milwaukee County does not include regulations for noise that apply to the ROC.

5.4 STATE STANDARDS

The State of Wisconsin does not include regulations for noise that apply to the ROC.

5.5 WHO COMMUNITY NOISE GUIDELINES AND ANSI STANDARDS

To begin our assessment of what other jurisdictions and organizations view as reasonable noise levels in communities, we look at guidelines issued by the World Health Organization (WHO) and the voluntary standards of the American National Standards Institute (ANSI). As these are guidelines and voluntary standards, neither are enforceable but rather provide context in helping to set regulatory standards and design goals.

The WHO guidelines address noise annoyance and potential health impacts. The ANSI standards discuss land use compatibility as it relates to sound originating from different land uses.

World Health Organization

The WHO has studied and adopted noise guidelines to address health and aesthetic issues. In the WHO's Community Noise Guidelines[1], they write, "The scope of WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments."

The WHO long-term guideline to protect against hearing impairment is 70 dBA L_{24h} over a lifetime exposure, and higher for occupational or recreational exposure. For short-term protection against hearing impairment due to impulsive sound the guideline is 120 dB-peak for children and 140 dB-peak for adults.

The WHO guideline to protect against serious annoyance is 55 dBA averaged over a 16-hour daytime period from 7 AM to 11 PM outside of a residence, and to protect against moderate annoyance the WHO recommends a limit of 50 dBA averaged over a 16-hour daytime period. The WHO guideline for night (11 PM to 7 AM) is 45 dBA averaged over an 8-hour period and an L_{max} of 60 dBA, using fast response, to protect against sleep disturbance. These WHO guidelines are to be measured outdoors.

The WHO recognizes that noise measures based solely on A-weighted values may not adequately characterize some noise environments nor the impacts of certain types of sound sources. For example, if the noise includes a large proportion of low-frequency components, as quantified by the difference between the A-weighted and C-weighted levels being more than 10 dB, it is recommended that a frequency analysis of the noise be performed. The WHO does not offer quantitative guidelines for sources with strong low-frequency components, such as rock music.

American National Standard, ANSI S12.9 Parts 4 and 5

For additional context regarding land use compatibility, we can look to the American National Standard, ANSI S12.9 Part 5, "Quantities and Procedures for Description and Measurement of Environmental Sound – Part 5: Sound Level Descriptors for Determination of Compatible Land Use." ANSI S12.9 Part 5 provides ratings of compatibility for varying sound levels for different land uses in Annex A of the standard The standard uses an annual average of the day-night

[1] "Guidelines for Community Noise," Edited by Birgitta Berglund, Thomas Lindvall, Dietrich H Schwela, World Health Organization, Geneva, 2000

average sound level (DNL)[2]. For urban/suburban residential areas, the standard lists a DNL of up to 55 dBA as being compatible, and a DNL of up to 60 dBA as being marginally compatible. The standard lists a DNL of up to 60 dBA as being compatible with outdoor spectator sports. For music shells and outdoor spectator sports, DNLs of up to 65 and 70 dBA, respectively, are considered marginally compatible.

ANSI S12.9 Part 4, "Quantities and Procedures for Description and Measurement of Environmental Sound — Part 4: Noise Assessment and Prediction of Long-Term Community Response," specifies methods to assess environmental sounds and to predict the potential annoyance response of a community to outdoor long-term noise. Annex D of the standard states that

> "sounds with strong low-frequency content can engender greater annoyance than is predicted from the A-weighted sound level. The additional annoyance may result from a variety of factors including (1) higher indoor exposures that result from the fact that there is less building sound transmission loss at low frequencies than at high frequencies and (2) there is a more rapid growth in subjective loudness per decibel change in lower frequencies compared to higher frequencies. In addition, Z-weighted sound pressure levels in excess of 80 dB outdoors in the 16, 31.5, or 63-Hz octave bands may result in noticeable building rattle sounds. Perceptible rattle can cause a large increase in annoyance. ... Generally, annoyance is minimal when Z-weighted octave-band sound pressure levels are less than 65 dB at 16 and 31.5 Hz, and less than 70 dB at 63 Hz. However, low-frequency sound sources characterized by rapidly fluctuating amplitude, such as rhythm instruments for popular music, may cause annoyance when these octave-band sound pressure levels are lower."

5.6 LOW FREQUENCY NOISE REGULATIONS IN OTHER JURISDICTIONS

Some ROC activities include a large proportion of low-frequency components, as recognized in the WHO guidelines. ANSI S12.9 Part 4 suggests a noise limit at a residential receiver of 65 dB at 16 and 31.5 Hz, and 70 dB at 63 Hz to reduce annoyance. In addition, the Noise Pollution Clearinghouse (NPC) has analyzed noise ordinances from the 500 largest communities in the United States with respect to how they regulate low frequency noise. [3] Of the 500 ordinances, 304 include "plainly audible" standards, 23 include octave band limits, 15 use a dBC metric, and six use an "over background" metric, where background is defined as all of the sounds in the environment, excluding the event or equipment being proposed or studied.

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[2] A day-night level is the average frequency-weighted sound level with a 10-dB penalty applied to nighttime sound levels between 10 PM and 7 AM.

[3] Blomberg, Leslie D., The state of low frequency noise regulation in the United States, Draft to be submitted.

> "Plainly audible" was generally defined as any sound that can be detected by a person using his or her unaided hearing faculties. If the sound source under investigation is a portable or personal vehicular sound amplification or reproduction device, the enforcement officer need not determine the title of a song, specific words, or the artist performing the song. The detection of the rhythmic bass component of the music is sufficient to constitute a plainly audible sound."

Communities that use the plainly audible standard in a comprehensive manner typically specify larger distances than 50 and 100 feet from the source for observation.

Figure 3 and Figure 4 show the daytime and nighttime criteria levels for the 23 communities that include octave band limits. As shown in the figures, the average limit at 63 Hz is 72 dB during daytime and 67 dB at night. The metrics and averaging times for these criteria varied, but the most common is the L_{eq} metric with averaging times varying from 5 minutes to 1 hour.

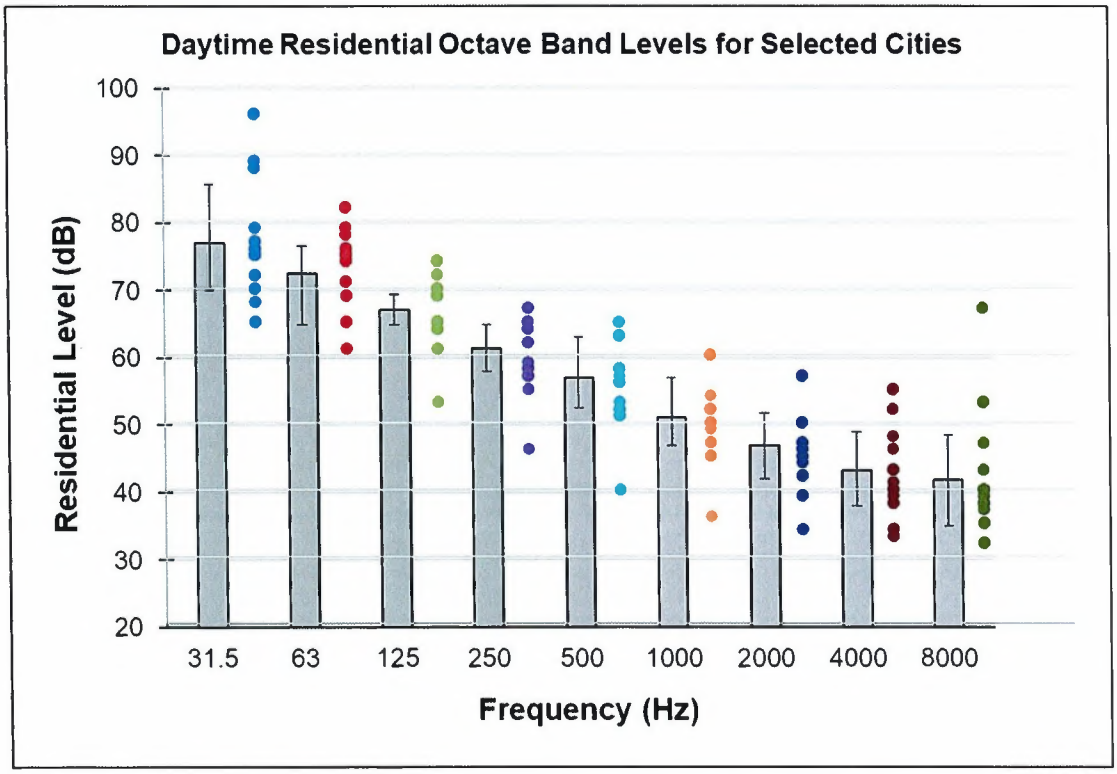


FIGURE 3 : DAYTIME RESIDENTIAL OCTAVE BAND LIMITS FOR US CITIES

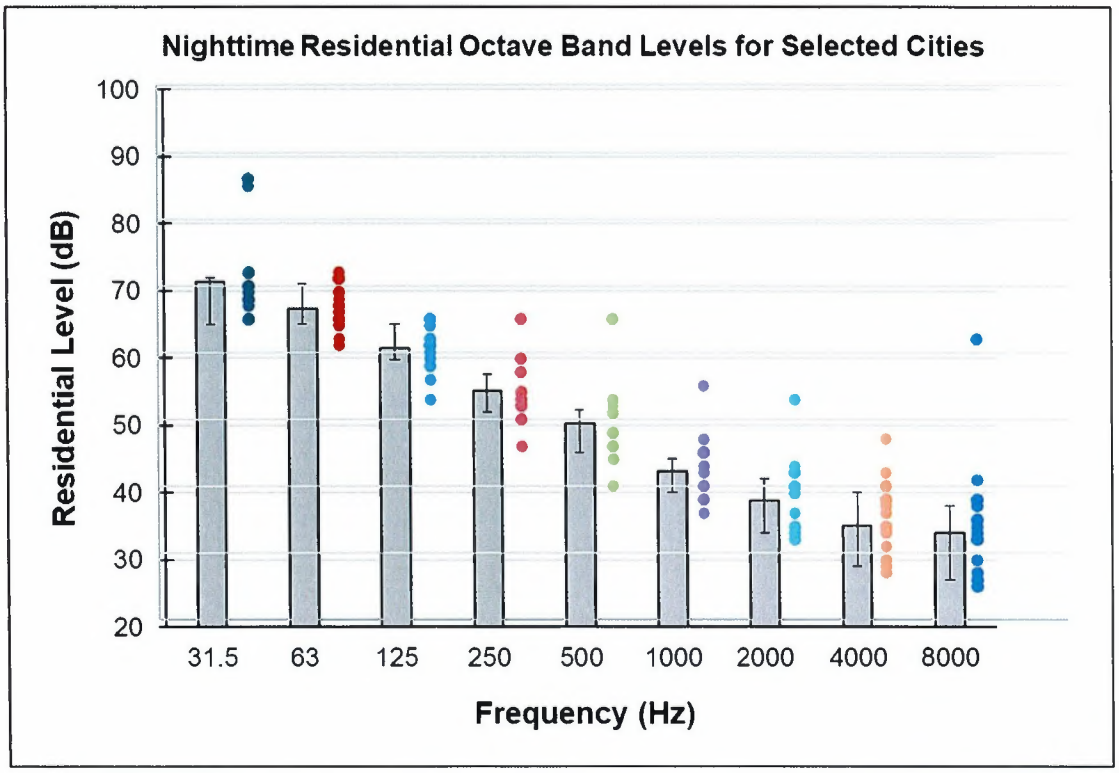


FIGURE 4 : NIGHTTIME RESIDENTIAL OCTAVE BAND LIMITS FOR US CITIES

C-Weighting (denoted by dBC) deemphasizes very high frequencies similarly to A-Weighting but does not deemphasize low frequencies. It is commonly used to describe low frequency sounds. The daytime dBC limits in the 15 ordinances range from 60 dBC to 75 dBC, with a mean of 68 dBC, and a mode of 65 dBC. The nighttime limit range is from 60 dBC to 75 dBC, with a mean of 64 and a mode of 60 dBC. "Above background" dBC criteria range from 5 to 10 dB during daytime and from 3 to 5 dB during nighttime.

Of the six ordinances that use an "over background" metric, four specify a 10 dB increase over the background sound pressure level in any octave band and two ordinances specify a 5 dB increase over background sound levels.

6.0 SOUND MONITORING

Sound monitoring for this study included unattended long-term continuous monitoring in conjunction with attended short-duration monitoring. The purpose of the long-term continuous monitoring was to assess the diurnal sound levels occurring during periods with and without ROC events. The purpose of the attended short-term monitoring was to quantify sound levels generated by individual activities during ROC events. Sound level data from the ROC compliance monitors was reviewed to assess their ability to identify non-compliance with applicable sound limits but was not analyzed to determine event or background sound levels.

RSG installed three long-term monitors on July 6, 2022 and picked up these monitors on January 10, 2023. Attended short-term monitoring was conducted for six events during the long-term measurements, as follows:

- Evening of Saturday, August 6, 2022: Baseball game, parade, fireworks, live band in Umbrella Bar (The Playlist)
- Evening of Saturday, August 20, 2022: Baseball game, live band in stadium, fireworks, live band in Umbrella Bar (The Toys)
- Evening of Saturday, August 27, 2022: Baseball game, parade, movie in stadium, live band in Umbrella Bar (Superfly)
- Afternoon of Sunday, August 28, 2022: Baseball game, planned movie in stadium and planned helicopter drop (cancelled due to weather)
- Evening of Saturday, September 10, 2022: Live band in Umbrella Bar (33 RPM)
- Evening of Saturday, October 29, 2022: Haunted Hills Event, drive-in movie at Milky Way Drive-In

The project team did not receive permission to monitor on ROC property. As a result, monitoring was conducted at the ski hill and in the surrounding communities.

6.1 MONITORING LOCATIONS

All short- and long-term monitoring locations are shown in Figure 5. Note that the North Monitor was relocated slightly in November 2022 to accommodate snow making equipment and recreational users of the facility. Photographs of the three long-term monitor locations are provided in Appendix F. The long-term monitoring locations were selected as follows:

- East Monitor: The East Monitor is representative of the ground floor exposure of residences located in Neighborhood E.

- North Monitor The North Monitor is a reference location with exposure to Franklin Field and the Umbrella Bar. The data from this site was used to confirm ROC activities and to validate the sound modeling.
- West Monitor: The West Monitor is representative of the ground floor exposure of residences located in Neighborhood B. The location is setback from South 76th Street, which reduces the traffic noise exposure and allows the ROC activity sounds to be more evident in the data (for an example, compare Figure 15 and Figure 16).

Short-term attended monitoring sites included locations on the ski hill and in neighborhoods to the east, west, and north of the ROC. Note that each attended monitoring period only included a few of these locations as staff moved throughout the area. Field staff typically attended each site for a period of approximately 30 minutes and then moved to the next site. Detailed information on the sites used for each short-term monitoring period is provided in Appendix E.

The three ROC monitor locations are also shown in Figure 5. Again, sound level data from the ROC monitors was reviewed to assess their ability to identify non-compliance with applicable sound limits but was not analyzed to determine event or background sound levels.

FIGURE 5 : SOUND MONITORING LOCATIONS

6.2 MONITORING EQUIPMENT

Sound level monitoring was performed with ANSI/IEC Type 1 sound level meters (SLM) with a minimum frequency range of 6.3 Hz to 20 kHz. Cesva SC310 meters were used for long-term sound monitoring. Cesva SC310, Svantek 977, and Larson Davis 831 sound level meters were used for short-term sound monitoring. Sound level meters were set to log 1/3 octave band sound levels once each second.

Attended sound level meters were mounted on tripods at a height of approximately 1.5 meters (5 feet) and covered with windscreens to minimize the impact of wind distortion on the measurements. During short-term monitoring, field staff attended each monitor and documented sound levels attributable to facility and non-facility related activities occurring during the attended events.

Field staff accessed the long-term sound levels meters to download data and change batteries and/or maintain the equipment approximately every 7 to 10 days, as needed. Each Cesva SC310 meter was connected to an Edirol R-09HR or R-05 audio recorder, recording audio data at 128 kbps in *.mp3 format. The microphone of each SLM was mounted on a wooden stake at a height of approximately 1.2 m (4 ft) and protected by a windscreen to minimize the impact of wind distortion on measurements. In addition to sound level data, meteorological data was collected at each long-term location to assist with data exclusions. An Onset HOBO anemometer was located at microphone height at each of the three monitor locations. The average wind speed and maximum wind gust speed were logged once per minute.

The sound level meters were field calibrated during setup, tear down, and all meter checks. All sound level meters and field calibrators were lab-calibrated within one year of the measurement campaign.

6.3 DATA PROCESSING AND PRESENTATION

Short-Term Attended Monitoring

Analysis of the attended event data occurred following each attended event. Logged one-second L_{eq} sound levels were imported into R,[4] an Open-Source computing language, for processing and data analysis. Field notes, meteorological data, and analysis of sound level spectrograms were used to identify exclusion periods and to identify event and non-event periods.

The data from each attended event was provided to the County in the form of six technical memos (one following each attended event), which documented the data acquired during these events including the sound level time history, spectral content of the sound, and sound level

[4] https://www.r-project.org/about.html

statistics, including L_5, L_{95}, and L_{eq}. Definitions of these metrics are provided in Appendix A. The attended monitoring memos are provided in Appendix E

Long-Term Continuous Monitoring

Logged one-second sound level data for each long-term monitor was downloaded during each field visit. Logged one-second L_{eq} sound levels were then imported into R for processing and data analysis.

Field notes, event schedules, meteorological data, audio recordings, and analysis of sound level spectrograms were used to identify exclusion periods and to identify event and non-event periods. At each monitoring location, the sound level data underwent pre-processing to exclude those periods under the following conditions:

- Wind gust speeds at the monitoring location exceeding 5.4 m/s (12 mph),
- Precipitation and thunder,
- Temperatures below -18° C (0° F), and
- Equipment interactions by field staff and other external activities (e.g., sprinklers).

Approximately 12.6% of the data was removed for data exclusions.

Once the data underwent preprocessing and data exclusions were removed, the one-second sound level data from all monitors were assigned an "Event" or "No Event" designation. Periods corresponding to any event were excluded from the "No Event" category. Hourly sound level metrics (L_{eq}, L_{01}, L_{10}, L_{50}, and L_{90}) were then calculated using the one-second data for each "Event" and "No Event" designation. In the case of Fireworks, data were aggregated into 10-minute sound level metrics to match event duration more appropriately.

Long-Term Overall Daily Sound Levels

Hourly sound level data were then grouped based on time of week ("Weekend" includes both weekends and holidays), hour of day, monitor identification (East, North, and West), and the event category (Event, No Event). From these data, the average metrics for each Event and No Event were calculated. Five average metrics are shown for each hour:

- The highest 1% of sound levels (99th percentile) is represented by the dashed line (L_{01})
- The median sound level (50th percentile) is represented by the dotted line (L_{50})
- The equivalent sound level (L_{eq})
- The shaded region represents the 10th to 90th percentile range of sound levels (L_{90} to L_{10})

For events occurring primarily during the weekend, only weekend hours were considered. These aggregated data were used to compare sound levels occurring during event periods to

sound levels occurring under similar conditions without events (same time of day, day of week, etc.). The results are presented in the following section for each event-type.

In the plots, the horizontal axis of each chart shows the hour in local time over the course of a calendar day. The plot's convention is such that the numerical hour of the day includes sounds that occurred during that hour, e.g., hour five (5) represents sound levels from to 5:00:00 AM to 5:59:59 AM. Event periods are colored dark grey and periods without events are in orange.

Spectral Results

Spectral 1/3 Octave Band charts for each monitor are provided for each event type in the following section. "Background" sound levels indicate periods when there were no events at the Facility. "Total" sound levels indicate the measured sound levels during a specified event. "Event Only" sound levels are the background-corrected sound levels attributable to the event (Total minus Background). The "Event-Only" sound levels were calculated by logarithmically subtracting the "No Event" (background) sound levels from the Event (total) sound levels on a 1/3 octave band basis as described in ANSI S12.9 Part 3 Section 7. If sound levels during an event are at or below background during corollary no-event periods, the sound level of the event cannot be quantified at the specific 1/3 octave band. Sounds that are different in character than the background sounds, such as those that include tones, substantial low frequency sounds, or speech or music content, may be audible even if the sound level is below that of the background.

Note that since the background sound levels are calculated based on "No Event" days, which are different days than the "Event" days, in some cases the "Background" levels are calculated to be higher than the "Total" sound levels. This can be seen in the higher frequency data for the Hills Have Eyes and for snowblowing. In both cases, the higher "Background" levels are attributable to insect sounds, which were more prevalent during the summer months than during the late fall and winter when Hills Have Eyes and snowblowing occurred.

6.4 SOUND MONITORING RESULTS

Below is a summary of the sound sources generated by each of the sound generating ROC activities for which RSG performed sound monitoring. An explanation on how to read a spectrogram is given in Appendix A. The neighborhood designations are given in Figure 2.

Milwaukee Milkmen Baseball Game

Prior to the start of a game the primary sound sources included announcements from the Public Address (PA) system, music at the ball field, and the singing of the Star-Spangled Banner. Once the baseball game was underway, the primary sound sources included intermittent speech, music, and "Mooo"ing, amplified over the PA system. Cheering by spectators, which is typically the primary sound source in communities near sporting event facilities, was lower in sound level than these amplified sounds.

Neighborhoods B and E are both shielded from the ROC by intervening berms. Game announcements, music, and "Mooo"ing were clearly audible and distinguishable above background levels in Neighborhood E. Baseball games were not audible in Neighborhood B, which is located further from Franklin Field and has higher background sound levels due to its proximity to South 76th Street.

Figure 6 shows the long-term hourly average sound level results during Milwaukee Milkmen Baseball games. Games occurred on weekdays and on weekends. At the North and West monitors, sound levels during baseball games were typically above background after 17:00 (5 PM). All monitors showed notable increases in Event sound levels around 21:00 (9 PM). This coincides with events at the facility progressing from baseball games to live music at the Umbrella Bar (see Figure 10).

The spectral sound level results for Milwaukee Milkmen Baseball games are shown in Figure 7. "Total" sound levels were up to 4 dB above "Background" at the North and West Monitors, resulting in overall Event-Only sound levels 1 to 2 dB higher than Background sound levels. At the North Monitor, an increase in low to mid frequencies (<500 Hz) was observed during the events. For the West Monitor, the increase was at mid to high frequencies (250 Hz to 4 kHz). Overall event sound levels were below background at the East Monitor.

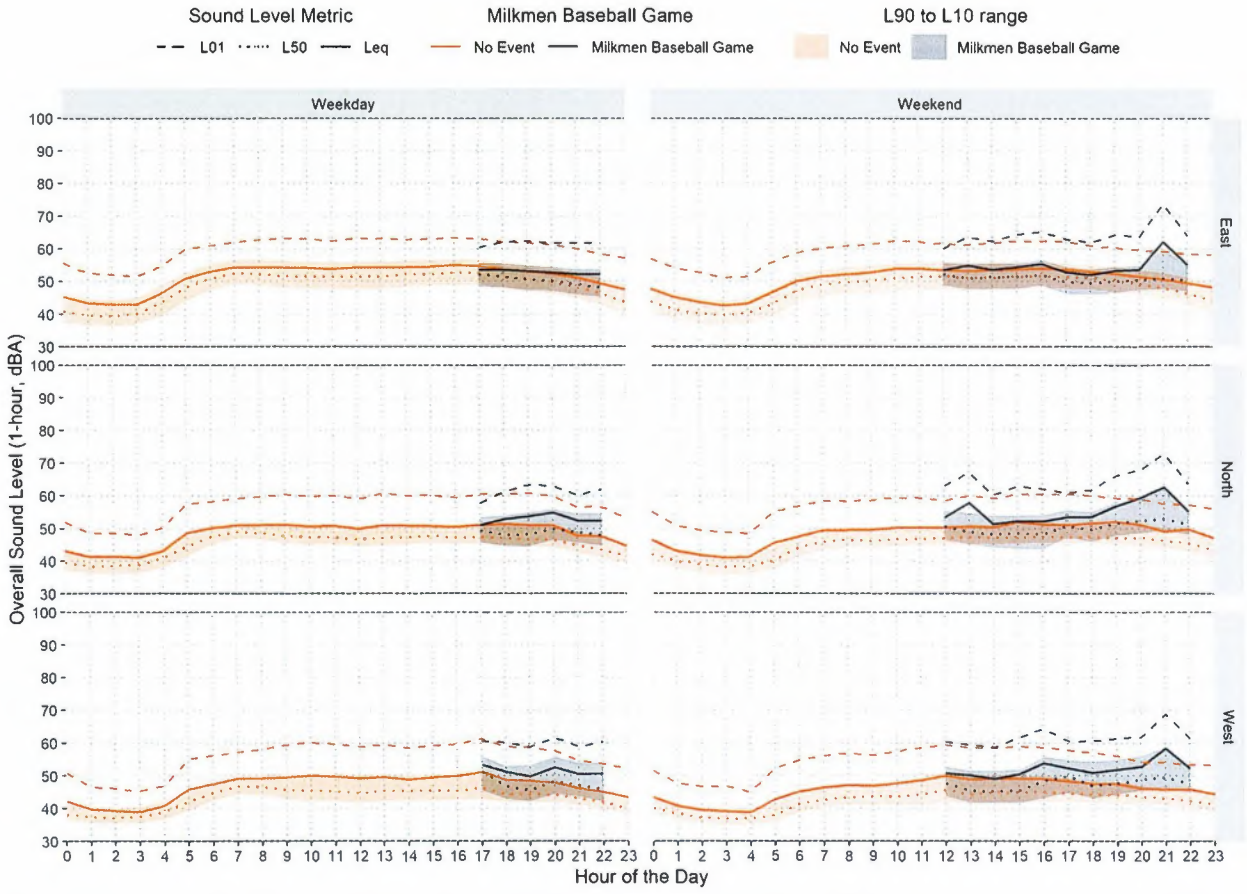


FIGURE 6: LONG-TERM SOUND LEVELS FOR MILWAUKEE MILKMEN BASEBALL (ONE-HOUR)

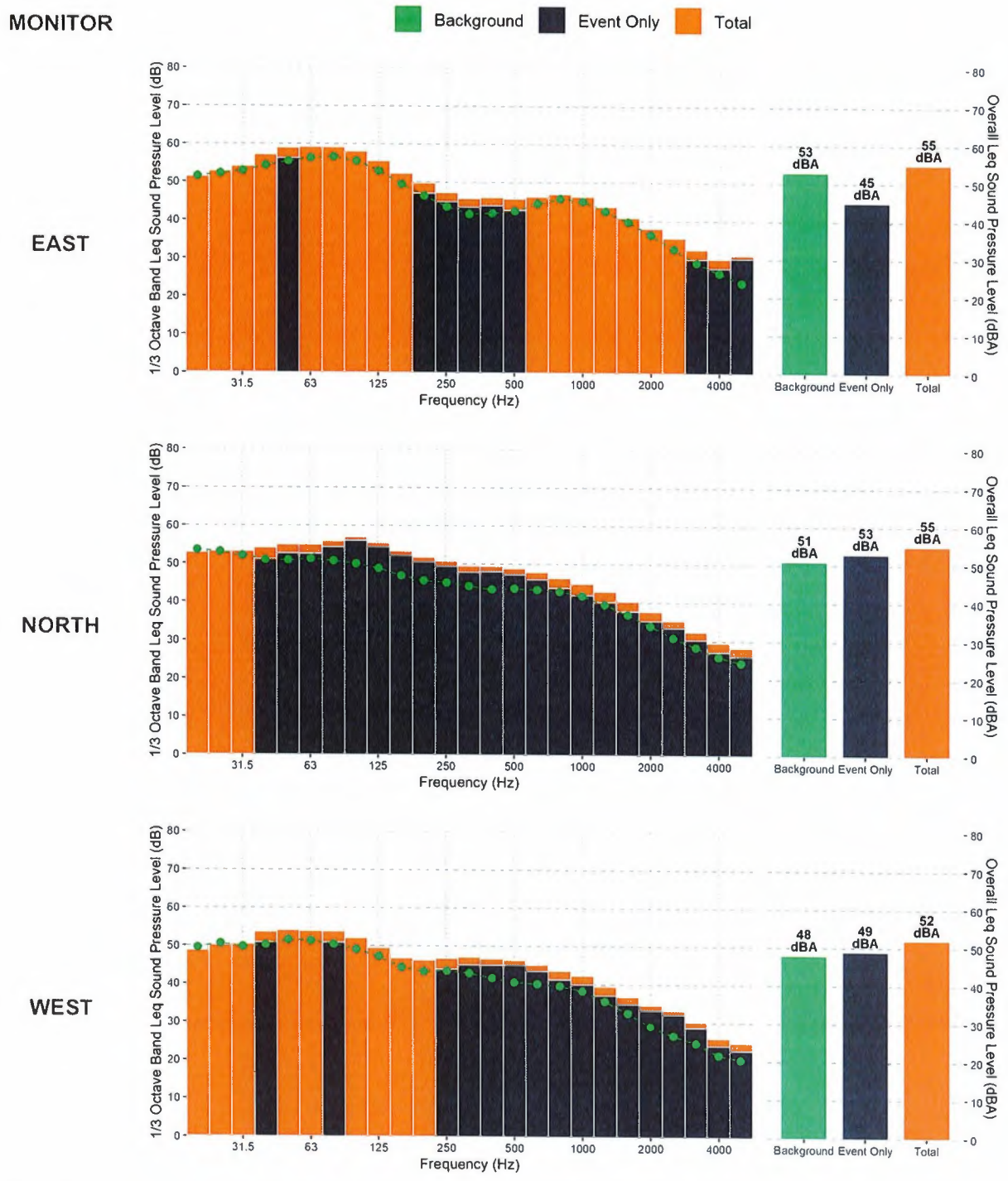


FIGURE 7: SPECTRAL RESULTS FOR MILWAUKEE MILKMEN BASEBALL

Summer Concert Series

Low frequency sounds are the primary concert generated sound source in the surrounding communities during live music at the Umbrella Bar. During periods when background sound levels were low, music and speech were also audible in some locations.

Neighborhoods B and E are shielded from the ROC by intervening berms. Music from the Umbrella Bar was audible at Neighborhood E during attended monitoring, including elevated sounds in the lower frequency bands. Although the overall A-weighted difference between the periods when the band was and was not performing was only 1 dB in Neighborhood E, sound levels in the 40 and 50 Hz bands increased by 12 and 10 dB, respectively, above background levels when the band was playing. As shown in Figure 8, low frequency sounds are clearly identifiable in the spectrogram during the period when the band was playing. In Neighborhood B, bass from live music at the Umbrella Bar band was clearly distinguishable during lulls in traffic. An example spectrogram from Neighborhood E which includes live music at the Umbrella Bar is given in Figure 9.

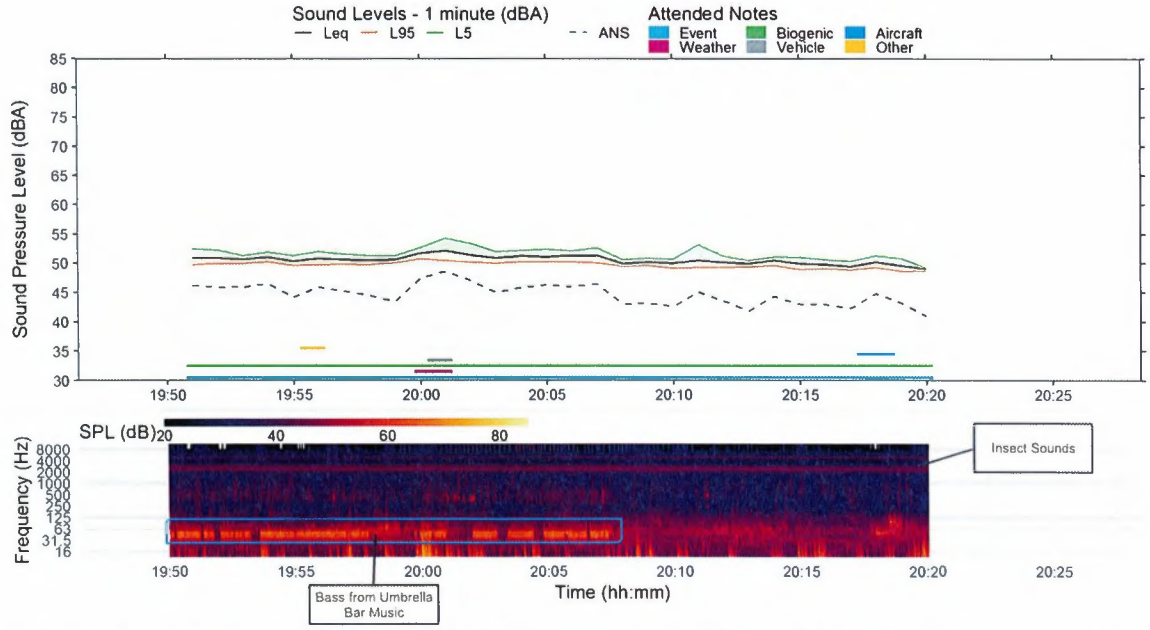


FIGURE 8 : SPECTROGRAM DURING AND AFTER AN OUTDOOR PERFORMANCE AT UMBRELLA BAR IN NEIGHBORHOOD E

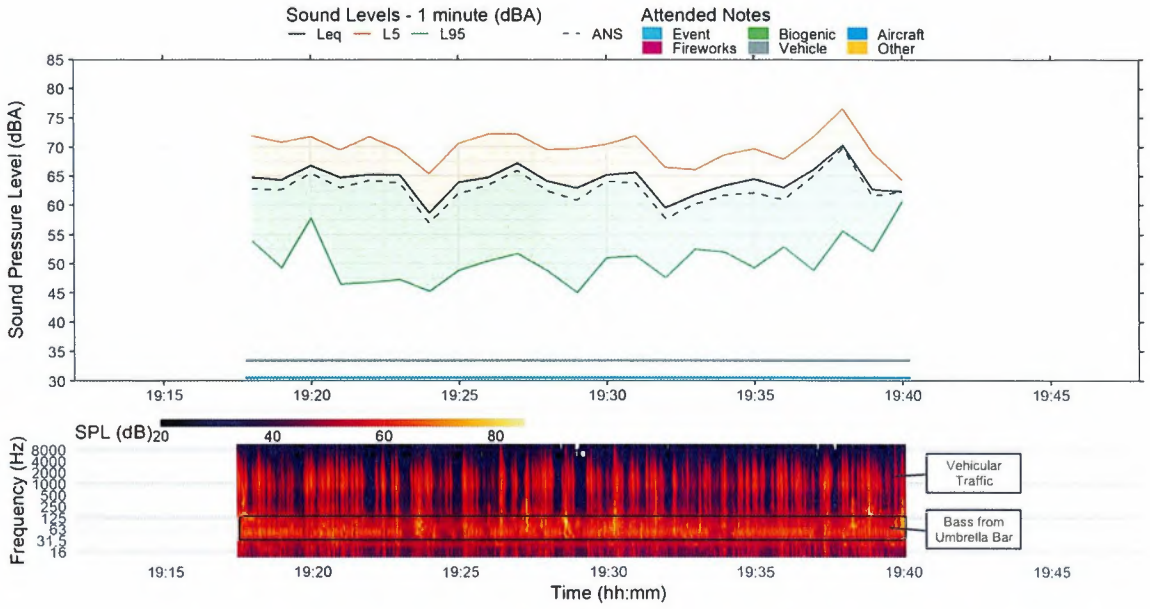


FIGURE 9 : SPECTROGRAM DURING AN OUTDOOR PERFORMANCE AT UMBRELLA BAR IN NEIGHBORHOOD B

Long term daily hourly average sound level results for live music events at the Umbrella Bar are shown in Figure 10. Live music at the bar occurred exclusively on Saturday evenings. Sound levels at the North and West monitors were consistently higher during periods of live music at the Umbrella Bar compared to Background. Event sound levels were highest at all monitors around 21:00 (9 PM). During the highest hourly period, sound levels at the North and West monitors were 10 dB higher than Background levels without events.

Spectral results for Live Music at the Umbrella bar are shown in Figure 11. Although the overall Event-Only sound levels were below the corresponding overall background level at the East Monitor, event sound was prominent at low frequencies (< 125 Hz), with at least a 10 dB increase over background in the 40 Hz 1/3 octave band.

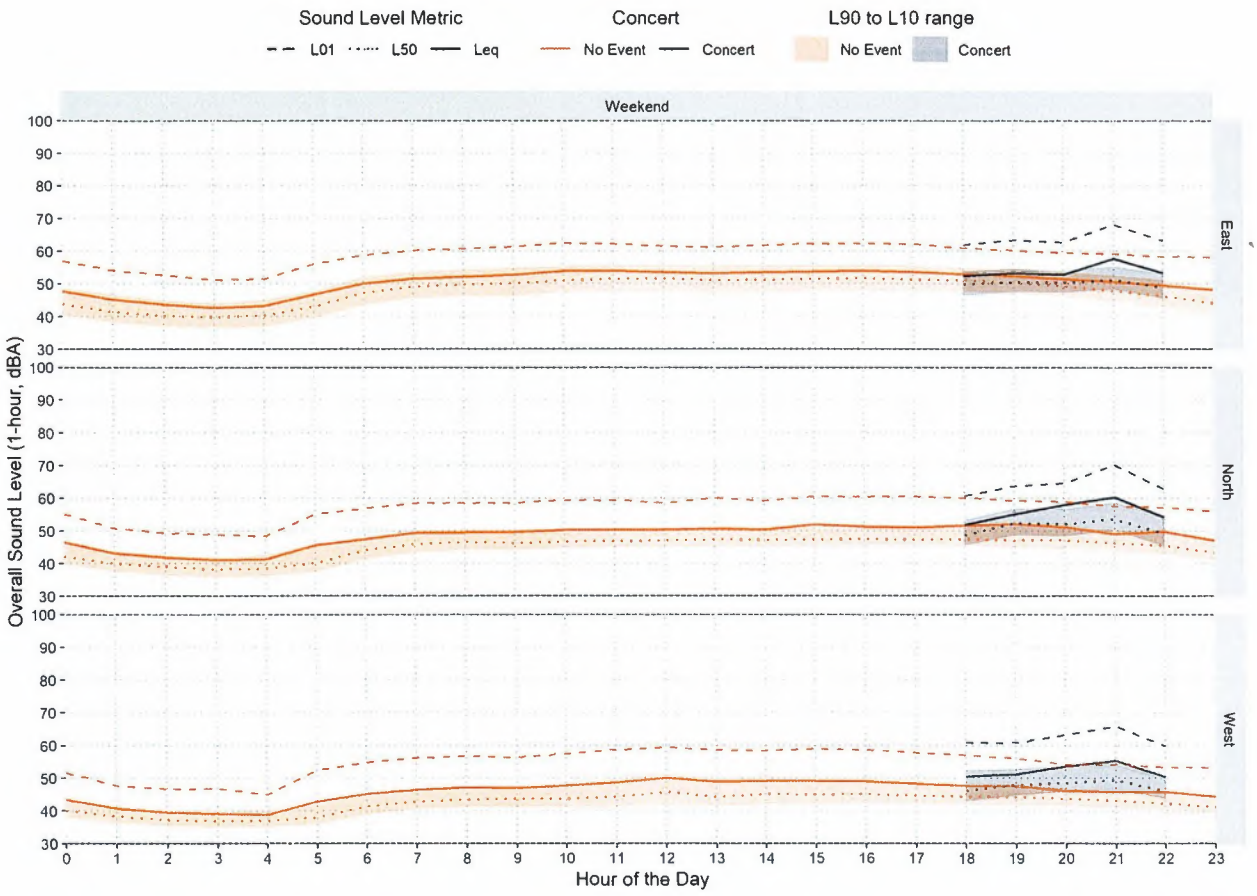


FIGURE 10: LONG-TERM SOUND LEVELS FOR LIVE MUSIC AT THE UMBRELLA BAR (ONE-HOUR)

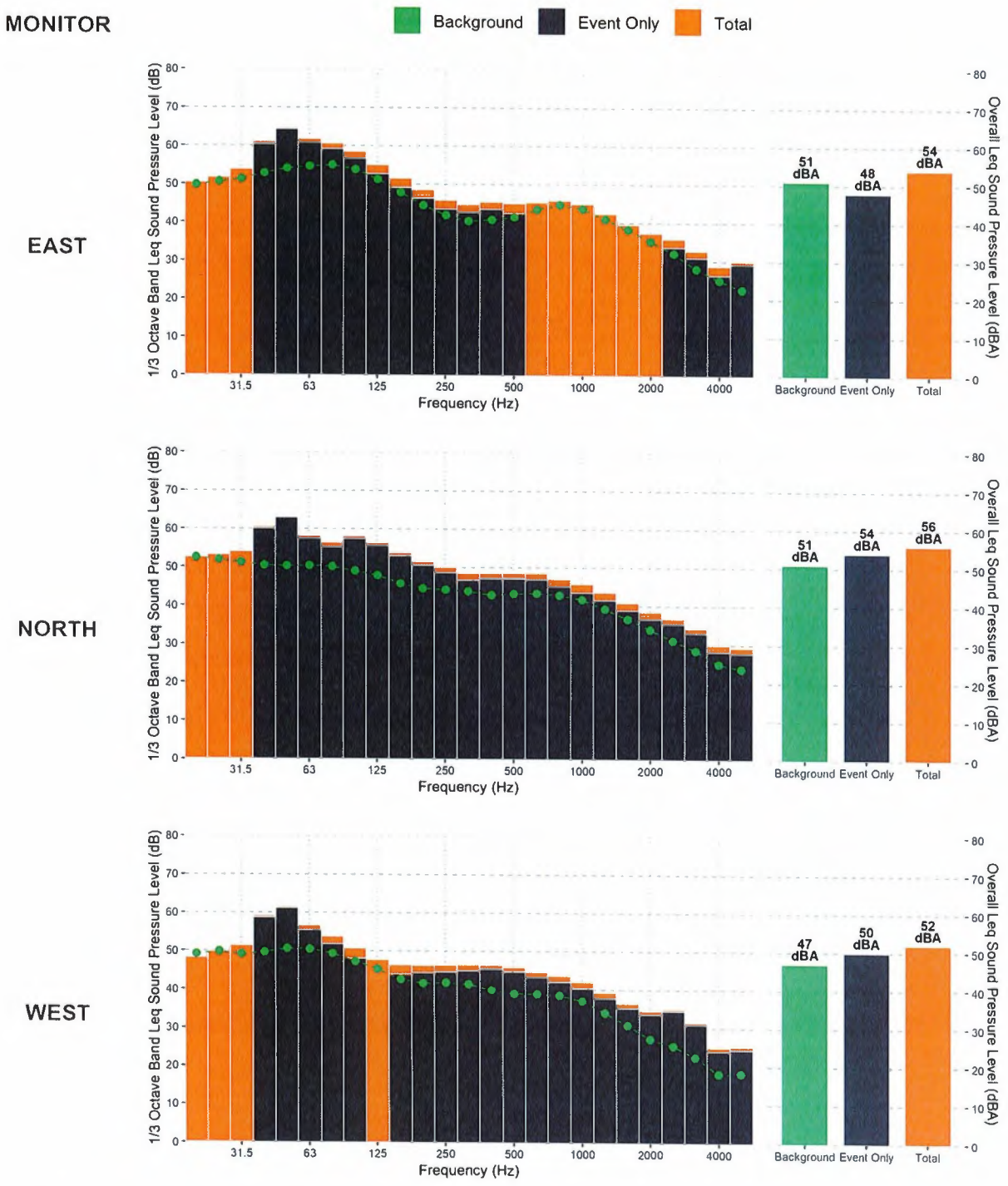


FIGURE 11: SPECTRAL RESULTS FOR LIVE MUSIC AT THE UMBRELLA BAR

Fireworks

One-minute average L_{eq} sound levels during fireworks were 17 to 20 dB louder than sound levels during other ROC events in Neighborhoods A and E. An example spectrogram from Neighborhood E which includes an outdoor performance at the Umbrella Bar and a period with fireworks is given in Figure 12. From this example, the elevated sound levels during fireworks are clearly observed.

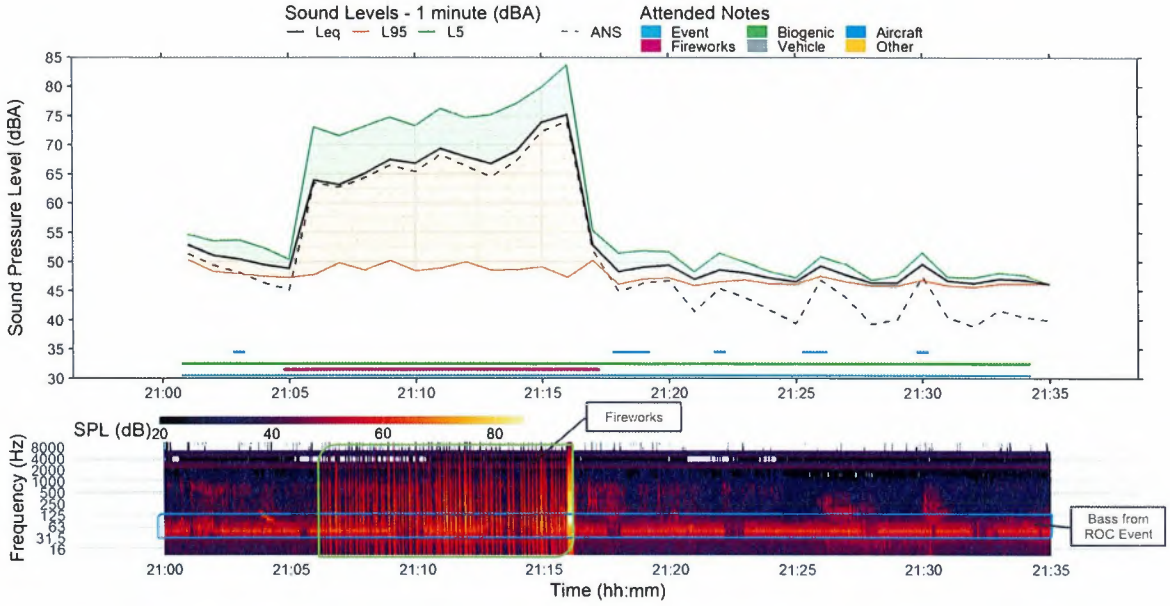


FIGURE 12 : SPECTROGRAM OF FIREWORKS OCCURRING DURING OUTDOOR PERFORMANCE AT UMBRELLA BAR IN NEIGHBORHOOD E

Long-term ten-minute average sound level results during Fireworks events are shown in Figure 13. Fireworks only occurred on weekend nights between 9:00 PM and 10:10 PM local time and are thus represented on the chart for hours 21:00 (9 PM) and 22:00 (10 PM). At all monitors, sound from the fireworks display dominated the soundscape during these times.

Spectral results for fireworks are provided in Figure 14. The broadband dominance of the fireworks is apparent, with the fireworks at least 20 dB above background levels in all 1/3 octave bands and 29 to 35 dB above background L_{eq} levels overall.

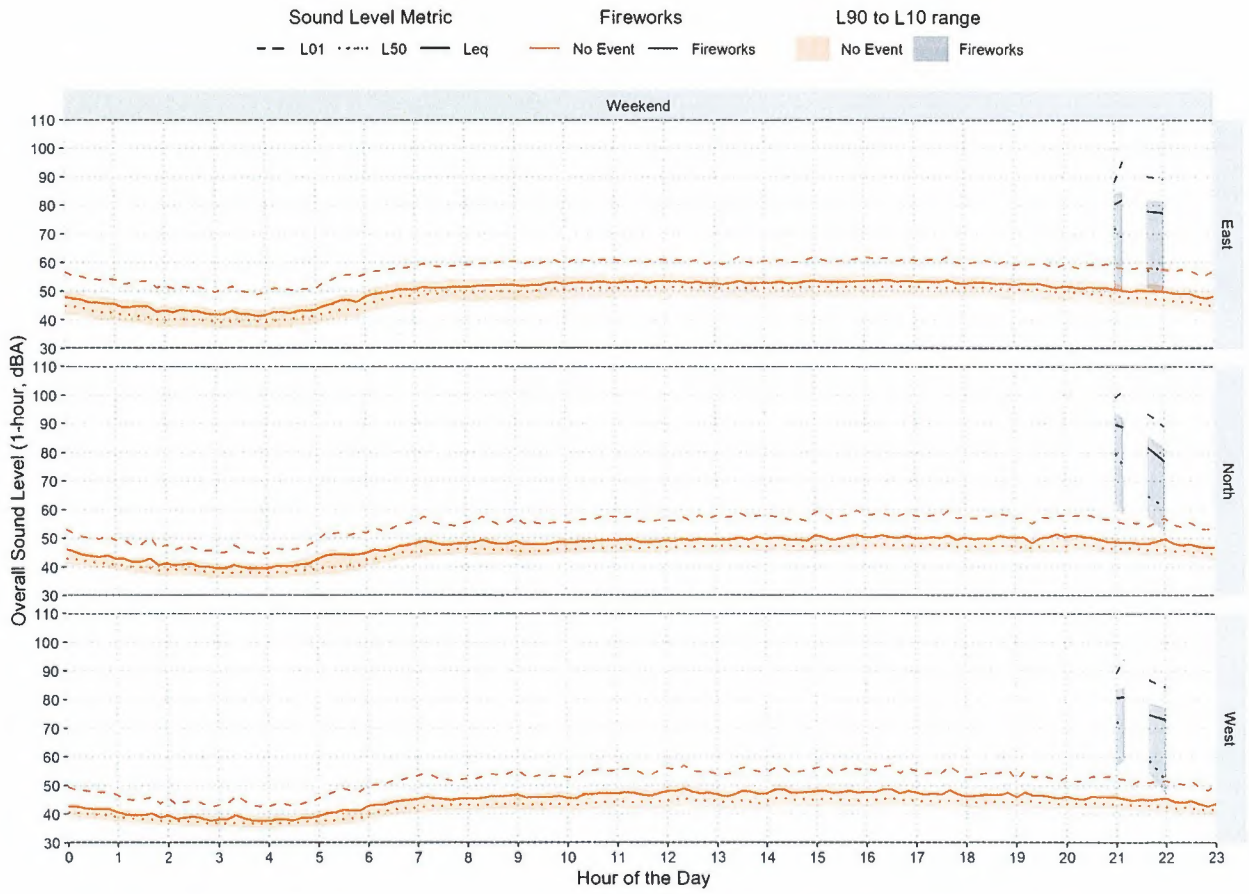


FIGURE 13: LONG-TERM SOUND LEVEL COMPARISON FOR FIREWORKS (10-MINUTE)

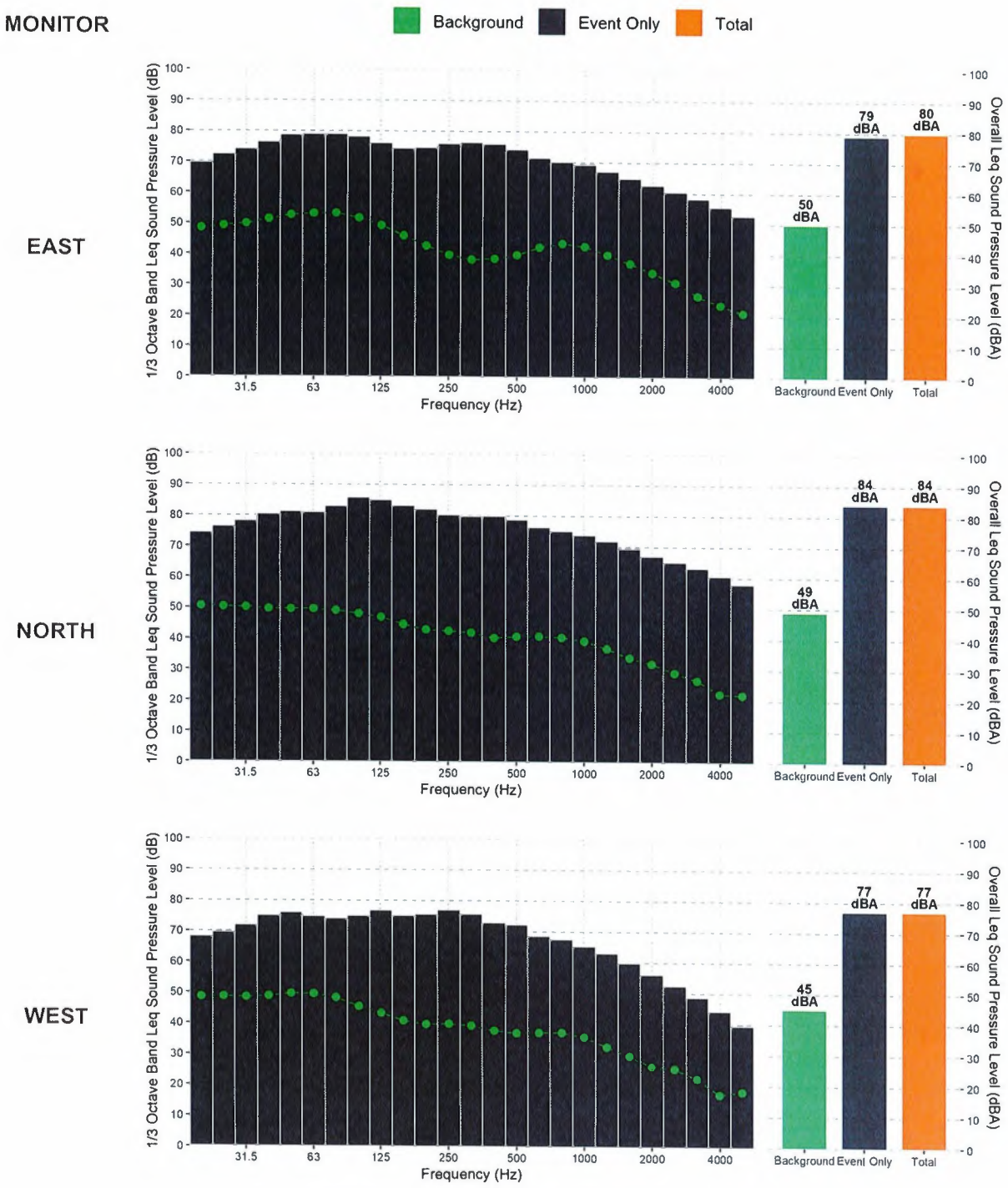


FIGURE 14: SPECTRAL RESULTS FOR FIREWORKS

The Hills Have Eyes Event

The primary sound sources during The Hills Have Eyes event included a chainsaw, the public announcement (PA) system, music, and special effects sounds. During attended monitoring, the event was not audible at homes in Neighborhood E.

In portions of Neighborhood B located near South 76th Street, low frequency sounds from event related music were clearly audible, as identified in the example spectrogram shown in Figure 15, but other event sounds (PA system, chain saw, special events sounds) were not audible. Figure 16 shows the spectrogram at a location in Neighborhood B which is well shielded and setback from South 76th Street by about 1,000 feet. At this location, low frequency sounds are clearly identifiable in the spectrogram and the event was clearly audible including both low frequency sounds and other event sound sources.

In Neighborhood A, the Hills Have Eyes event was clearly audible at sites located more than a mile to the north of the event location. As shown in Figure 17, low frequency sounds are clearly identifiable in the spectrogram, and the event was clearly audible including both low frequency sounds from amplified music and other event sound sources.

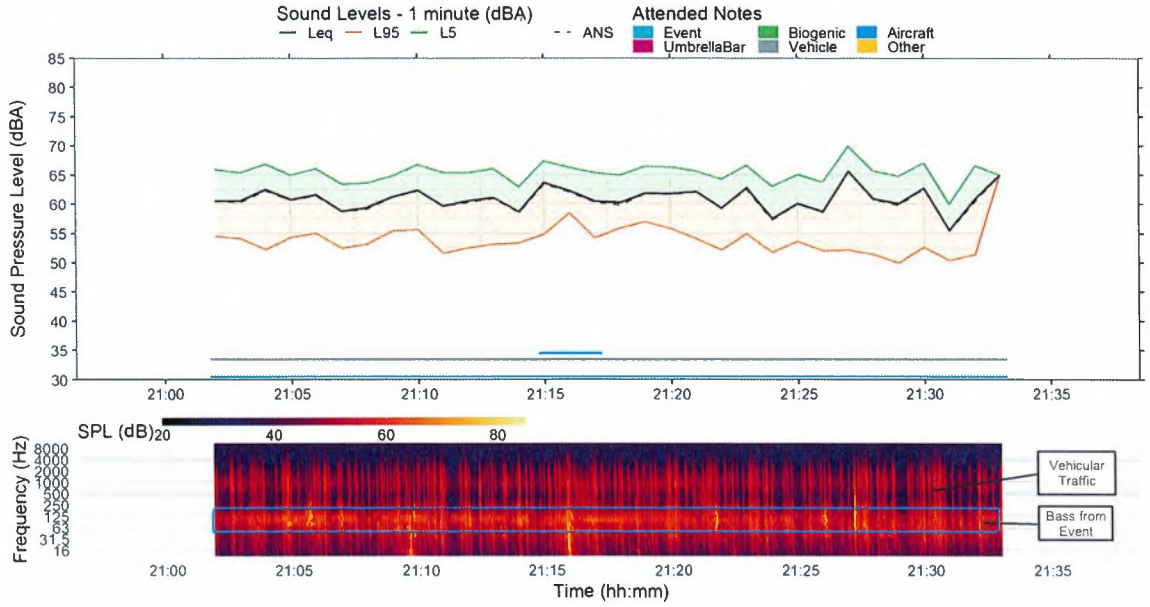


FIGURE 15 : SPECTROGRAM OF HILLS HAVE EYES EVENT IN NEIGHBORHOOD B, ADJACENT TO SOUTH 76TH STREET

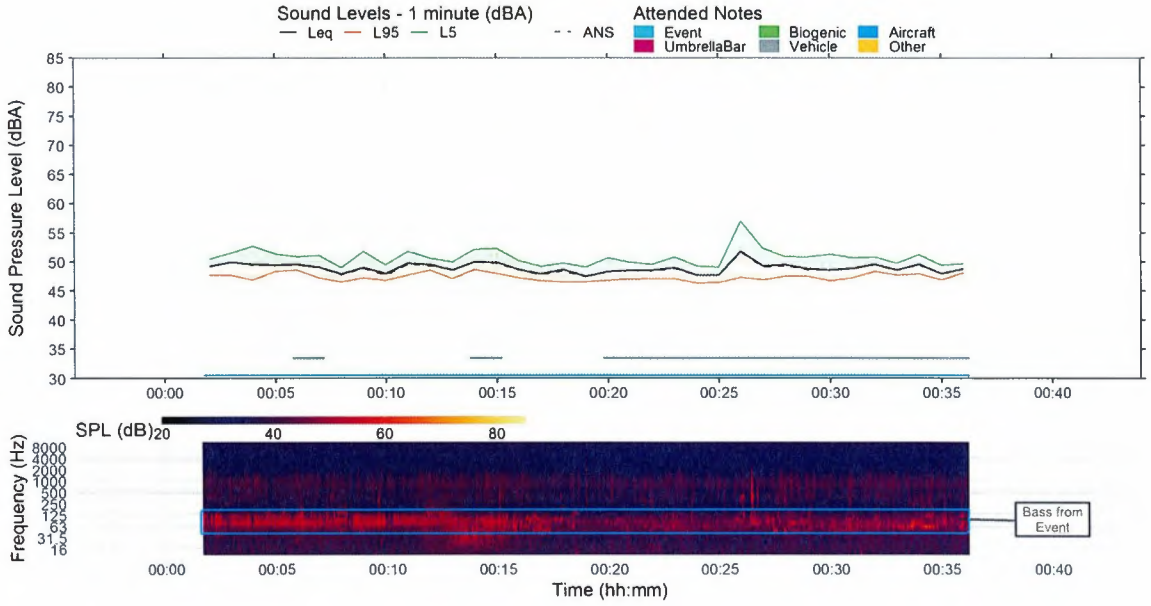


FIGURE 16 : SPECTROGRAM OF HILLS HAVE EYES EVENT IN NEIGHBORHOOD B, SETBACK FROM SOUTH 76TH STREET

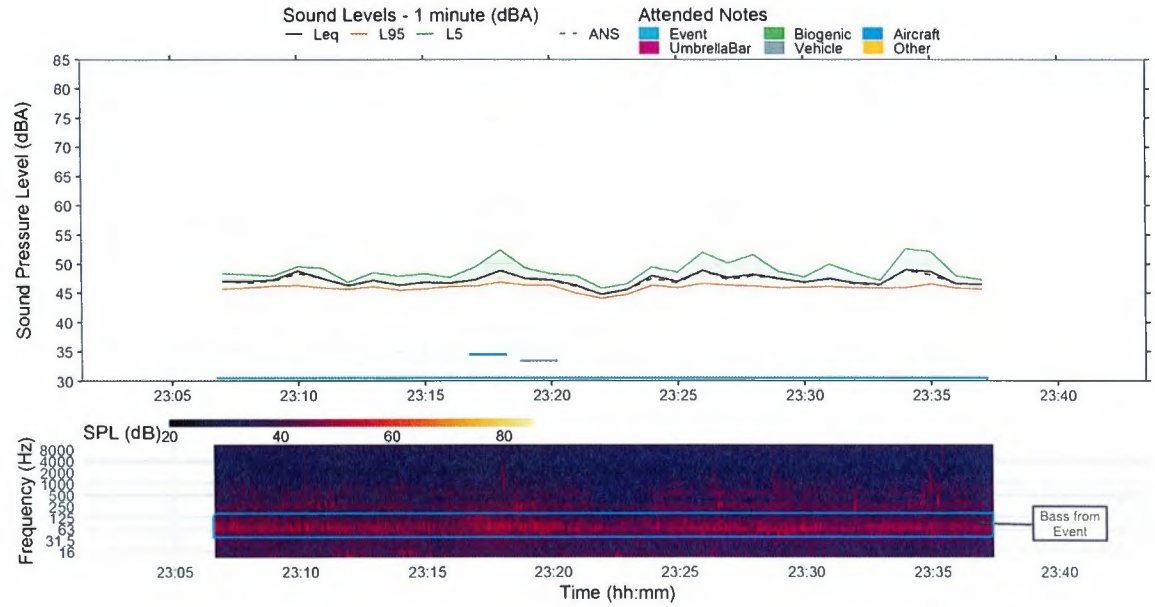


FIGURE 17 : SPECTROGRAM OF HILLS HAVE EYES EVENT IN NEIGHBORHOOD A, MORE THAN ONE MILE FROM THE EVENT LOCATION

Long-term hourly average results for The Hills Have Eyes event in the context of a full day are provided in Figure 18. The Hills Have Eyes event started around 6 PM and ended by midnight each day. Hourly average sound levels at the East and West Monitors were nearly equivalent during the event as they were when no event was present. Conversely, sound levels at the North monitor were typically slightly lower during the event compared to weekend nights when no events were occurring. This is attributable to the Hills Have Eyes event occurring during late fall, when insect sounds are less prevalent.

The spectral results for The Hills Have Eyes event are provided in Figure 19. In all cases, The Hills Have Eyes event was not distinguishable in sound level from background sound levels. However, as described above for the attended monitoring, the sound characteristics of the event made it clearly audible at locations as far as one mile or more to the north of the ROC. As described previously, the higher Background levels in the high frequencies in Figure 19 are attributable to insect sounds, which were more prevalent during the summer months than during the late fall when Hills Have Eyes occurred.

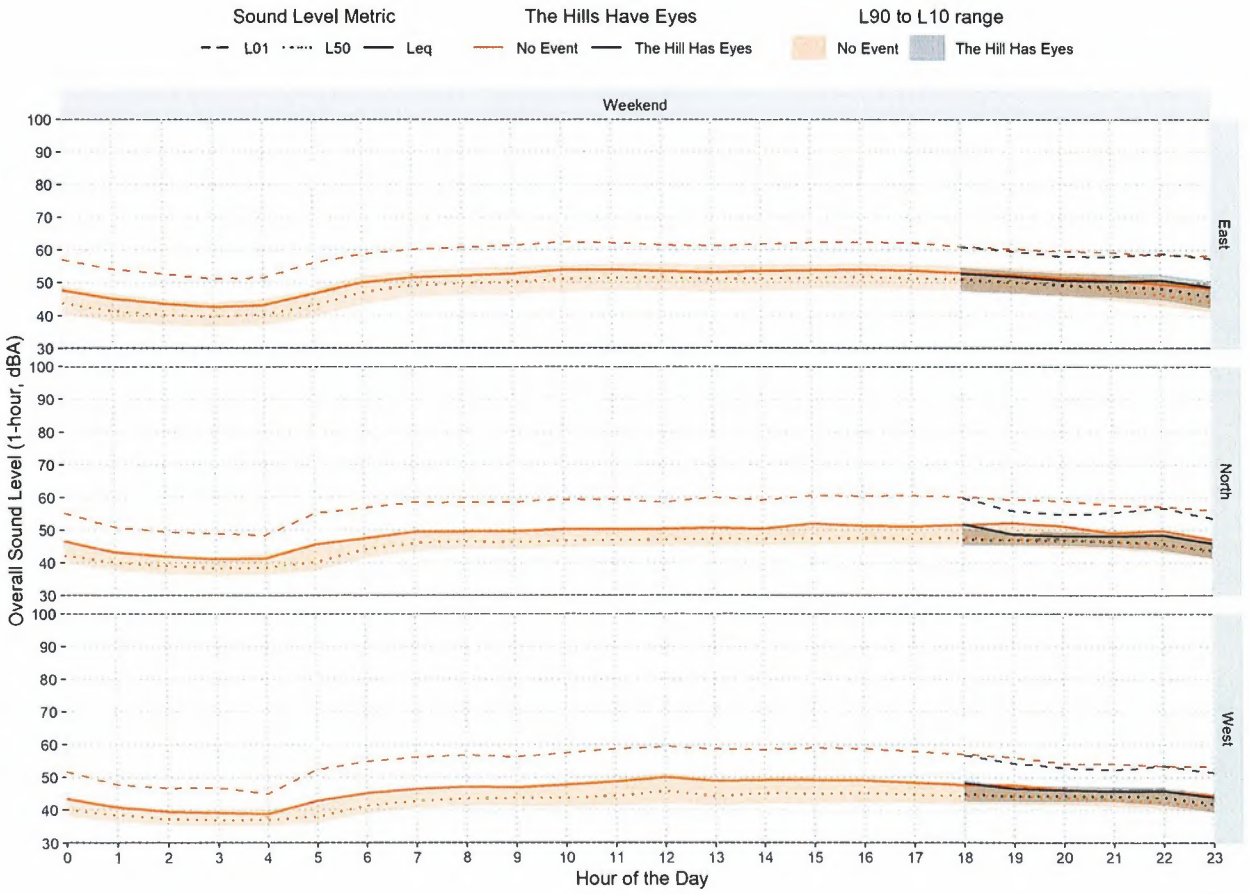


FIGURE 18: LONG-TERM SOUND LEVELS FOR THE HILLS HAVE EYES (ONE-HOUR)

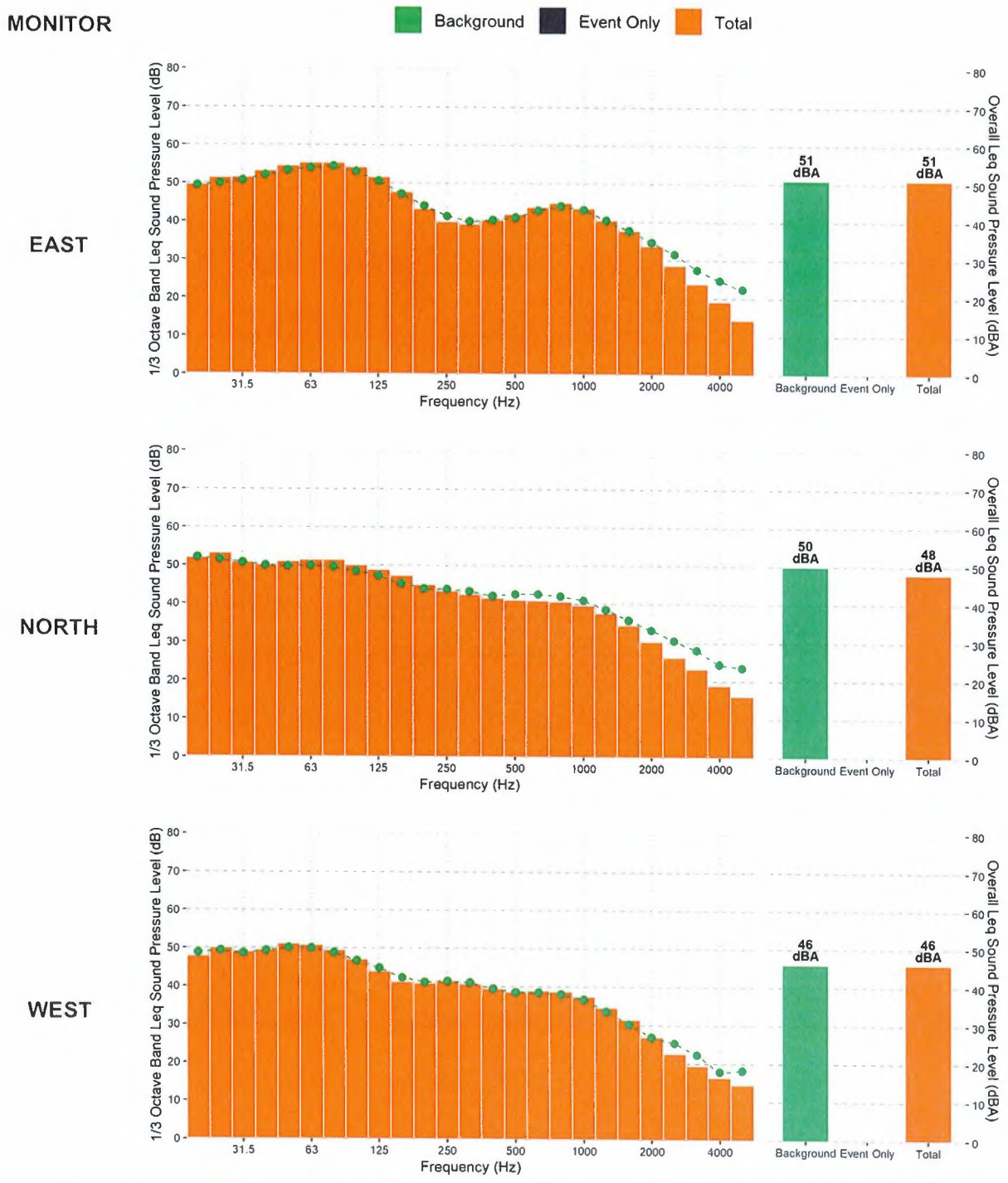


FIGURE 19: SPECTRAL RESULTS FOR THE HILLS HAVE EYES

Snowmaking

Snowmaking occurred at the Facility at all hours of day and night on weekdays and weekends. The primary sound source for snowmaking is the snow guns. The long-term hourly average sound level results for snowmaking at the Facility is presented in Figure 20. The snow guns were located very close to the North Monitor and they dominated sound levels at this location when snowmaking was in progress. Snowmaking was only distinguishable in the sound levels at the West and East Monitors in the nighttime and early morning hours (12 to 5 AM) when background sound levels were low enough for sound from the snow guns to not be masked by background sounds. Hourly average sound levels in the early morning hours were 2 to 4 dB higher with snowmaking compared to background.

Figure 21 shows the spectral sound level results for snowmaking. Snowmaking was a dominant sound source at the North Monitor and the spectral content of snowmaking was well defined at the North Monitor. Sounds in the 31.5 Hz 1/3 octave band were detectable at the East and West Monitors; if the spectral analysis were limited to nighttime hours, sound from snowmaking would be more apparent in the spectra.

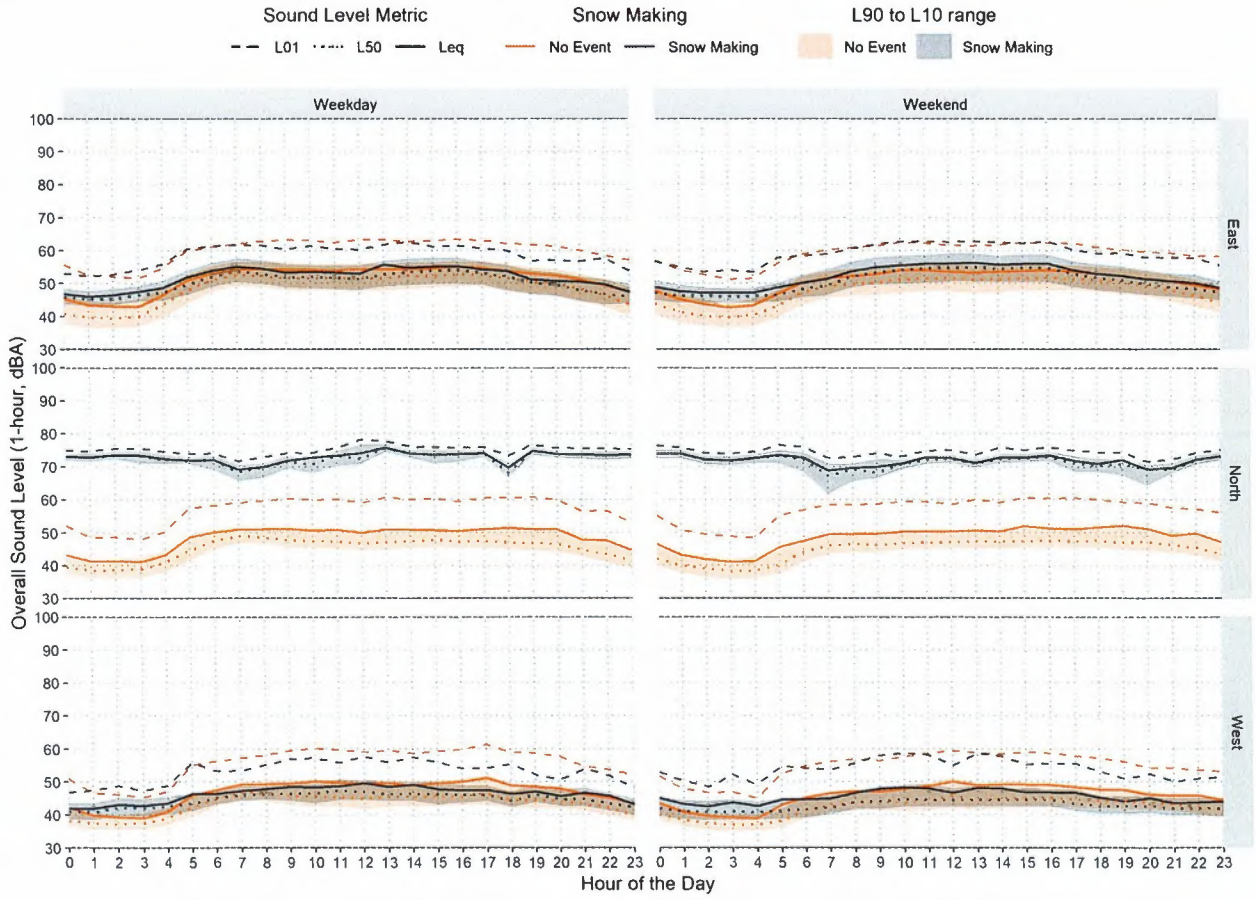


FIGURE 20: LONG-TERM SOUND LEVELS FOR SNOWMAKING (ONE-HOUR)

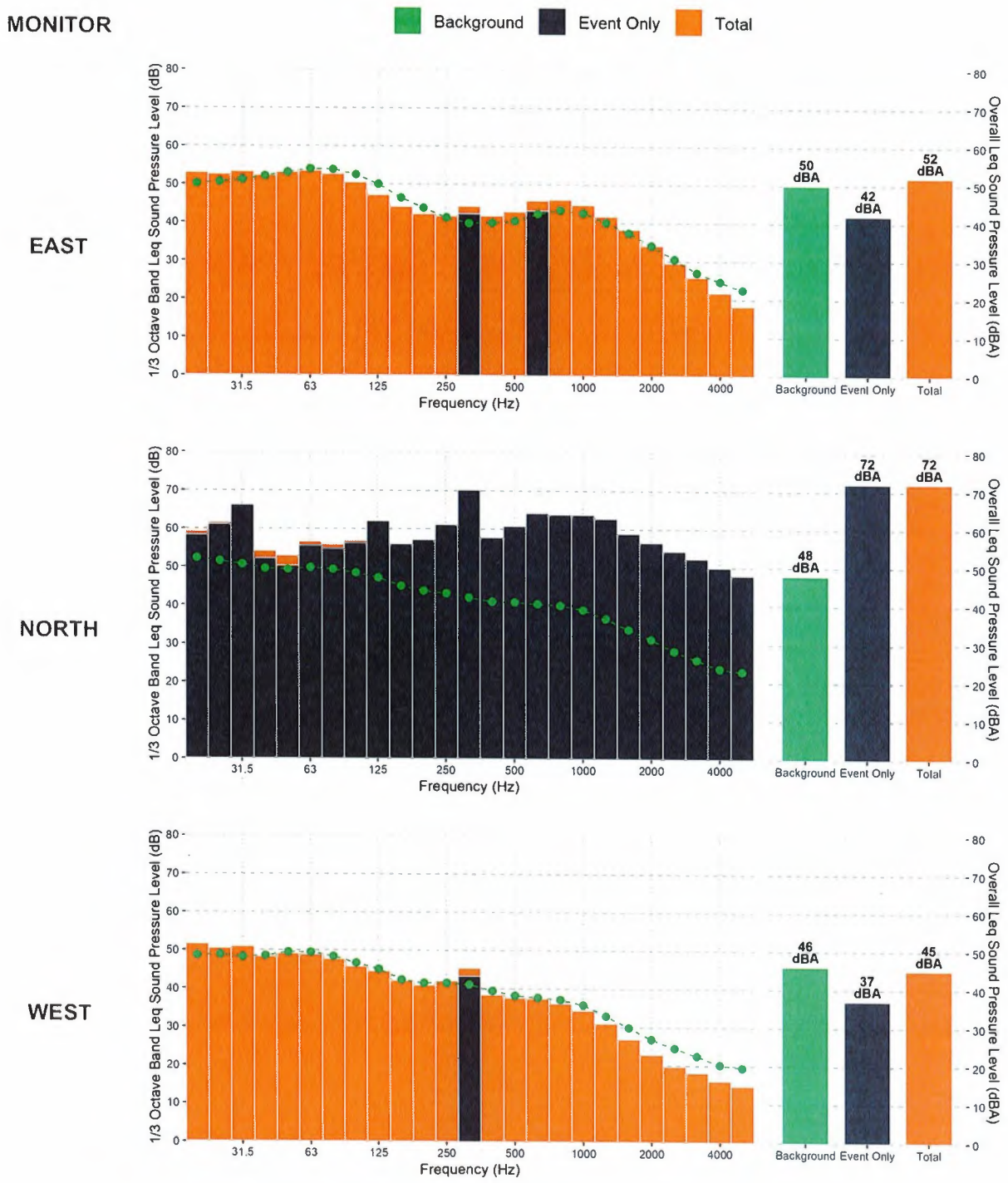


FIGURE 21: SPECTRAL RESULTS FOR SNOWMAKING

Helicopter Candy Drop

The Helicopter candy drop scheduled for August 29, 2022 was cancelled for rain. No indication of a rescheduling of the event was found in the long-term data. As a result, sound monitoring was not conducted during a helicopter candy drop. However, past staff experience of helicopters has indicated that they generate high sound levels.

Luxe Golf

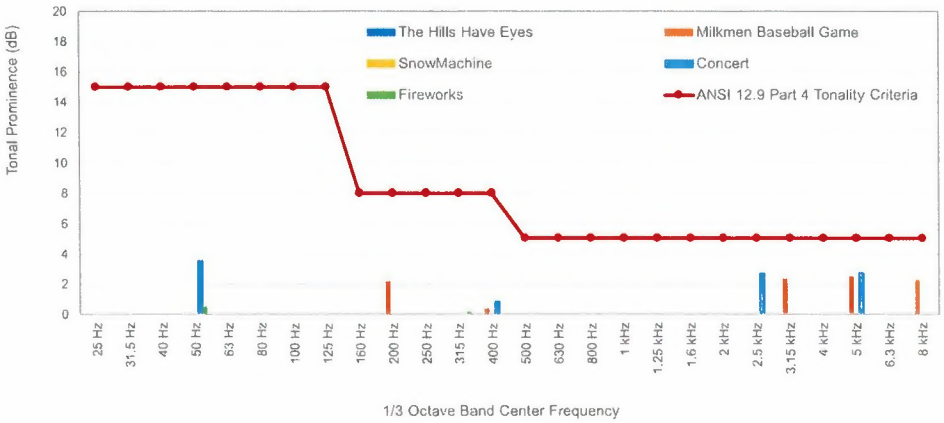
The Luxe Golf facility opened for business over the course of the study and was not a focus of the analysis. However, field staff noted that activities at the golf facility were the primary sound source at adjacent homes in Neighborhood E during the Hills Have Eyes event. Sound sources included golf ball hits, people talking, and the golf ball pickup machine sweeping the range area.

6.5 TONALITY

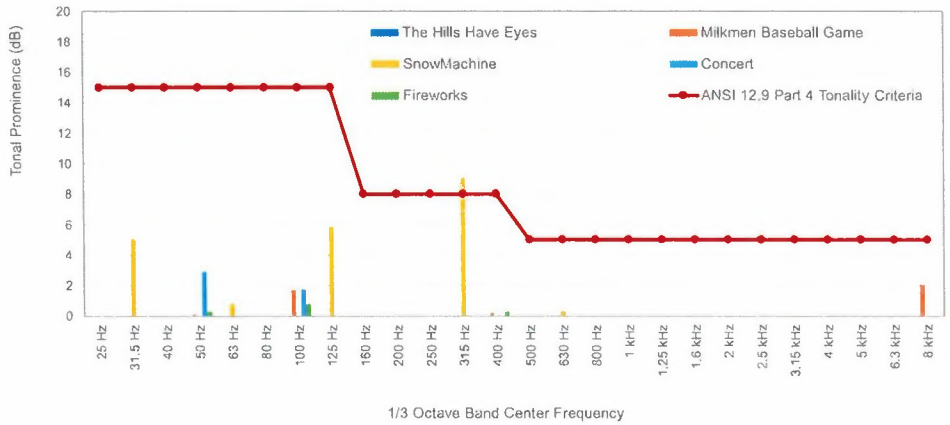
The Event-Only sound level results were assessed for tonal prominence (audible tones) at the long-term monitoring locations. Tonality was assessed using the 1/3 octave band data as defined in ANSI 12.9 Part 4. The results in Figure 22 show that the only tonal prominence associated with an event was found at the North Monitor for snowmaking. Tonality associated with snowmaking at the North Monitor was expected due to the tonal nature of the equipment and the proximity of the North Monitor to the snowmaking equipment. The North Monitor is not representative of any residential areas and the tones did not persist into the residential areas (as shown with the results for the West and East Monitors). No tonal prominence was identified at the East or West Monitors.

MONITOR

EAST



NORTH



WEST

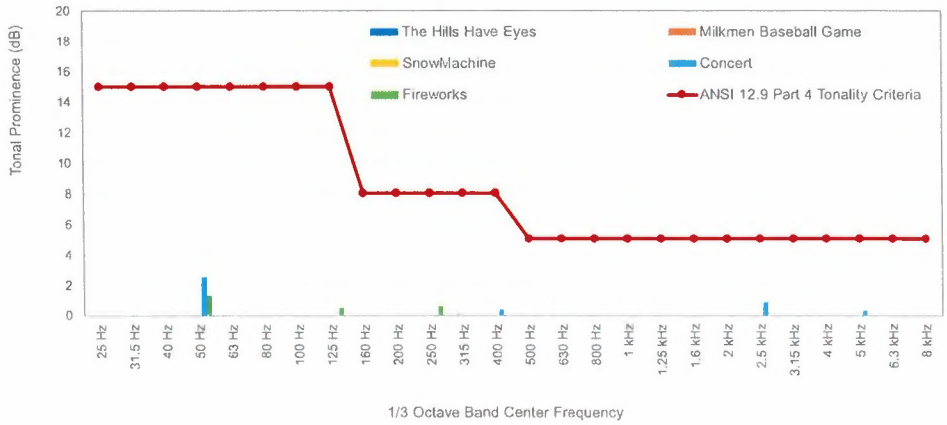


FIGURE 22: TONAL PROMINENCES FOR SPECTRAL EVENT-RESULTS - ALL MONITORS

6.6 LOW-FREQUENCY ANALYSIS

Overall Discussion

Event-only results were logarithmically summed into three respective full octave bands (31.5 Hz, 63 Hz, and 125 Hz) for comparison to the low frequency thresholds (see Chapter 9.0). The results are presented in Figure 23 for each monitor.

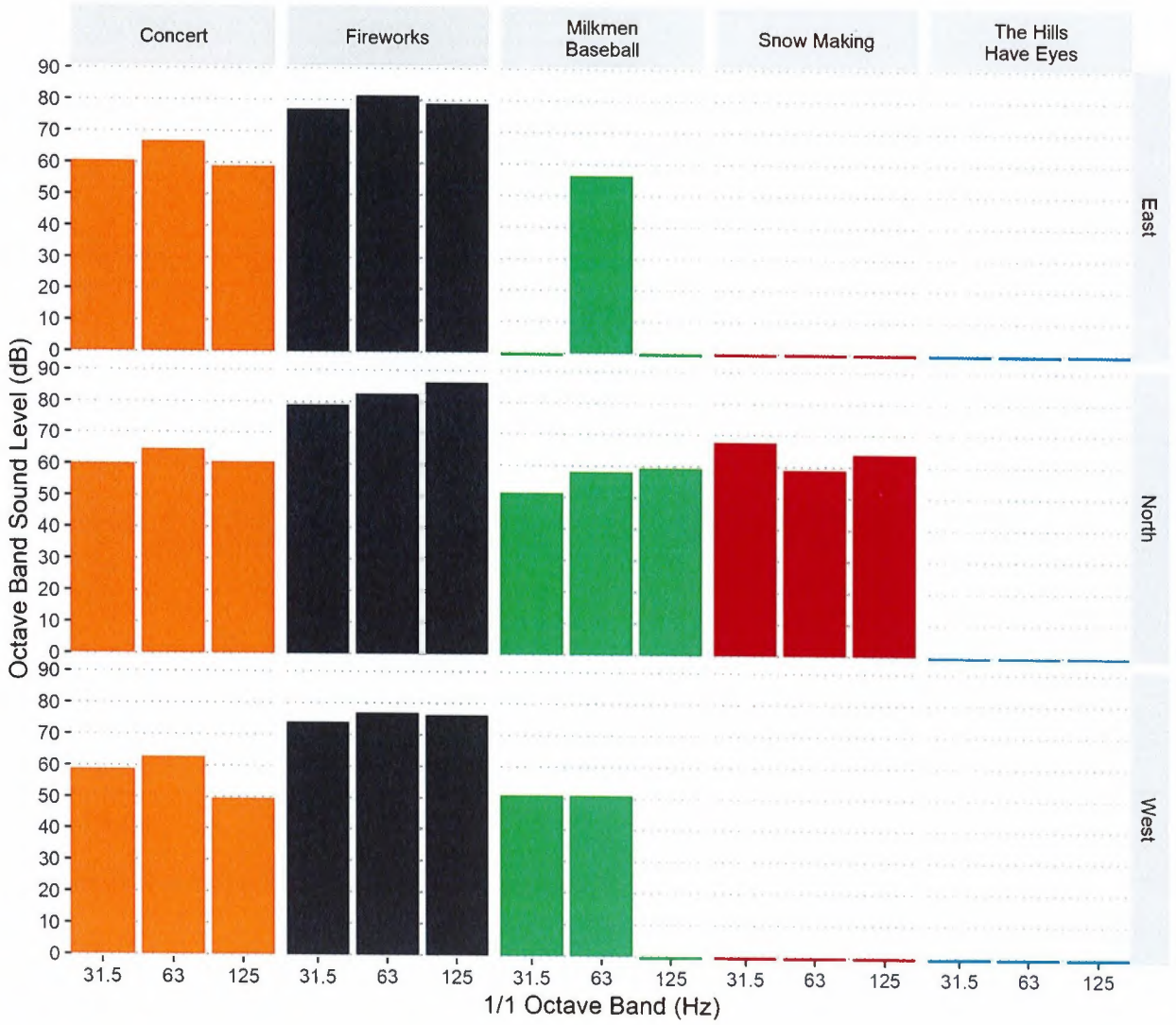


FIGURE 23: LOW FREQUENCY OCTAVE BAND RESULTS

Live Music at Umbrella Bar

Due to the dynamic nature of live music at the Umbrella Bar and complaints regarding the low-frequency portion music, a more detailed analysis was made of the worst-case event-only hour (9 PM, see Figure 11). During this hour, the measured event-only sound level was highest and non-event background sound levels were low because it was a nighttime hour.

The event-only octave band results for the loudest hour of the concert series are presented in Table 2. The event-only levels indicate that the Concert was dominant at the East Monitor. Low frequency octave band sound levels were 2 to 4 dB lower at the West Monitor. At the North Monitor, 31.5 Hz octave band sound levels were nearly equivalent to the East Monitor.

TABLE 2: HIGHEST ONE-HOUR (9PM) L_{EQ} EVENT ONLY SOUND LEVELS FOR LIVE MUSIC

EVENT	MONITOR	TYPE	OCTAVE BAND SOUND LEVEL, dB			OVERALL SOUND LEVEL, dBA
			31.5 Hz	63 Hz	125 Hz	
Concert	East	No Event (Background)	56	58	55	51
		With Event (Total)	65	71	63	58
		Event Only	65	70	62	56
	North	No Event (Background)	56	55	52	49
		With Event (Total)	66	69	66	60
		Event Only	65	69	65	60
	West	No Event (Background)	54	54	49	46
		With Event (Total)	63	67	56	55
		Event Only	63	66	56	54

6.7 SUMMARY OF RESULTS

A summary of results at each monitor for the periods associated with each event type for the East, North, and West Monitors is provided in Table 3. The table provides the sound levels for complementary Event/No Event periods. The Difference column denotes the increase above Background for each event. The Event-Only sound level is the background-corrected sound level attributable to each event.

Table 3 shows that the Event-Only levels for Milkmen Baseball Games and Umbrella Bar Concerts ranged from 45 to 54 dBA L_{1h} at the three monitor locations, similar to or below background levels at all monitors. Baseball games and concerts increased the overall sound level by 2 to 5 dB above background at the monitor locations. Fireworks generated sound levels of 77 to 84 dBA L_{10m}, which dominated the sound environment at all monitor locations and were 29 to 35 dB above comparable non-event periods. The Hills Have Eyes events were not distinguishable in the sound level data but were audible at locations more than a mile to the north due to the characteristics of the sounds generated by the event, which include speech, music, and chainsaw sounds. Snowmaking did not appreciably increase the average sound levels at the East and West Monitors, but did result in elevated sound levels during the late night and early morning hours. High sound levels associated with snowmaking at the North Monitor is due to the close proximity (as close as 25 feet) to the snow making equipment.

TABLE 3: AVERAGE L_{EQ} RESULTS FOR EVENTS AT EACH MONITOR

MONITOR	EVENT TYPE	SOUND LEVEL, dBA			
		With Event (Background + Event)	No Event (Background)	Difference	Event Only
East	Milkmen Baseball Game	55	53	2	45
North		55	51	4	53
West		52	48	4	49
East	Concert	54	51	2	48
North		56	51	5	54
West		52	47	6	51
East	Fireworks	80	50	30	79
North		84	49	35	84
West		77	45	32	77
East	The Hills Have Eyes	51	51	0	*
North		48	50	-2	*
West		46	46	0	*
East	Snowmaking	52	50	2	42
North		72	48	24	72
West		45	46	0	37

*Event Only sound levels are more than 10 dB below background levels and could therefore not be calculated.

7.0 SOUND PROPAGATION MODELING

Sound propagation models were developed to visually depict how sound from ROC events propagates in the residential areas surrounding the site and to adjust the long-term monitoring data for use in identifying noise limit exceedances.

7.1 PROCEDURES

ISO 9613-2 & CadnaA

Modeling for the ROC was conducted in accordance with the standard ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." The ISO standard states,

> This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level ... under meteorological conditions favorable to propagation from sources of known sound emissions. These conditions are for downwind propagation ... or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.

The model takes into account source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain. The acoustical modeling software used was CadnaA, from Datakustik GmbH. CadnaA is a widely accepted acoustical propagation modeling tool, used by many noise control professionals in the United States and internationally.

ISO 9613-2 assumes downwind sound propagation between every source and every receptor, consequently, all wind directions, including the prevailing wind directions, are taken into account.

Model Assumptions

The study area was modeled with soft ground (G=1.0). A temperature of 10 degrees Celsius with 70 percent relative humidity was used. A 1.5-meter (5 foot) receptor height was used for contour mapping to represent ground level (and ground floor) exposures. Both 1.5-meter (5 foot) and 4-meter (13 foot) receptor heights were used to model discrete receptors (like homes), representing ground level and upper story exposures. On-site structures were modeled in all scenarios. Residential structures were modeled for contour mapping but were not included in the more conservative (worst-case) modeling of discrete receptors. Modeling inputs are provided in Appendix H.

Sound Source Validation

As described in Chapter 6.0, the project team did not receive permission to monitor on ROC property. Sound source levels were validated based on monitoring conducted at the ski hill and in the surrounding communities. For each scenario, a representative time period occurring during attended monitoring was selected. The 1/3 octave sound source spectra were calculated based on the sounds measured at the long-term North Monitor. The overall A-weighted sound level was then validated at each of the three long-term monitors. The 1/3 octave band spectra for all sound sources are provided in Appendix H, based on the data from the North Monitor. Details for each scenario are provided in Section 7.2.

7.2 MODELING RESULTS

Sound propagation models were developed for seven scenarios: 1) Existing daytime background traffic noise, 2) Milwaukee Milkmen baseball game at Franklin Field Baseball Stadium, 3) live music from a band at the Umbrella Bar, 4) a baseball game concurrent with a live band, 5) fireworks, 6) The Hills Have Eyes event, and 7) snowmaking. A summary of modeling results is given in Table 4 for the "worst-case" residence in each residential area surrounding the ROC (see Figure 2 for Neighborhood Identifiers). The modeled sound levels for each receptor are given in Appendix I.

TABLE 4: TYPICAL L_{EQ} AT LONG-TERM MONITORS AND NEARBY WORST-CASE RESIDENCES

REPRESENTATIVE RECEPTOR	DAYTIME TRAFFIC NOISE LEVEL	SOUND LEVEL GENERATED BY ROC ACTIVITIES, dBA					
		Baseball	Concert	Baseball + Concert	Fireworks	Hills Have Eyes	Snowmaking
Neighborhood A	36 to 53	40	47	48	78	52	47
Neighborhood B	42 to 57	46	54	54	79	52	45
Neighborhood C	37 to 57	43	39	44	74	45	41
Neighborhood D	29 to 55	43	38	44	74	43	42
Neighborhood E	29 to 51	49	48	52	78	46	47
East Monitor	46	45	45	48	78	50	44
North Monitor	40	55	57	59	88	56	83
West Monitor	26	49	48	51	78	45	47

Existing Traffic Noise

Existing traffic noise levels were predicted using worst-hour traffic volumes available on the Wisconsin Department of Transportation (WisDOT) Traffic Counts Map Application (TCMap). Modeling was conducted using the Federal Highway Administrations Traffic Noise Model (TNM 2.5), as implemented in the CadnaA software. Modeling results do not include sound generated by other background sound sources, such as aircraft, natural, or community sound sources such as lawn equipment or human vocalizations. Modeled sound levels were not validated with sound monitoring. Modeled hourly-average sound levels (L_{1hr}) are shown in Figure 24.

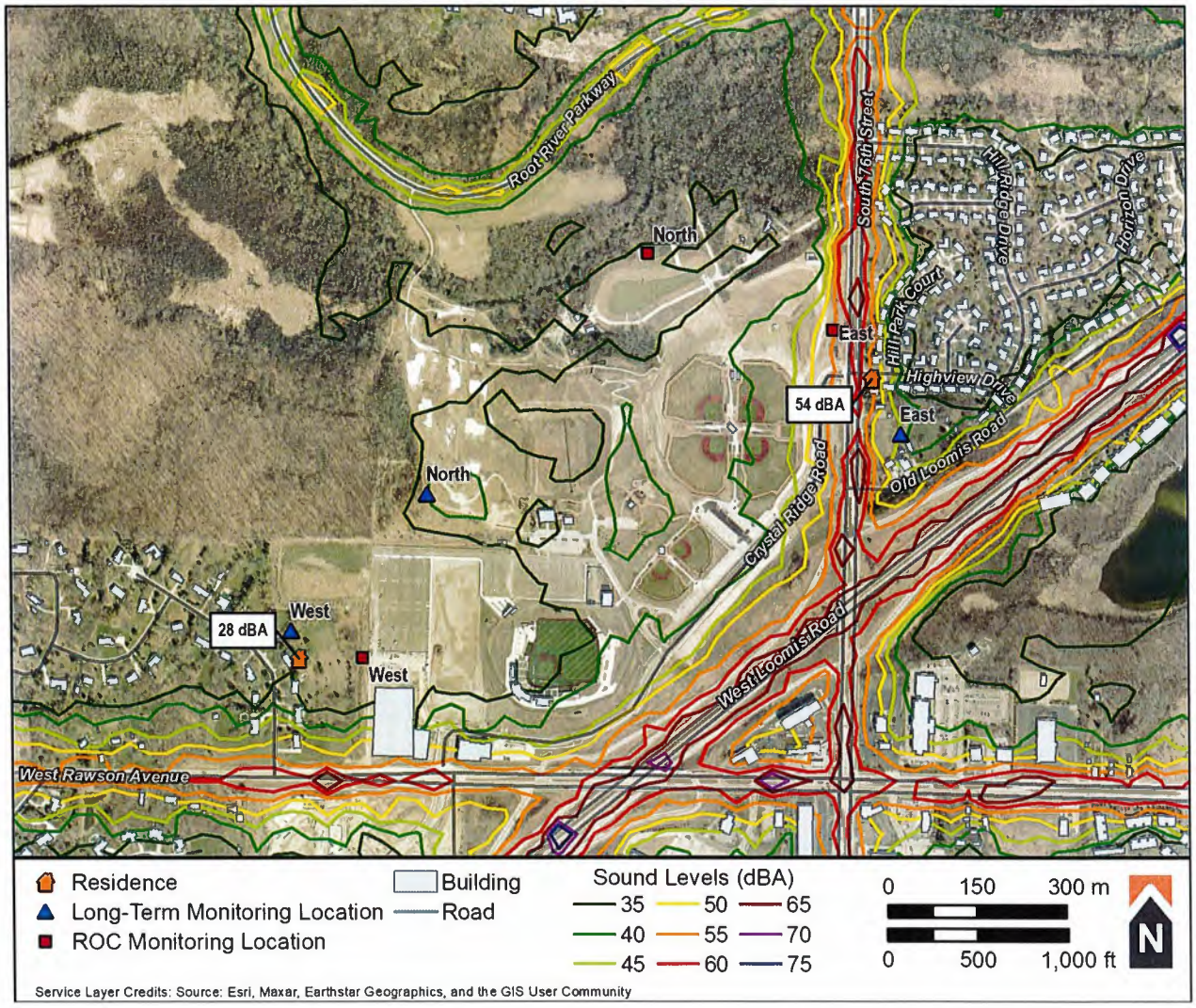


FIGURE 24: MODELED HOURLY AVERAGE L_{EQ} – EXISTING TRAFFIC NOISE

Milwaukee Milkmen Baseball Game

Sound propagation modeling was validated based on the Milwaukee Milkmen baseball game occurring on August 27, 2022, which included both attended and unattended sound monitoring. The speakers from Franklin Field were modeled as individual point sources. Speaker locations, height, and directivity were based on photos taken during field observations (see Appendix D). The spectra and sound level were based on a representative 1-minute L_{eq} that included both the "Moo-ing" and the announcer talking through the PA system. The background sound levels were removed for each 1/3 octave band using a 10-minute L_{eq} prior to the baseball game. Modeled average sound levels (L_{eq}) are shown in Figure 25.

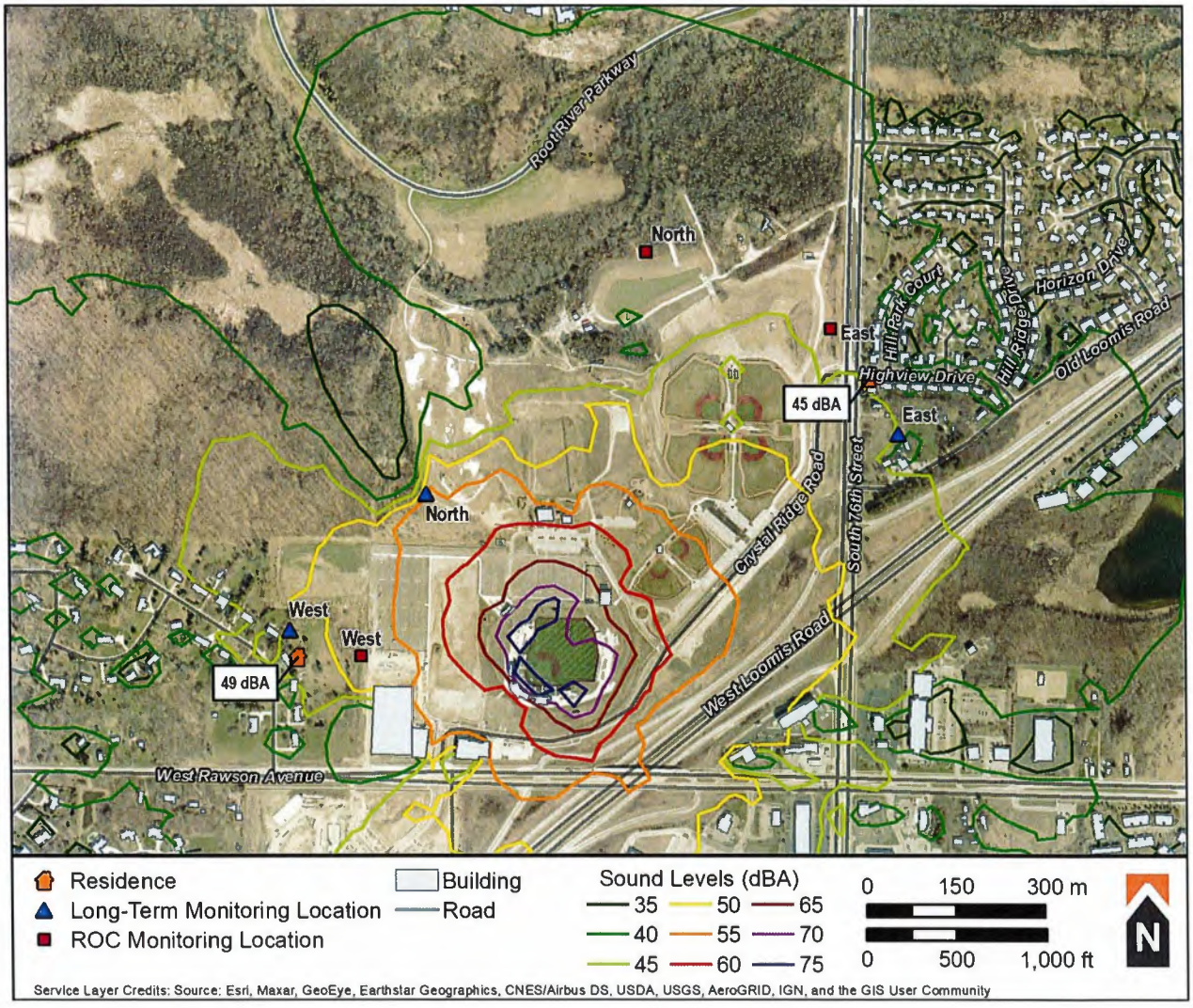


FIGURE 25: MODELED SOUND LEVELS, L_{EQ} - MILWAUKEE MILKMEN BASEBALL GAME

Live Music at the Umbrella Bar

Sound propagation modeling was validated based on the rock band playing at the Umbrella Bar occurring on September 10, 2022, which included both attended and unattended sound monitoring. The band was modeled as an individual point source in front of the stage at a height of 1.5 meters (5 feet) directed towards the patio and umbrella bar area. The spectra and sound level were based on a representative 10-minute L_{eq} during the rock band concert occurring on September 10. The background sound levels were removed for each 1/3 octave band using a 10-minute L_{eq} after the concert was over. Modeled sound levels (L_{eq}) are shown in Figure 26.

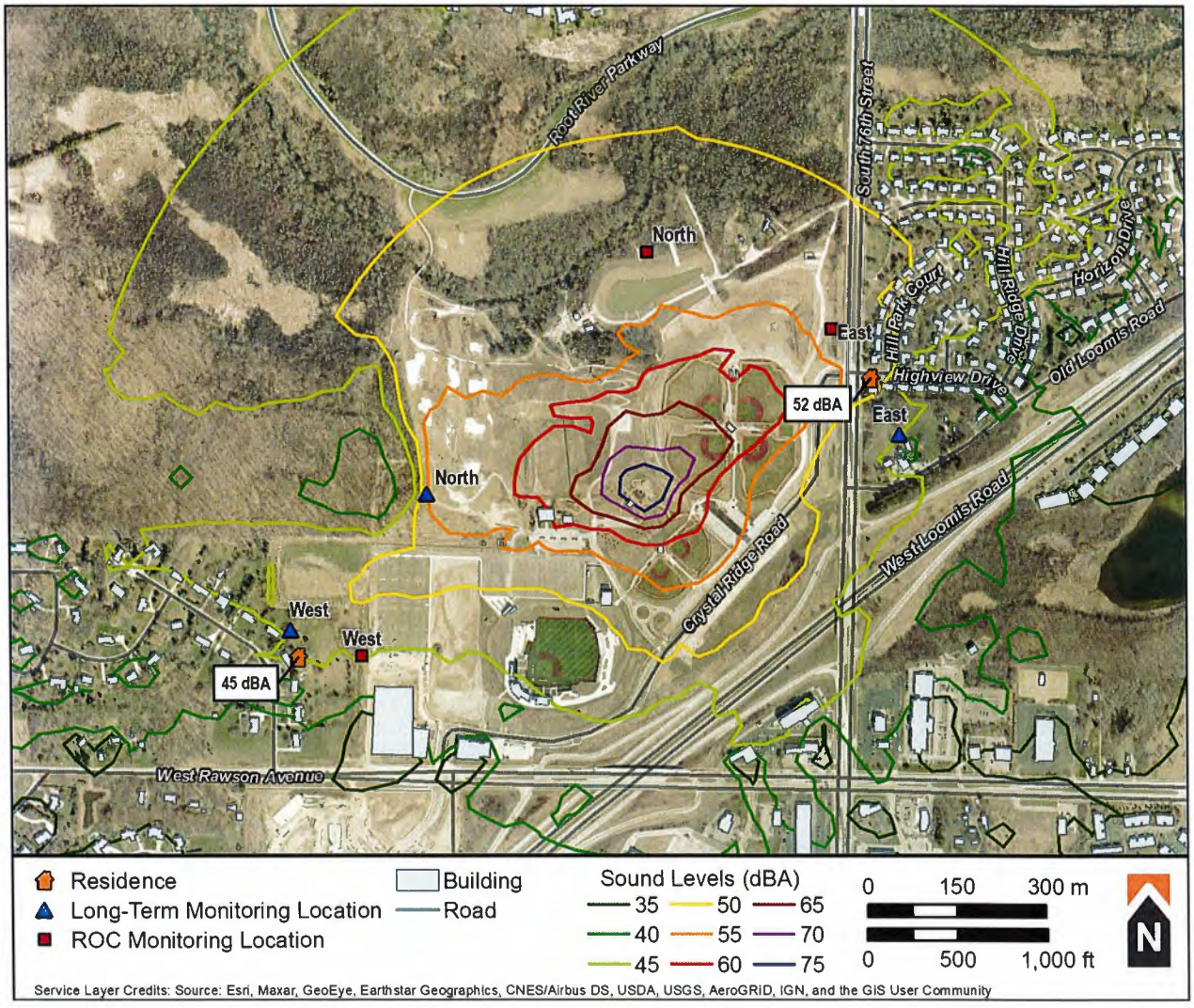


FIGURE 26: MODELED SOUND LEVELS, L_{EQ} – UMBRELLA BAR

Baseball Game Concurrent with Umbrella Bar Band

Sound propagation modeling used the sound pressure levels from "Moo-ing" and announcer during the Milwaukee Milkmen baseball game on August 27, 2022 and the rock band concert at the Umbrella Bar on September 10, 2022. Model inputs are the same as those described in the Milwaukee Milkmen Baseball Game and Umbrella Bar Band sections above. Modeled average sound levels (L_{eq}) are shown in Figure 27.

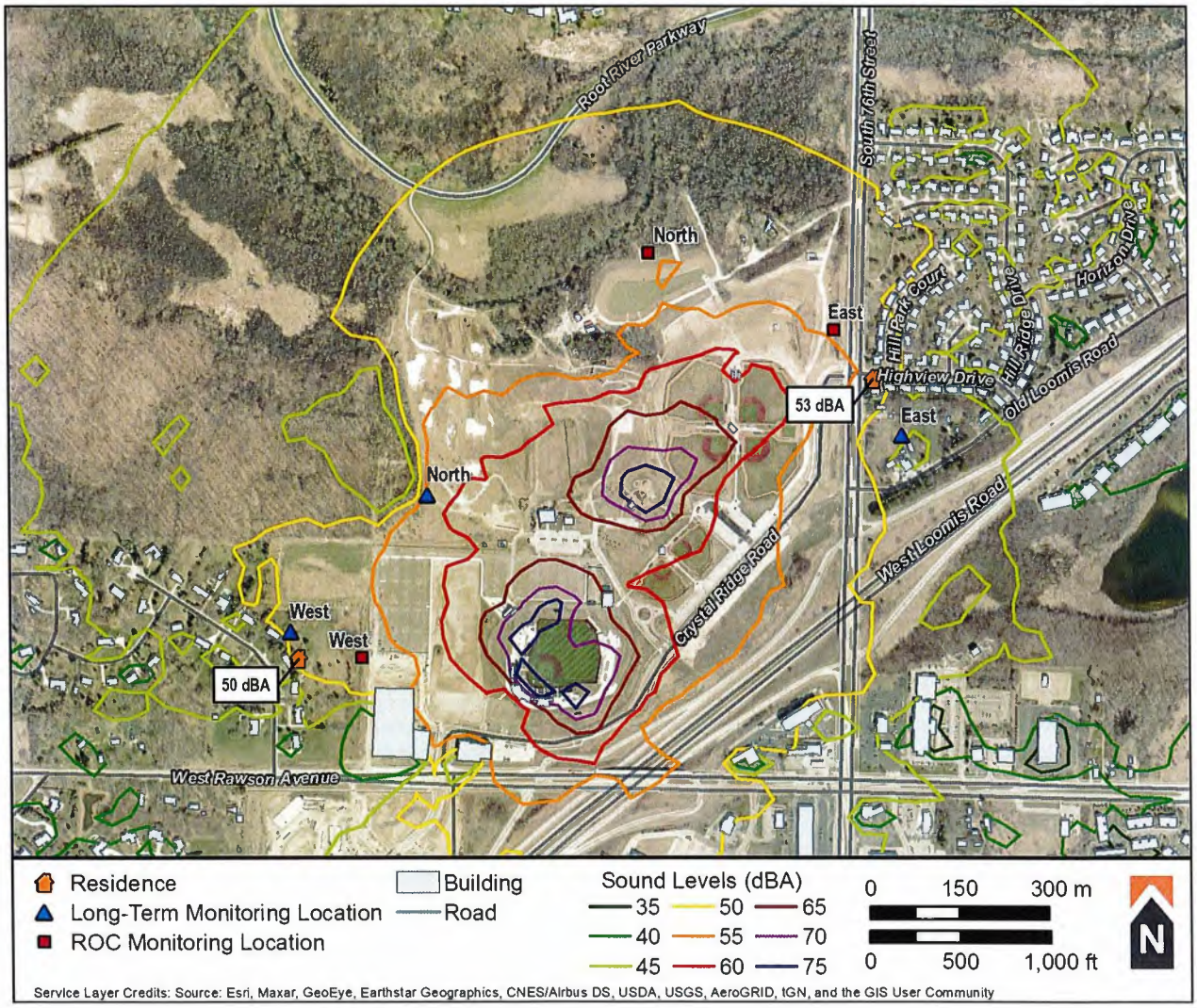


FIGURE 27: MODELED SOUND LEVELS, L_{EQ} – UMBRELLA BAR AND MILKMEN BASEBALL GAME

Fireworks

Sound propagation modeling was validated based on the fireworks occurring on August 6, 2022, which included both attended and unattended sound monitoring. For a conservative worst-case analysis, fireworks were modeled as two individual point-sources, a launch and a burst, occurring simultaneously. The launch was modeled at a height of 0.5 meters (1.6 feet) above the ground elevation and the blast was modeled at a height of 183 meters (600 feet) above the ground. The spectra and sound level were based on the highest 1-second L_{eq} of each sound source. Modeled average sound levels (L_{eq}) are shown in Figure 28.

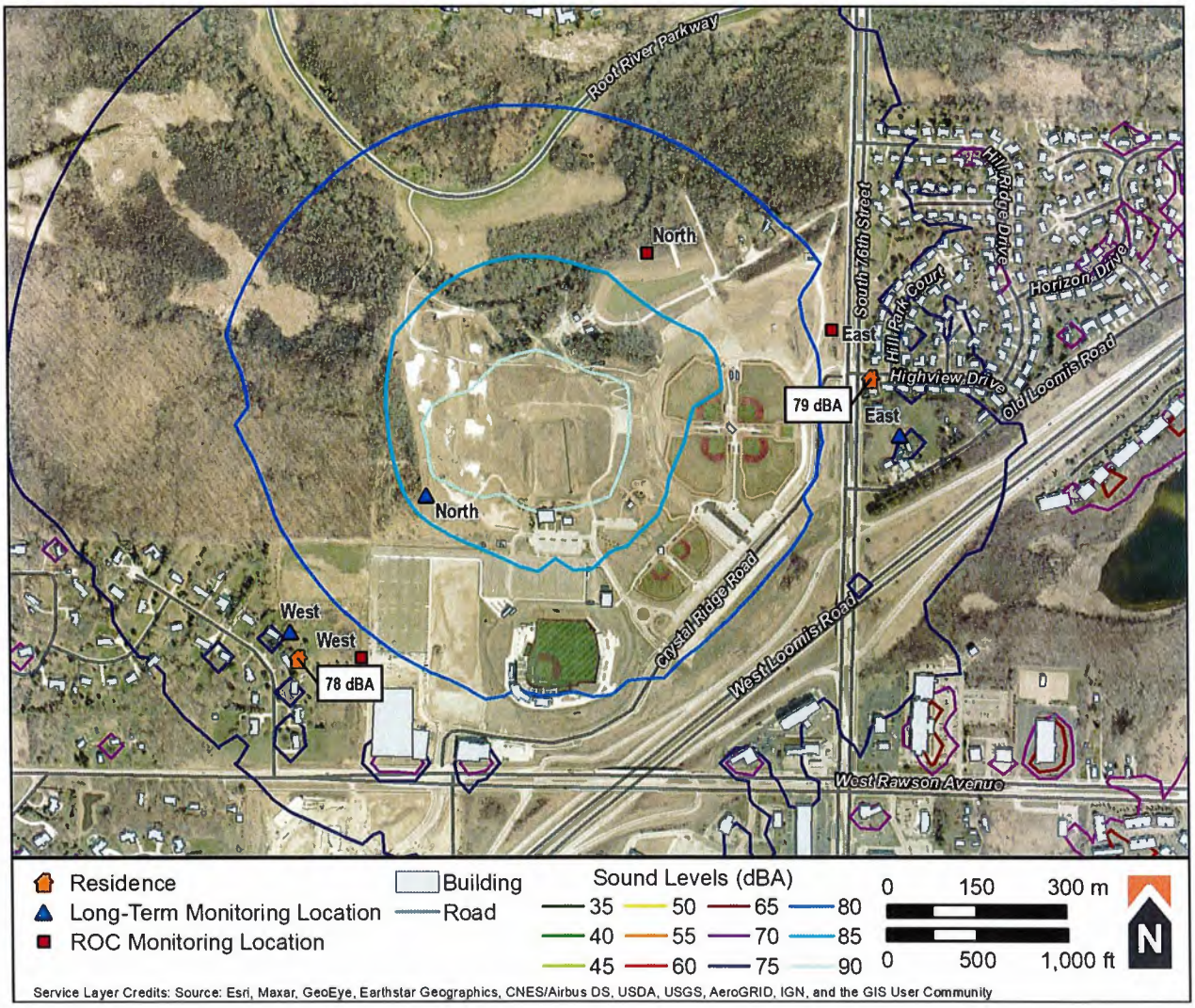


FIGURE 28: MODELED SOUND LEVELS, L_{EQ} – FIREWORKS

The Hills Have Eyes Event

Sound propagation modeling was validated based on measurements made on October 29, 2022, which included both attended and unattended sound monitoring. The event was modeled as an area source located at the base of the tubing hill. The spectra and sound level were based on a representative 10-minute L_{eq} that included all representative sound sources (chain saw, people talking, music, etc.). The background sound levels were removed for each 1/3 octave band using a 10-minute L_{eq} from before the event started. Modeled average sound levels (L_{eq}) are shown in Figure 29.

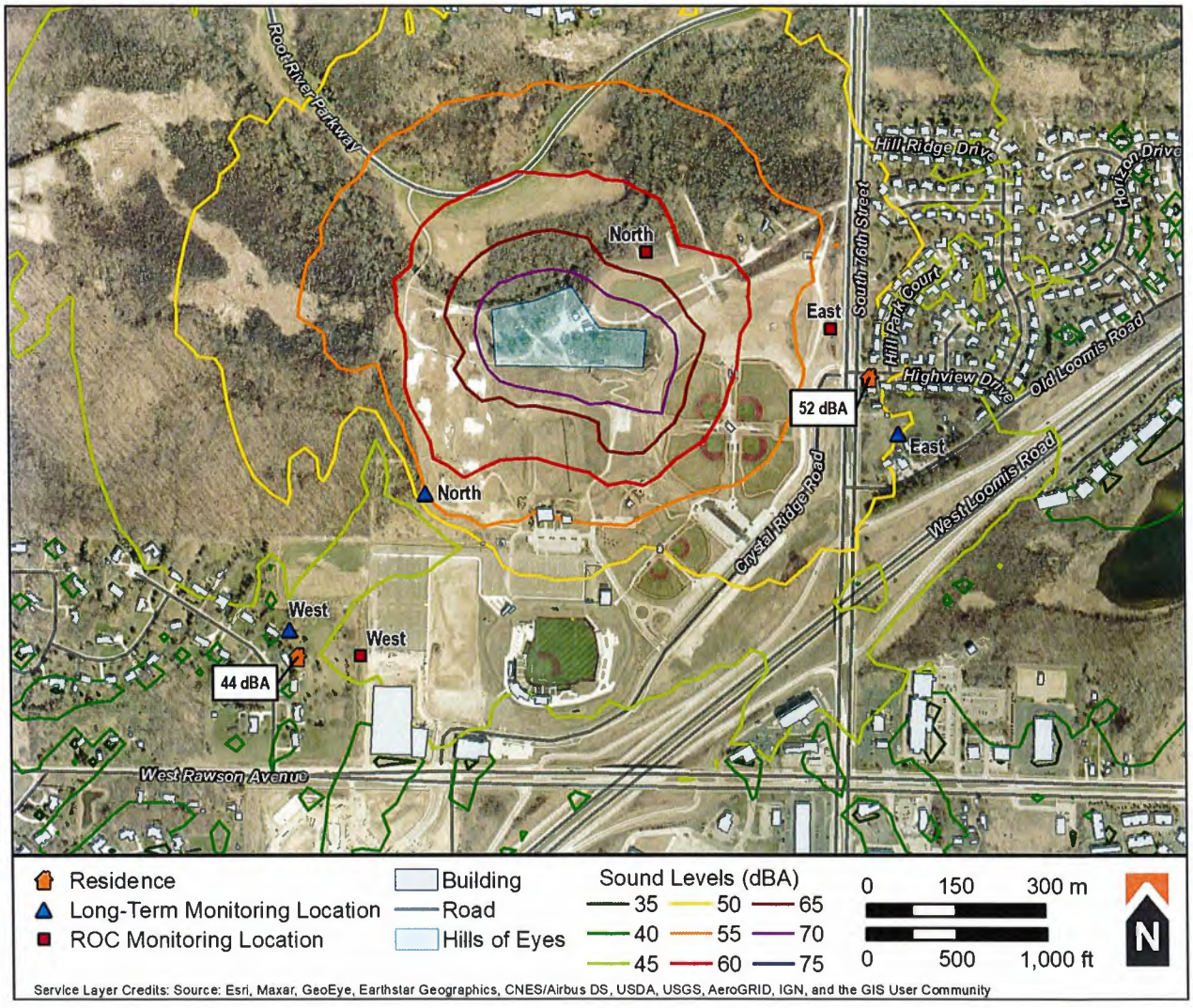


FIGURE 29: MODELED SOUND LEVELS, L_{EQ} – HILLS HAVE EYES EVENT

Snowmaking

Sound propagation modeling was validated based on the snowmaking occurring on December 16, 2022. The snow making equipment was modeled as individual point sources at a height of 1.5 meters (5 feet) or 3 meters (10 feet). The equipment location and height were determined based on photos from the December 12, 2022 field visit and aerial imagery. The spectra and sound level were based on a representative 1-hour L_{eq} while the snowmaking was occurring. Modeled average sound levels (L_{eq}) are shown in Figure 30. Note that these sound levels represent a credible worst-case positioning of the snow guns and are somewhat higher than the average measured levels provided in Section 6.4.

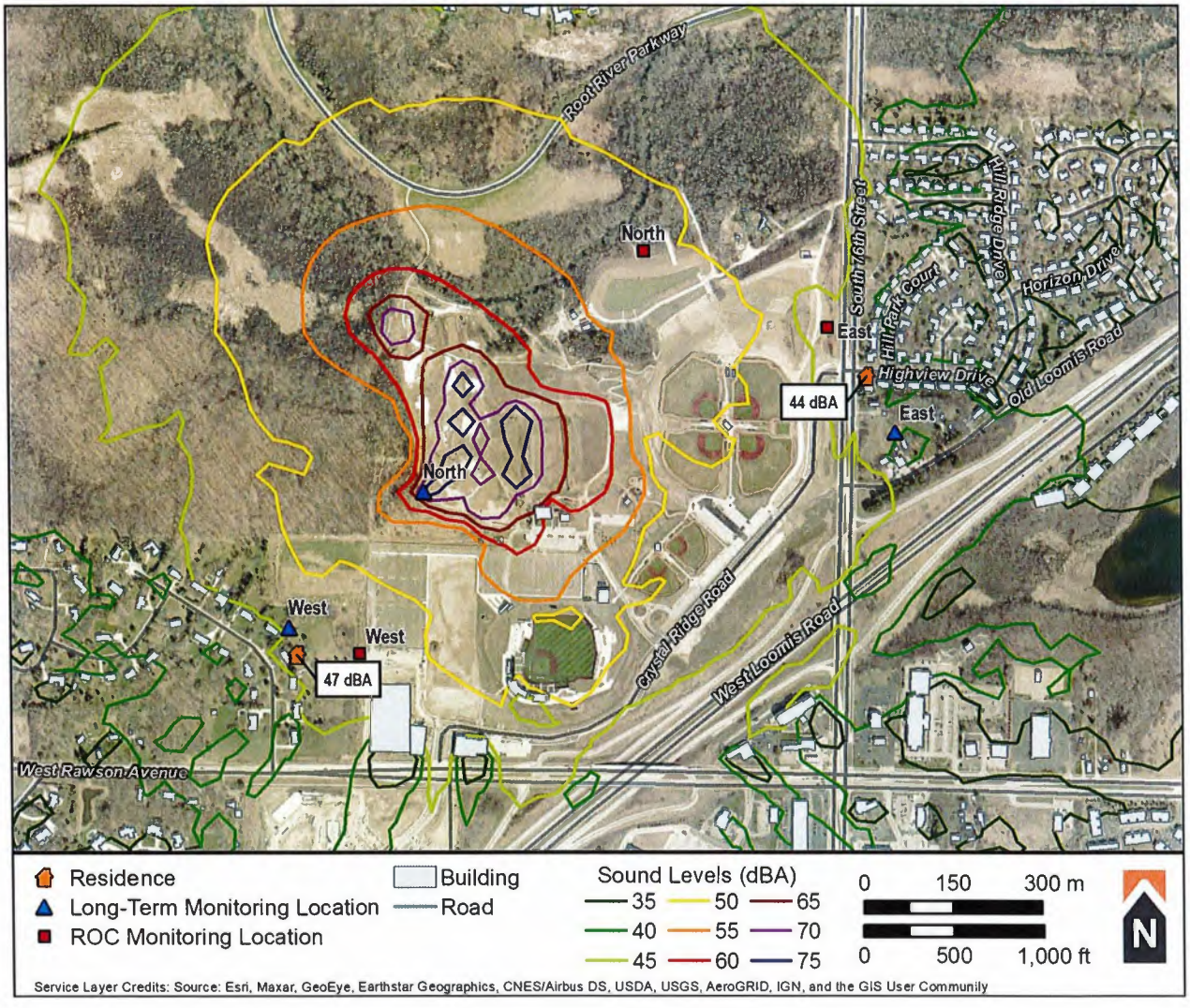


FIGURE 30: MODELED SOUND LEVELS, L_{EQ} – SNOWMAKING

8.0 ROC COMPLIANCE MONITORING

The Chapter described the current state of enforcement of the development agreements through use of compliance monitoring.

8.1 ROC COMPLIANCE MONITOR LOCATIONS

As RSG staff were not given permission to access the ROC facility or monitors, we cannot comment on the appropriateness of the micro-siting of the equipment. Using the general mapped location information provided by the County, the ROC compliance monitor locations were assessed for their ability to represent the sound exposure levels of nearby residences and property boundaries. Based on our review of the monitoring locations, it is assumed that the ROC West Monitor is meant to represent residences in the Hawthorn Neighborhood (Neighborhood E in Figure 31), the ROC East Monitor is meant to represent residences in the H Section Neighborhood (Neighborhood B), and the ROC North Monitor is meant to represent residences in Overlook Farms (Neighborhood A).

The modeled sound levels at each ROC monitor were compared to the modeled sound levels at the neighborhood locations to assess whether each location was appropriate for the associated neighborhood and property boundary locations. A summary of modeling results is given in Table 5 for the three ROC monitors and for the neighborhoods which they are meant to represent. Note that the modeled levels shown in Table 5 are averages and are not comparable to regulatory limits.

TABLE 5: MODELED AVERAGE SOUND LEVELS AT ROC COMPLIANCE MONITORS COMPARED TO THE WORST-CASE NEIGHBORHOOD RESIDENCE AND PROPERTY BOUNDARY

		SOUND LEVELS GENERATED BY ROC ACTIVITIES, dBA					
		Baseball	Concert	Baseball + Concert	Fireworks	Hills Have Eyes	Snowmaking
ROC West Monitor	Monitor	53	45	54	79	46	48
	Residence	50	48	52	78	46	47
	Property Line (PL)	52	48	53	80	49	49
	Monitor - Res	+3	-3	+2	+1	0	+1
	Monitor - PL Res	+1	-3	+1	-1	-3	-1
ROC North Monitor	Monitor	43	54	55	84	62	51
	Residence	40	47	48	78	52	47
	Res. PL	40	47	48	78	53	47
	Park PL	43	53	54	83	63	60
	Monitor - Res	+3	+7	+7	+6	+10	+4
	Monitor – PL Res	+3	+7	+7	+6	+9	+4
	Monitor - PL Park	0	+1	-1	+1	-1	-9
ROC East Monitor	Monitor	44	54	55	79	51	44
	Residence	46	54	54	79	52	45
	Property Line (PL)	48	54	55	79	53	44
	Monitor - Res	-2	0	+1	0	-1	-1
	Monitor - PL Res	-4	0	0	0	-2	0

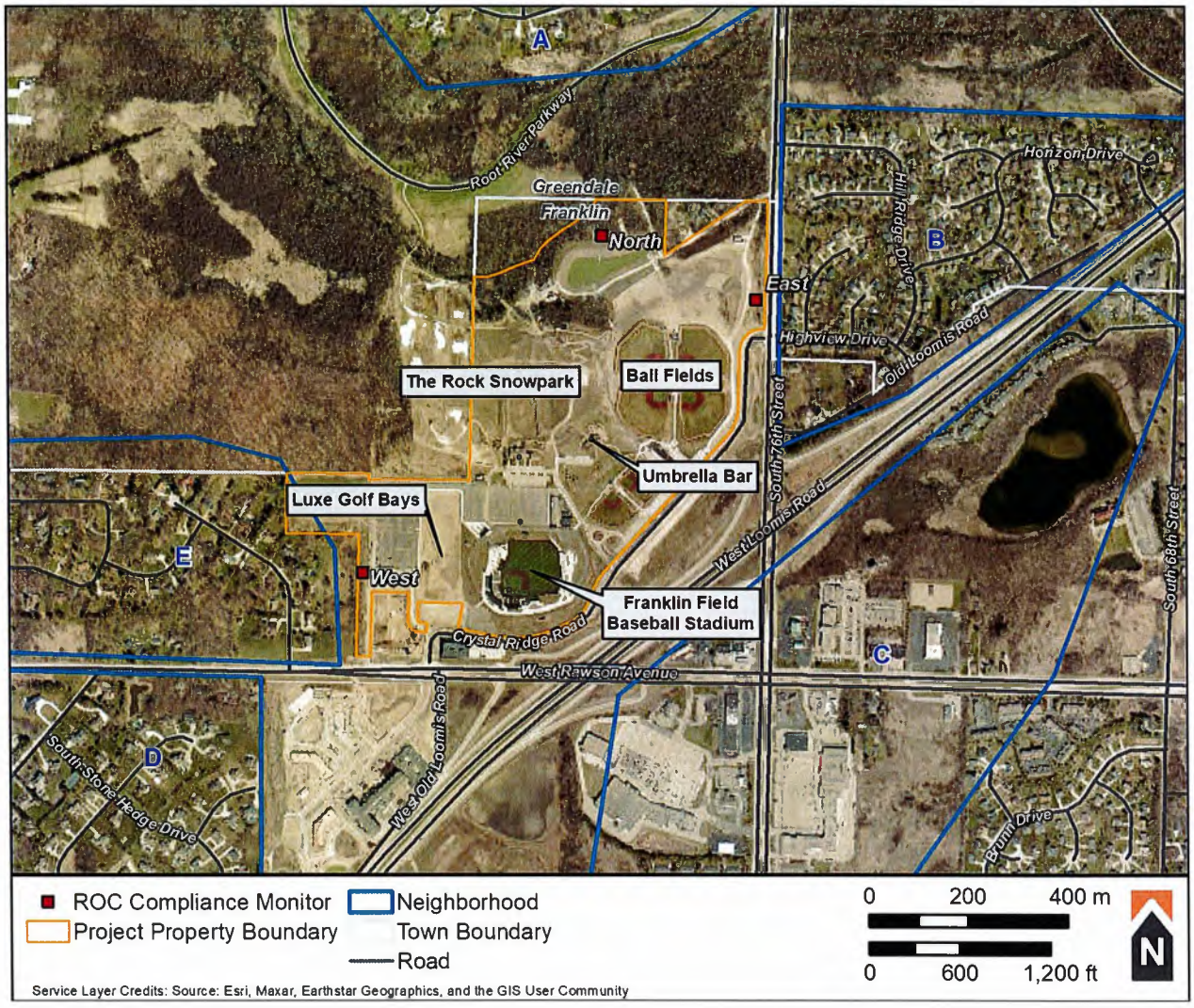


FIGURE 31: ROC COMPLIANCE MONITOR LOCATIONS

Modeled sound levels at the ROC West and East Monitors are within 3 dB of worst-case adjacent residential homes during all events and also within 3 dB of the worst-case property boundary, with the exception of the ROC East Monitor being 4 dB below the level at the property line during baseball games. Baseball games are not generally audible above traffic noise in Neighborhood B. Therefore, we would consider these locations to be appropriate to represent the adjacent residences and residential property boundaries.

The ROC North Monitor is exposed to sound levels 3 to 10 dB higher than the worst-case residences to the north and to the neighborhood property line, but generally within 1 dB of the property boundary of the adjacent park (with the exception of snowmaking, which is located very close to the park boundary). Moving this monitor further to the north, closer to the residences in

the Overlook Farms neighborhood, would result in it being better representative of the residences but less representative of the park. Alternatively, since the Overlook Farms neighborhood generally has a lower noise exposure that the Hawthorn or H Section neighborhoods, the ROC North Monitor could be moved to act as a reference location for sounds generated by activities at the Umbrella Bar. In this case, the monitor would be best located at the far (northwest) end of the Umbrella Bar seating area. If the ROC North Monitor is used as a reference location, the sound levels would be anticipated to be substantially higher than those experienced in the neighborhoods. The sound levels measured at this location would, therefore, not be used directly to assess compliance for a residential location. Rather, the monitor would be used to confirm that sound levels occurring at the East or West ROC Monitors are correctly attributable to ROC activities.

8.2 ROC COMPLIANCE MONITORING DATA

Pursuant to the ROC's development agreements with the County, the ROC must make data from the ROC Compliance Monitors available to the City and/or County upon request. It is our understanding that this data is being provided to the City of Franklin, by request, on the days on which a complaint is filed with the City. However, through discussions with the City of Franklin we understand that the ROC East and West Monitors are not currently operational and have been inoperable for a long period, perhaps approaching a year. Therefore, data is currently being provided for the ROC North Monitor only.

As part of the sound study, we reviewed the ROC North Monitor data acquired on the dates of the attended short-term monitoring, August 6, 20, 27, and 28, September 10, and October 29, 2022. Sound level monitoring at the ROC North Monitor is being performed with a Larson Davis 831 sound level meter (SLM). The SLM is currently programed to log overall A-, C-, and Z-weighted equivalent continuous sound levels (L_{eq}) once each minute. Ten-second duration sound recordings are made automatically if the sound level exceeds 65 dBA L_{max} using a slow-response time weighting. An event history is also recorded, with an average (L_{eq}) and maximum (L_{max}) level occurring during each logged period for the entire duration for which the sound levels exceeded 65 dBA L_{max}. Note that this is 5 dB below the City of Franklin's limit of 70 dBA.

Because the amount of time that exceeds 65 dBA L_{max} for each logged event period varies, the duration of the recorded L_{eq} for each of these events varies, resulting in inconsistent data being used to identify violations of the limits. In addition, the selection of 65 dBA L_{max} as a trigger level weights the average sound level (L_{eq}) of these documented events to a sound level closer to 65 dBA L_{eq}. If a higher trigger level were to be used, the resulting L_{eq} level for the recorded event would be higher because the lower sound levels would not be included in the averaging.

The ROC North Monitor data documents that the SLM was last field calibrated on June 20, 2019, almost four years ago. The date of the last lab calibration is unknown.

The Larson Davis 831 SLM is an ANSI/IEC Type 1 SLM with a frequency range of 6.3 Hz to 20 kHz and should be sufficient for use as a compliance monitor. However, compliance monitoring can only be effective if all three required monitors are operating, properly maintained and calibrated, and data is provided to the City and/or County upon request. As a result, we have numerous concerns:

- The compliance monitors are only effective to identify violations if they are operating. Currently the ROC North Montor, which does not clearly represent any of the nearby residences, is the only operational monitor.
- The data file from the ROC North Monitor indicates that it has not been field calibrated in nearly four years. This is insufficient to ensure that the SLM is acquiring accurate data. To ensure that the SLM is acquiring valid data, each meter should be field calibrated at least monthly (ANSI S12.18 specifies that a calibration check shall be performed at least at the beginning and end of each measurement session), and lab-calibrated every two years (see ANSI S1.13:9.2 .1 and ISO 1996-2). Lab-calibrations should take place during the off-season when event exceedances are not anticipated.
- We recommend that a more consistent method of identifying exceedances be programmed into the SLMs. This is described in more detail in Chapter 11.0.

8.3 CITY OF FRANKLIN'S ENFORCEMENT PROCESS

From discussions with the City of Franklin, we understand that the City is currently enforcing compliance of the ROC with the Ballpark Commons Development Agreement through the following process:

1. If the City receives a complaint, they request data from the ROC compliance monitors for the day of the complaint.
2. The data from the ROC compliance monitors is provided to the City for review. The provided data includes sound level and 10-seconds of audio data for periods when sound levels exceeded 65 dBA L_{max}. Currently only data from the ROC North Monitor is being provided.
3. The City listens to all provided recordings for the day of the complaint to determine if the sounds are generated by the ROC or by background sound sources.
4. For ROC generated sounds, the City reviews the monitor data to determine if the sound levels exceed the ordinance limits. Due to the lack of clarity of the Development Agreement and the Franklin Noise Ordinance, the identification of a violation has been interpreted differently over time.
    a. Until recently, the practice of the City had been to identify a violation of the ordinance limits only if the sound level at a monitor continuously exceeded 79 dBA for a duration of 30 minutes or more. Thus, a musical concert could consist

of a series of songs that are consistently louder than the limits and the concert could go on for several hours and not be treated as a violation if there was even a short break between one song and the next or a relatively quiet period within a song. Only a continuous exceedance of the 79 dBA limit for 30 minutes or more was treated as a violation. There is and was no basis in the language in the Development Agreement or in the ordinance for this practice. The Franklin ordinance prohibits activities resulting in sound levels of 70 to 79 dBA and does not exempt exceedances that last less than 30 continuous minutes.

b. Currently, the practice of the City is to identify a violation of the ordinance limits if the sound level at a monitor exceeds 74 dBA during nighttime (10 PM to 7 AM) or 79 dBA during daytime (7 AM to 10 PM) hours. The sound level from the provided monitor data that is compared to these limits is the average (L_{eq}) sound level occurring over the period of the exceedance of the 65 dBA L_{max} threshold.

5. If there is an exceedance, the City will provide enforcement of the agreement. So far, no exceedances have been identified through this process. The City's practice is currently to exempt fireworks from the sound limits.

The current interpretation of the noise limits by the City is an improvement from the previous interpretation of the limits. However, the City fails to apply the 70 dBA limit from the ordinance, instead selecting 74 dBA and 79 dBA as the daytime and nighttime limits, respectively The sound level from the provided monitor data that is currently compared to these limits is the average sound level occurring over the period of the exceedance of the 65 dBA L_{max} threshold. As described above, the use of an L_{eq} that includes sounds down to 9 dB below the violation limit will, by its very nature, tend to weight the sound level to most likely be below the limit. No metric or averaging time is specified. The Franklin limit does not distinguish between daytime and nighttime hours, but the City's enforcement implies that there is a distinction.

Another item of note is that because the City only looks at the data if there is a complaint, the burden is on citizens to enforce the noise standard rather than the ROC reporting back to the City about its activities. Additionally, the City is overlooking the most impactful noise events - fireworks - with apparently no variance in place under the regulations.

As a result, it is no surprise that no violations have been identified, despite regular complaints from residents. Clarity of the Development Agreement and the Franklin Noise Ordinance limits is needed to make this process effective in identifying periods of activity that "substantially annoy, injure or endanger the comfort, health, repose or safety of the public." This is provided in Chapter 11.0.

9.0 SOUND EXCEEDANCE EVALUATION

In this section we identify where sound levels may exceed appropriate noise limits at the receiving use, in this case the residential homes and property boundaries surrounding the ROC. Chapter 6.0 described the results of the sound monitoring, which was made at representative locations and not necessarily at the worst-case residential locations. The modeling results described in Chapter 7.0 can be used to adjust the Chapter 6.0 measured levels to sound levels at residences.

An evaluation of the sound levels in each neighborhood, relative to the applicable standards and guidelines, is provided below. Franklin and Greendale have regulations that include direct sound limits that address the overall A-weighted sound levels only. Due to community concerns over the low frequency content of some of the ROC events, an additional analysis of low frequency sound was also included.

Note that the assessment in this report evaluates sound levels generated by average events. Although typical events did not exceed the thresholds in many cases, there is still potential for louder than typical events to exceed thresholds. In addition, this assessment does not include an evaluation of the characteristics of the sound (i.e., use of a penalty to account for speech and / or music sounds) or the impact associated with event generated sound level increases over background sounds.

9.1 LOCAL JURISDICTIONS

City of Franklin

The City of Franklin noise regulation does not specify the intended metric for their 70 dBA sound limit and does not differentiate between daytime and nighttime limits. The limit applies at the real property boundary of the noise source.

Based on our prior experience and a comparison to the comparable levels in the Greendale code, we are interpreting the 70 dBA limit from the City of Franklin as an L_{max}, which is the highest level measured during a given monitoring period. The L_{max} will vary depending on the time response speed of the sound level meter. The ROC monitors and the RSG monitors are set to a slow time response (1-second time constant), which is a common setting for environmental sound monitoring.

The L_{max} is necessarily an outlier, occurring for less than or equal to a second of any hour. It may make sense to use the L_{max} for identification of individual exceedances when audio is reviewed to attribute the exceedance to the sound source. However, for purposes of identifying typical exceedances for average events, we have used the L_{01} of the long-term monitoring data for this exceedance evaluation. The L_{01} is the highest 1% of sound levels in a given period and is commonly thought of as a 'typical' maximum, or the maximum level that is typically reached.

The assessment period for all events was one-hour, except for fireworks, which were assessed on a 10-minute basis.

Table 6 shows the measured L_{01} levels for each monitor location. Table 7 compares the calculated L_{01} levels to the Franklin sound limit. As shown in Table 7, fireworks exceeded the limit in all surrounding neighborhoods and at the property boundaries. Live music at the Umbrella Bar also exceeds the limit at the worst-case location in Neighborhood B and at the Neighborhood B property boundary.

TABLE 6: MEASURED L_{01} SOUND PRESSURE LEVELS (dBA)

MONITOR	FIREWORKS	BASEBALL	CONCERT	SNOWMAKING	HILLS HAVE EYES
East	90	64	64	59	59
North	92	64	64	75	56
West	86	62	62	54	54

TABLE 7: COMPARISON OF MONITORING RESULTS TO CITY OF FRANKLIN LIMIT, L_{01} (dBA)

WORST-CASE MODELED EXPOSURE LEVELS BY NEIGHBORHOOD, dBA										
	Fireworks		Baseball		Concert		Snowmaking		Hills have Eyes	
	Ground Floor	Upper Floor	Ground Floor	Upper Floor	Ground Floor	Upper Floor	Ground Floor	Upper Floor	Ground Floor	Upper Floor
Neighborhood A	82	85	49	50	55	57	39	41	52	52
Neighborhood B	91	94	65	67	72	74	60	62	60	61
Neighborhood C	82	85	56	58	54	57	47	49	54	55
Neighborhood D	82	86	56	57	52	54	49	50	52	53
Neighborhood E	86	89	62	64	62	65	53	54	55	56
Boundary A	82		49		55		39		53	
Boundary Park (A)	87		52		61		52		63	
Boundary B	91		67		73		59		62	
Boundary C	85		65		60		53		55	
Boundary D	83		56		52		48		51	
Boundary E	88		65		62		56		58	
NOISE IMPACTS BY NEIGHBORHOOD (Franklin Limit = 70 dBA)										
Neighborhood	All	All	None	None	B	B	None	None	None	None
Boundaries	All		None		B		None		None	

Village of Greendale

The Village of Greendale regulations include noise limits at residential receiving uses. The limits vary based on the type of sound generated, e.g. perpetual, impulsive, intermittent, and continuous. Similar to the City of Franklin's Code, the averaging time and metric are ambiguous. Although not explicit in the code, it is implied that the limit is an L_{eq} for the duration of the event.

Table 8 shows the calculated Event-Only L_{eq} for each RSG monitor location. Table 9 compares the Village of Greendale nighttime sound limits for residential, agricultural, historic, and park districts to the worst-case sound levels in each neighborhood. Although not specified in the Greendale code, it is assumed that the limits apply to the Event-Only levels and not the overall (event plus background) levels. As shown in Table 9, fireworks exceeded the limit in all surrounding neighborhoods. Live music at the Umbrella Bar during a typical concert exceeded the limit at the worst-case location in Neighborhoods B and E. All other typical events were within the Greendale limits.

TABLE 8: MEASURED SOUND PRESSURE LEVELS, L_{eq} (dBA)

MONITOR	FIREWORKS	BASEBALL	CONCERT	SNOWMAKING	HILLS HAVE EYES
East	79	44	45	41	*
North	84	51	52	70	*
West	77	48	49	35	*

*Not discernable from background sound levels.

TABLE 9: COMPARISON OF GREENDALE LIMITS TO EACH EVENT, L_{eq} (dBA)

WORST-CASE MODELED EXPOSURE LEVELS BY NEIGHBORHOOD, dBA										
	Fireworks		Baseball		Concert		Snowmaking		Hills have Eyes	
	Ground Floor	Upper Floor	Ground Floor	Upper Floor	Ground Floor	Upper Floor	Ground Floor	Upper Floor	Ground Floor	Upper Floor
Neighborhood A	74	77	36	37	43	45	34	36	-	-
Neighborhood B	80	83	45	47	53	55	42	44	-	-
Neighborhood C	73	76	42	44	41	44	28	30	-	-
Neighborhood D	73	77	42	43	39	41	30	31	-	-
Neighborhood E	77	80	48	50	49	52	34	35	-	-
NOISE IMPACTS BY NEIGHBORHOOD										
Greendale Limit Daytime / Nighttime	Impulsive 70/60		Intermittent 60/55		Continuous 50/45		Perpetual 50/45		Intermittent 60/55	
Neighborhood - Daytime	All	All	None	None	B	B, E	None	None	None	None
Neighborhood - Nighttime	All	All	None	None	B, E	B, E	None	None	None	None

Low-Frequency Sound

Fireworks exceed the ANSI S12.9 Part 4 thresholds of 65 dB in the 31.5 Hz octave band and 70 dB in the 63 Hz octave band[5] in all surrounding neighborhoods and live music at the Umbrella Bar exceeded the low frequency thresholds in Neighborhood E. All other events remain below the notated thresholds.

[5] See Section 5.5 for a description of ANSI S12.9 Part 4.

10.0 STANDARDS ANALYSIS

The sound study included the development of sound thresholds for use in the County's and/or other municipality's municipal code(s). Through discussions with the County, RSG was directed to clarify the existing Franklin Code language to help the City to enforce the Development Agreement with the ROC.

The Development Agreement does not specifically set out a noise limit and the City of Franklin's Code is not specific in that it does not indicate the type of sound level or metric (i.e., maximum sound level, average sound level) or averaging time associated with the sound limits. Due to the lack of clarity of the Development Agreement and the Franklin Noise Ordinance, the identification of a violation is left to interpretation by the City's enforcement officer and the interpretation has changed over time.

Identification of the sound metric is essential for the City's Code so it may be used more effectively to identify violations. In defining a sound metric for regulation, the following should be considered:

1) Relevance – The sound metric should be relevant to impacts on humans or wildlife and not be set arbitrarily.
2) Sound source characteristics – The sound metric should be based on the characteristic of the source in terms of the sound sensitivity of humans to the type of sound, the variability of the sound over time, and the spectral characteristics of the sound.
3) Ease of enforcement – The metric should be able to be measured and violations identified using the existing ROC compliance monitor equipment. Some metrics can only be measured or calculated by an experienced noise control engineer using specialized sound monitoring equipment.

10.1 RELEVANCE

Since the results of this study would potentially be used in a regulatory setting, a sound metric used in regulation should be related to the City of Franklin's Code, which prohibits public nuisances, defined as acts or conditions that "substantially annoy, injure or endanger the comfort, health, repose or safety of the public".

The A-weighted sound level is the most commonly used metric for human response to sounds at sound levels typical of ROC events. It is used by the U.S. Environmental Protection Agency, Federal Highway Administration, Department of Housing and Urban Development, and Federal Aviation Administration, for example, as well as the City of Franklin and the Village of Greendale. Studies of human annoyance tend to focus on A-weighted sound levels. Due to community concerns over the low frequency content of some of the ROC events, low frequency sound limits were also considered.

10.2 SOUND SOURCE CHARACTERISTICS

Different types of sound sources may require different sound limits to reduce annoyance. This is acknowledged in the Village of Greendale Code through the setting of different limits for distinct types of sound sources and in the WHO Guidelines, which recognize that noise measures based solely on A-weighted values may not adequately characterize some noise environments nor the impacts of certain types of sound sources.

Appendix A describes how difference sound metrics account for changes in sound over time (see Figure 34). For a steady state sound source, such as a continuous air conditioning system, all sound metrics would give essentially the same value. For more intermittent sounds, like aircraft flyovers, the results would be very different depending on the descriptor and averaging time used.

The spectral content of a sound also influences annoyance. People tend to be more annoyed by sounds with speech or music content, tonal prominence, and/or strong low frequency content.

ROC events did not generate distinct tones at the residences. Concerts were determined to have strong low frequency content and, of course, concerts, baseball games, and the Hills Have Eyes all include speech and music content (and, in the case of the Hills Have Eyes, a chainsaw). While protection from low-frequency sound is desirable, no additional exceedances were identified from the long-term monitoring data using the ANSI low frequency limits than those using the A-Weighted Greendale Code limits. Therefore, the addition of a low-frequency limit may add complexity without adding value for reducing annoyance. The ordinance does not currently include any penalties for speech or music content of the sounds; the inclusion of this type of penalty may further reduce complaints from the community.

10.3 EASE OF ENFORCEMENT

Different sound metrics will require different levels of sophistication with respect to measurement equipment and analysis difficulty. At one end, there may be metrics, such as L_{max}, L_{01}, and L_{eq}, that can be read directly from many sound level meters. A-, C-, and Z-weighted metrics, along with fast and slow response, are standard on most Type 1 and Type 2 sound level meters, including the ones currently used for ROC compliance monitoring. Sound level meters used for enforcement should also have logging capability, to record relevant metrics. Again, the ROC compliance meters have this capability.

Among the metrics evaluated in this study, those that are already being logged with the ROC monitors and do not require significant post-processing include the simple L_{max} and L_{eq}, over one-minute or other averaging times. The L_{01} metric can also be measured using the existing ROC monitoring equipment. Use of these metrics in conjunction with audio recordings to allow for event identification should be sufficient for violation identification. The ROC compliance monitors are set to one minute logging and include audio recordings during triggered events.

11.0 NOISE ORDINANCE RECOMMENDATIONS

This chapter provides clarification of the existing City of Franklin noise ordinance and suggestions on how it may be further refined to reduce annoyance and complaints from residences near the ROC. A review of relevant ordinances and recommendations regarding the City of Franklin's ordinance and enforcement is provided in Appendix J.

11.1 CLARIFICATIONS OF EXISTING REGULATIONS

The current Franklin noise ordinance, at Section 183-41, prohibits noises between 70 to 79 dBA as measured at the real property boundary (or 50 feet from the noise source). As described in Chapter 9.0, we recommend that the Franklin noise limit be enforced when sound levels exceed 70 dBA L_{Smax}. These violations can be easily identified by the City's enforcement officer using the existing data that is provided by the ROC compliance monitors. The ROC compliance monitors provide L_{Smax} for each one-minute duration and also for trigger events. Identification from either of these logged data would be sufficient to detect a violation if audio files are available to ensure that the sound source generating the exceedance is related to ROC activities. If sound source attribution cannot be used, we would recommend the use of the "typical maximum" L_{01} metric (so, 70 dBA L_{01}), similar to the analysis conducted in Section 9.1.

Section 178-1 of the Franklin ordinances also prohibits public nuisances, defined as acts or conditions that "substantially annoy, injure or endanger the comfort, health, repose or safety of the public." Given the widespread negative community reaction under the City's approach to regulating its noise limits, and our knowledge of other noise limits cited in this report that address the comfort, health, repose, and safety of the public, which are below 74 dBA, we believe that other noise standards can be implemented under the regulation that protect the comfort, health, repose, and safety of the public.

70 dBA is used in the Greendale Code as the sound limit for daytime impulsive sounds. We agree that 70 dBA L_{Smax} or L_{01} limit may be appropriate for daytime impulsive sound sources, like fireworks (assuming they occur during daytime hours) but is not appropriate to avoid sleep disturbance or to reduce more steady state sound sources to be compatible with the adjacent residential soundscape. Given that the Village of Greendale has already provided noise limits for other types of sound characteristics and that the 70 dBA L_{Smax} or L_{01} threshold is in line with the City of Franklin's noise limit, the Greendale Code limits can be applied directly to use metrics that are already being provided by the ROC compliance monitors, as shown in Table 10.[6]

[6] RSG can train the City of Franklin's Code Enforcement Officer on how to identify violations of noise limits in this table using the ROC compliance monitor data.

TABLE 10: RECOMMENDED PERMISSIBLE SOUND LEVELS

	PERMISSIBLE SOUND LEVEL, dBA	
	Residential, agricultural, historic, and park districts	
	Daytime (7 am to 8 pm)	Nighttime (8 pm to 7 am)
Perpetual / Continuous, 5-minute L_{eq}	50	45
Intermittent, 1-minute L_{eq}	60	55
Impulsive, L_{Smax} or L_{01}	70	60

Again, these violations can be identified by the City's enforcement officer using the existing data that is provided by the ROC compliance monitors. The ROC compliance monitors provide L_{eq} for each one-minute duration. For example, identification of a single L_{eq} that exceed the 1-minute limits or five consecutive one-minute L_{eq}'s that exceed the 5-minute limit would be a violation.

11.2 RECOMMENDATIONS FOR IMPROVED REGULATION

As described in Chapter 10.0, people tend to be more annoyed by sounds with speech or music content. Many of the ROC events, including concerts, baseball games, and the Hills Have Eyes all include speech and music (and, in the case of the Hills Have Eyes, a chainsaw). If enforcement of the limits specified in Table 10 are not sufficient to reduce complaints from the community, it is recommended that a penalty be added to account for the speech and music content of the sounds. A common penalty that is applied for noise consisting primarily of speech or music is 5 dB.[7] Table 11 shows what the limits would look like with a 5 dB penalty applied to activities that consist primarily of speech or music.

TABLE 11: RECOMMENDED PERMISSIBLE SOUND LEVELS FOR IMPROVED REGULATION, dBA

	Events without speech or music (Fireworks, snowmaking, golf)		**Events with speech and/or music (Baseball games, concerts, Hills Have Eyes)**	
	Daytime (7 am to 8 pm)	Nighttime (8 pm to 7 am)	Daytime (7 am to 8 pm)	Nighttime (8 pm to 7 am)
5-minute L_{eq}	50	45	45	40
1-minute L_{eq}	60	55	55	50
L_{Smax} or L_{01}	70	60	65	55

11.3 ATTRIBUTION OF SOUND SOURCES

As described in Section 8.3, the City's current enforcement process includes listening to recordings for the day of the complaint to determine if the sounds are generated by the ROC or by background sound sources. The current practice of recording for a period of 10-seconds with a trigger level of 65 dBA L_{max} is not adequate to attribute sound source origins for exceedances

[7] See Oakland, California or Sonoma County, California for examples of the use of the 5 dB speech and music penalty.

that extend beyond 10-seconds. Audio of the entire duration of all exceedances is needed for sound source attribution. If the ROC North Monitor is relocated to be used as a reference location (see Chapter 12.0), it would typically have the highest exposure to ROC sounds and would therefore be the most useful in attributing exceedances to ROC activities. The ROC East and West Monitors are more distant and may therefore be more contaminated by background sounds.

12.0 RECOMMENDATIONS

This chapter includes recommendations to reduce community sound exposure while allowing for recreational use of the ROC facility. The recommendations are based on the results of the comprehensive sound study (Chapters 2.0, 4.0, 6.0, 7.0, 8.0, and 9.0) with respect to the existing relevant noise standards and guidelines (Chapter 5.0) and the suggested improvements to the noise ordinance (Chapter 11.0).

12.1 FACILITY DESIGN IMPROVEMENTS

The project team did not receive permission to access ROC property (see Appendix B). Therefore, a detailed review of the existing sound sources, systems, and facilities could not be conducted. Based on field observations of this facility and knowledge of other similar facilities, we make the following general recommendations for facility design improvements:

- Franklin Field Stadium: The PA system (not crowd cheering) is the primary sound source from the stadium during baseball games. Two methods of reducing community sound exposure from the existing stadium sound system would be to turn the amplification volume down and / or focus the existing speakers away from sound sensitive areas in the surrounding community. Alternatively, a directional speaker system with multiple speakers could be installed.

  Speaker systems should be assessed for their ability to provide optimal coverage of the patron area while minimizing spillover into the surrounding communities. Based on aerial mapping, site observations, and available photographs of Franklin Field, the stadium includes approximately eight speaker clusters (see Appendix D). Most of the speakers appear to point towards the field or the spectator stands. However, the speakers on the north side of the stadium appear to point north towards the parking lot and west towards residential Neighborhood E. Repositioning these speakers to focus towards the patron areas would allow for the volume of the sound system to be turned down which would result in further sound reduction in the communities and could also potentially result in reduced energy costs for the ROC.

  It is recommended that an evaluation be conducted of the staging, engineering, and all sound systems currently in place at the stadium. The evaluation should be conducted by a qualified acoustical consulting company, who is granted full access to the facility, and include a review of the location, orientation, type, and broadcast range of the existing sound system design and design recommendations with respect to sound thresholds, monitoring devices, engineering, and design.

  Umbrella Bar: It is our understanding that each band brings their own amplification system to use at the Umbrella Bar. This is out of compliance with the Development

Agreement, which states "the operator will install a dedicated sound system to ensure that the sound at the Umbrella Bar is directionally controlled to minimize the spillover effect beyond the property boundary."

Installation of a dedicated sound system, as required under the Development Agreement would allow for more control by the ROC over the volume and directivity of the concert event sounds. If a dedicated sound system is not installed, the most effective method of ensuring compliance of this type of sound system with the community sound limits would be to include sound system calibration prior to the start of each event. The relocation of the ROC North Monitor to a location at the far (northwest) end of the seating area would allow for this calibration process. During the sound system check, each band could adjust the volume of their sound system to comply with the limit specified for the ROC Monitor location. This limit would be determined based on the modeled level at the ROC monitor location relative to the limit at the receiving use areas.

Another option for the Umbrella Bar would be the construction of a band shed, which would reduce sound levels from live music events in community areas that are shielded by the shed.

- Fireworks and Helicopter Events: Sound levels from fireworks and helicopter events are likely to exceed any reasonable community sound limit. Many communities, including Greendale, exempt some types of special events from their noise ordinance. The City of Franklin currently overlooks fireworks from its noise requirements. We recommend that if the City of Franklin would like to except fireworks from the requirements, that this be explicitly stated in the Development Agreement and that they limit the number of these louder events with the understanding that the noise limits will be exceeded. In an effort to reduce community annoyance during these special events, it is recommended that the City of Franklin commit to a maximum number of allowable special events per year (for example, six). Time limits, such as ending any special events by 10 PM, would reduce the chances of sleep disturbance in the community. It is also highly recommended that the ROC be required to notify residents of the surrounding community of the dates and times in which these events will take place. The notification should happen well in advance of the events, to allow residents to make accommodations in scheduling sound sensitive types of activities at their homes.
- The Hills Have Eyes: Sound levels from the Hills Have Eyes event were not generally above background levels. However, the sounds continue late into the night and the content of the sound, which included the sounds of a chain saw, speech amplified over a PA system, music and special effects sounds, were identified as particularly annoying by community residents. Again, the project team did not receive permission to access ROC property; therefore, a detailed assessment of the sound sources associated with the event was not able to be conducted. In general, sound sources such as chain saws or other disturbing sound events could be eliminated, located indoors, or shielding behind

temporary sound barriers or sound blankets. Temporary sound blankets can be easily installed by draping these blankets over a chain link fence or similar fencing or through the use of movable sound barrier partitions. The speakers used for the PA system should be focused away from community areas.

- Luxe Golf: Although the Luxe Golf facility was not a focus of the study, sounds generated by activities at the facility were measured at the West Monitor and during attended monitoring. Based on preliminary observations of the facility, it is recommended that further review of this facility be made to ensure that sound levels comply with recommended limits and to identify potential construction methods to minimize sound intrusion on residences in Neighborhood E.

12.2 COMPLIANCE MONITORING

The project team did not receive permission to access the ROC monitoring locations or equipment, so we cannot comment on the quality of the micro-siting. Based on an analysis of the sound level exposure at the ROC Monitor locations which were provided from the County, the ROC East and ROC West Monitors are generally in locations appropriate to assess compliance for the two closest neighborhoods, Neighborhoods B and E. However, neither of these monitors are currently acquiring data.

Based on the data received from the ROC North Monitor, we understand that the sound level monitoring equipment that is currently used at the ROC Monitor locations includes ANSI/IEC Type 1 sound level meters. These should be sufficient to enable compliance monitoring. However, only one of the three monitors (the ROC North Monitor) is currently operating, and this monitor has not been properly field calibrated in almost four years.

The City of Franklin currently enforces compliance of the ROC with noise limits through review of the ROC Monitor data on days when complaints occur. The methods and process used by the City seem generally sufficient. However, the data provided is unreliable due to the lack of calibration and also the inconsistency of the time averaging duration of events. Clarity on the limits that would cause an exceedance would help the City to better enforce compliance. Also, as described in Section 8.3, because the City only looks at the data if there is a complaint, the burden is on citizens to enforce the noise standard rather than the ROC reporting back to the City about its activities.

We make the following recommendations to enable the City to check for compliance and respond appropriately:

- Ensure that all ROC Monitors are operational, maintained, field calibrated at least monthly, and lab-calibrated at a minimum of every two years. Lab-calibrations should take place during the off-season when event exceedances are not anticipated.
- A qualified acoustical consultant should review the micro-siting of the ROC Monitors.

- Consider relocating the ROC North Monitor to a reference location at the Umbrella Bar to enable ROC staff to calibrate their sound system to comply with noise limits.
- Update the thresholds used to identify violations to those identified in Chapter 11.0 of this report.
- Require monthly reporting from the ROC on all sound exceedances occurring at each of the ROC compliance monitors, regardless of whether a complaint is filed or not.

12.3 FUTURE USES

A comprehensive sound study, conducted by a qualified acoustical consulting firm, should be conducted prior to the construction of any future uses at the ROC. The sound study should include a review of the proposed facility design, usage, and proposed equipment and activities, a calculation of sound levels anticipated in the surrounding neighborhoods, an evaluation of the calculated community sound exposure with respect to the applicable sound limits, and any noise reduction or mitigation needed to ensure compliance of the new facility with the sound limits. General acoustical design strategies should be used in the siting of future uses on the site, including positioning sound generating uses as far from sound sensitive areas as possible, providing shielding between sound generating and sound sensitive uses (such as building structures or topography), limiting sound generating uses to daytime hours when possible, and selecting quieter equipment. The City should ensure that enforcement of the noise limits are extended to any newly constructed use at the facility.

APPENDIX A. ACOUSTIC PRIMER

GLOSSARY OF TERMS

A-Weighting The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.

Ambient The all-encompassing sound associated with a given environment without contributions from the noise source or sources of interest. Note that the Zoning Ordinance uses "ambient" as meaning "background" (see below)

ANSI American National Standards Institute

ANSI/IEC Type – A classification of sound level meters from ANSI S1.4 and IEC 61672.

Attended Monitoring – Sound monitoring where a person is present to record their qualitative observations of the sound along with the sound level. A sound monitor may automatically record sound levels while the attendant is making observations, or the attendant can record both sound levels and observations at the same time.

Background Sound Level – The sound level measured without the presence of the sound of interest. In this case, it is the ambient sound level when ROC events are not occurring.

C-Weighting The C-weighting filter de-emphasizes the very high frequency components of the sound and is sometimes used to describe louder sounds or sounds with more low frequency content.

County Milwaukee County

dBA A-Weighted decibels (see A-Weighting, Decibel)

Decibel, dB A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.

Frequency In acoustics, the number of times in a second one cycle of a waveform passes a fixed space. The perceived pitch of a sound is proportional to its frequency. The relationship between wavelength and frequency is dependent on the speed of sound.

$$f = \frac{c}{\lambda}$$

where λ is wavelength, c is the speed of sound, and f is frequency. The typical hearing range for young healthy individuals is roughly between frequencies of 20 Hz (1 Hertz is one cycle per second) and 20,000 Hz (also designated as 20 kHz, where 1 kHz is one thousand cycles per second).

L_{1h} L_{10m}, L_{24h} The average A-weighted sound pressure level, in decibels, during a period of one hour (1h), ten minutes (10m), 24 hours (24h), etc.

L_{50} The median, or 50th percentile sound level measured over a period.

L_{eq} Equivalent continuous sound level. The average of the mean square sound *pressure* over an entire monitoring period and expressed as a decibel:

$$Leq_T = 10 * log_{10}\left(\frac{1}{T}\int_{\theta}^{T} p_A^2(t)dt \Big/ p_{ref}^2\right)$$

where p_A^2 is the squared instantaneous weighted sound pressure signal, as a function of elapsed time t, p_{ref} is the reference pressure of 20 µPa, and T is the stated time interval. The reference pressure of 20 µPa is used for all measurements in this document.

The monitoring period, T, can be for any defined length of time. It could be one second ($L_{eq\ 1\text{-}sec}$), one hour (L_{1h}), eight hours (L_{8h}), or 24 hours (L_{24h}). Because L_{eq} is a logarithmic function of the average pressure, loud and infrequent sounds have a greater effect on the resulting L_{eq} than quieter and more frequent sounds.

Low Frequency Sound – Sound with frequency content between 20 Hz and 200 Hz.

Measured An observed quantity. In this report, we differentiate between measured values, for example, those that are logged by a sound level meter, and modeled values, such as those that are predicted by a sound propagation model.

Measurement Period - The time interval during which acoustical data are obtained.

m/s Velocity in meters per second

mph Velocity in miles per hour

Octave Bands - A band of frequencies whose lower frequency limit is one half of its upper frequency limit. An octave-band is identified by its center frequency. As an example, the 500 Hz octave band is the range which includes frequencies between 360 Hz and 720 Hz. An octave higher would be twice this. That is, it would be centered at 1,000 Hz with a range between 720 and 1,440 Hz. The range of human hearing is divided into 10 standardized octave-bands: 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, and 16 kHz. For analyses that require even further frequency detail, each octave-band divided into equal parts, such as 1/3-octave-bands.

Octave Band Sound Pressure Level - The sound pressure level for the sound being measured contained within the specified octave band. The reference pressure is 20 micronewtons per square meter.

ROC Rock Sports Complex

Receptor A location with modeled or otherwise estimated sound levels.

Site — The location of a sound measurement.

SLM — Sound Level Meter

Sound [Pressure] Level – the sound pressure level as measured in decibels:

$$\text{Lp (in dB)} = 10log_{10}\left(\frac{p}{p_{ref}}\right)^2$$

where p is the sound pressure in Pascals and p_{ref} is the reference sound pressure of 20 µPa. All sound pressure levels shown in this document use this p_{ref}.

Spectrogram - A graph that illustrates the sound spectrum over time, with the horizontal axis as time, the vertical axis as the frequency, and the intensity of the color proportional to the sound level. The spectrogram is useful for identifying the sources of sound. For example, birds show short bursts of high frequency sound, while airplanes are mostly low frequency sound and show slow rise and fall times. In Figure 33 below, we can see several of these events.

Spectrum — The components of a sound broken down into individual frequencies.

Tonal Sound — Sound where narrow frequency band(s) are pronounced, such as in alarms, sirens, squeals, and horns.

Unattended monitoring – Sound monitoring where a sound level meter and associated equipment is left unattended for some length of time. Data are post-processed to filter out events not associated with the target source. Sound recordings may be taken along with the logged sound levels to aid in identification of different sources of sound.

WHO — World Health Organization

Z-Weighting — The unweighted sound pressure level.

EXPRESSING SOUND IN DECIBEL LEVELS

The varying air pressure that constitutes sound can be characterized in many different ways. The human ear is the basis for the metrics that are used in acoustics. Normal human hearing is sensitive to sound fluctuations over an enormous range of pressures, from about 20 micropascals (the "threshold of audibility") to about 20 pascals (the "threshold of pain").[8] This factor of one million in sound pressure difference is challenging to convey in engineering units. Instead, sound pressure is converted to sound "levels" in units of "decibels" (dB, named after Alexander Graham Bell). Once a measured sound is converted to dB, it is denoted as a level with the letter "L".

[8] The pascal is a measure of pressure in the metric system In Imperial units, they are themselves very small one pascal is only 145 millionths of a pound per square inch (psi) The sound pressure at the threshold of audibility is only 3 one-billionths of one psi at the threshold of pain, it is about 3 one-thousandths of one psi

The conversion from sound pressure in pascals to sound level in dB is a four-step process. First, the sound wave's measured amplitude is squared and the mean is taken. Second, a ratio is taken between the mean square sound pressure and the square of the threshold of audibility (20 micropascals). Third, using the logarithm function, the ratio is converted to factors of 10. The final result is multiplied by 10 to give the decibel level. By this decibel scale, sound levels range from 0 dB at the threshold of audibility to 120 dB at the threshold of pain.

Typical sound sources, and their sound pressure levels, are listed on the scale in Figure 32.

HUMAN RESPONSE TO SOUND LEVELS: APPARENT LOUDNESS

For every 20 dB increase in sound level, the sound pressure increases by a *factor* of 10; the sound *level* range from 0 dB to 120 dB covers 6 factors of 10, or one million, in sound *pressure*. However, for an increase of 10 dB in sound *level* as measured by a meter, humans perceive an approximate doubling of apparent loudness· to the human ear, a sound level of 70 dB sounds about "twice as loud" as a sound level of 60 dB. Smaller changes in sound level, less than 3 dB up or down, are generally not perceptible.

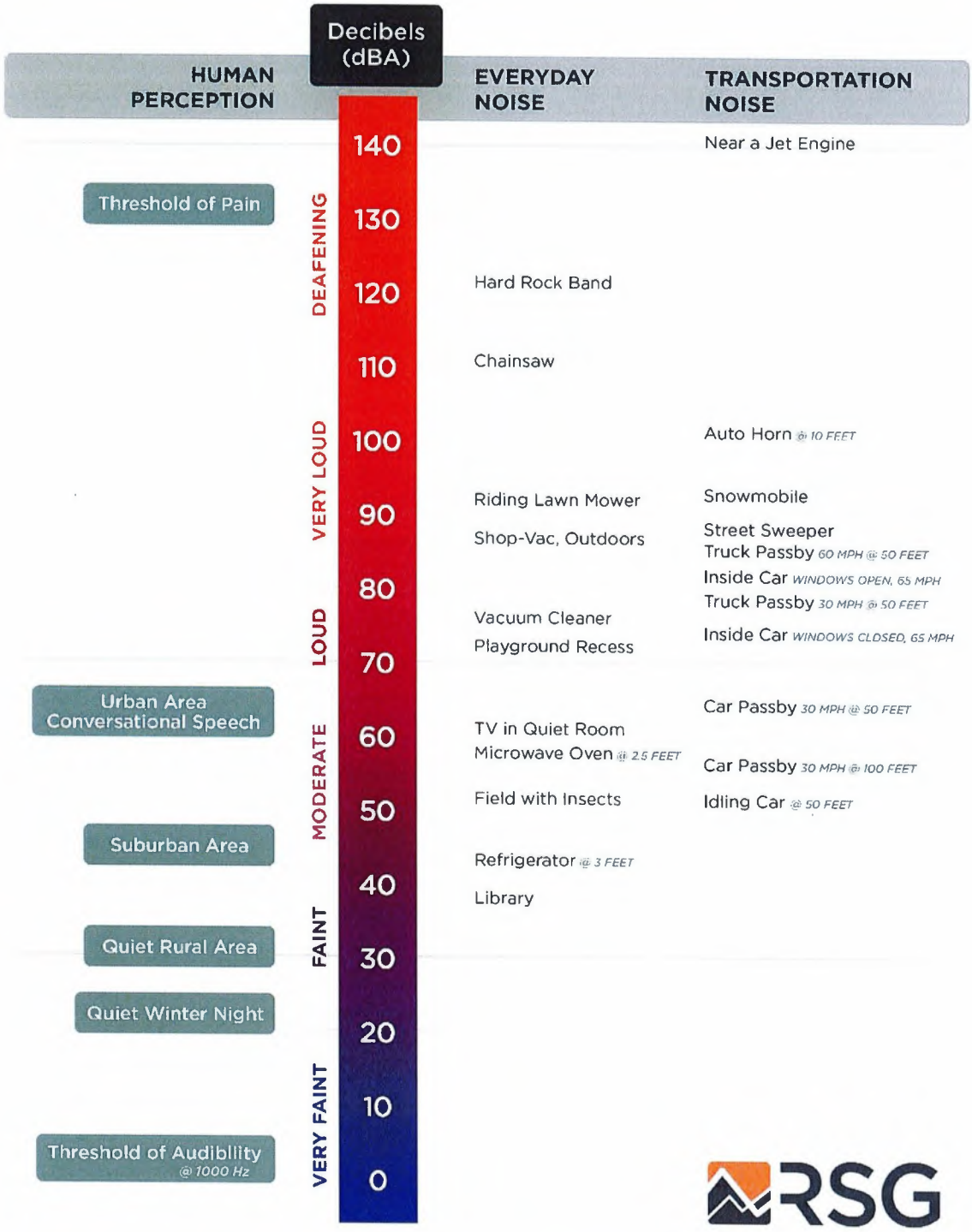


FIGURE 32: A SCALE OF SOUND PRESSURE LEVELS FOR TYPICAL SOUND SOURCES

FREQUENCY SPECTRUM OF SOUND

The "frequency" of a sound is the rate at which it fluctuates in time, expressed in Hertz (Hz), or cycles per second. Very few sounds occur at only one frequency: most sound contains energy at many different frequencies, and it can be broken down into different frequency divisions, or bands. These bands are similar to musical pitches, from low tones to high tones. The most common division is the standard octave band. An octave is the range of frequencies whose upper frequency limit is twice its lower frequency limit, exactly like an octave in music. An octave band is identified by its center frequency: each successive band's center frequency is twice as high (one octave) as the previous band. For example, the 500 Hz octave band includes all sound whose frequencies range between 354 Hz (Hertz, or cycles per second) and 707 Hz. The next band is centered at 1,000 Hz with a range between 707 Hz and 1,414 Hz. The range of human hearing is divided into 10 standard octave bands: 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1,000 Hz, 2,000 Hz, 4,000 Hz, 8,000 Hz, and 16,000 Hz. For analyses that require finer frequency detail, each octave-band can be subdivided. A commonly used subdivision creates three smaller bands within each octave band, or so-called 1/3-octave bands.

THE SPECTROGRAM

One method of viewing the spectral sound level is to look at a spectrogram of the sound. As shown in Figure 33, the spectrogram shows the level, frequency spectra, and time in one graph. That is, the horizontal axis represents time, the vertical axis is frequency, and the intensity of the color is proportional to the intensity of the sound.

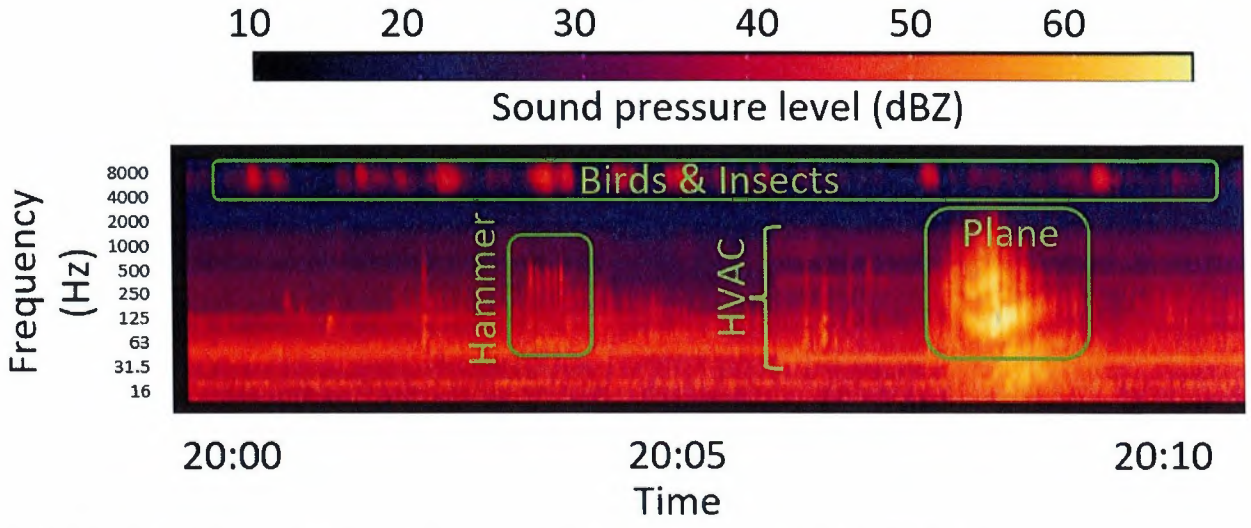


FIGURE 33: AN EXAMPLE OF A SOUND SPECTROGRAM WITH ANNOTATIONS

The spectrogram is useful for identify the sources of sound. For example, birds show short bursts of high frequency sound, while airplanes are mostly low frequency sound and show slow rise and fall times. In the example above, we can see several of these events.

HUMAN RESPONSE TO FREQUENCY: WEIGHTING OF SOUND LEVELS

The human ear is not equally sensitive to sounds of all frequencies. Sounds at some frequencies seem louder than others, despite having the same decibel level as measured by a sound level meter. In particular, human hearing is much more sensitive to medium pitches (from about 500 Hz to about 4,000 Hz) than to very low or very high pitches. For example, a tone measuring 80 dB at 500 Hz (a medium pitch) sounds quite a bit louder than a tone measuring 80 dB at 60 Hz (a very low pitch). The frequency response of normal human hearing ranges from 20 Hz to 20,000 Hz. Below 20 Hz, sound pressure fluctuations are not "heard", but sometimes can be "felt". This is known as "infrasound". Likewise, above 20,000 Hz, sound can no longer be heard by humans; this is known as "ultrasound". As humans age, they tend to lose the ability to hear higher frequencies first; many adults do not hear very well above about 16,000 Hz. Most natural and man-made sound occurs in the range from about 40 Hz to about 4,000 Hz. Some insects and birdsongs reach to about 8,000 Hz.

To adjust measured sound pressure levels so that they mimic human hearing response, sound level meters apply filters, known as "frequency weightings", to the signals. There are several defined weighting scales, including "A", "B", "C", "D", "G", and "Z". The most common weighting scale used in environmental noise analysis and regulation is A-weighting. This weighting represents the sensitivity of the human ear to sounds of low to moderate level. It attenuates sounds with frequencies below 1000 Hz and above 4000 Hz, it amplifies very slightly sounds between 1000 Hz and 4000 Hz, where the human ear is particularly sensitive. The C-weighting scale is sometimes used to describe louder sounds. The B- and D- scales are seldom used. All of these frequency weighting scales are normalized to the average human hearing response at 1000 Hz. at this frequency, the filters neither attenuate nor amplify. When a reported sound level has been filtered using a frequency weighting, the letter is appended to "dB". For example, sound with A-weighting is usually denoted "dBA". When no filtering is applied, the level is denoted "dB" or "dBZ". The letter is also appended as a subscript to the level indicator "L", for example "L_A" for A-weighted levels.

A relatively new standard weighting is the ANS weight. ANS stands for A-weighted, natural sounds. The ANS weight is the same as the A-weighting, but it filters out all sound above the 1,000 Hz octave band. Thus, it removes the impact of many high frequency biogenic sound such as insects, birds, and amphibians. The ANS weighting is often used to eliminate the effects of seasonality of sound, as there are fewer insects and birds during the winter than the summer.

TIME RESPONSE OF SOUND LEVEL METERS

Because sound levels can vary greatly from one moment to the next, the time over which sound is measured can influence the value of the levels reported. Often, sound is measured in real time, as it fluctuates. In this case, acousticians apply a so-called "time response" to the sound level meter, and this time response is often part of regulations for measuring sound. If the sound level is varying slowly, over a few seconds, "Slow" time response is applied, with a time constant of one second. If the sound level is varying quickly (for example, if brief events are mixed into the overall sound), "Fast" time response can be applied, with a time constant of one-eighth of a second.[9] The time response setting for a sound level measurement is indicated with the subscript "S" for Slow and "F" for Fast: L_S or L_F. A sound level meter set to Fast time response will indicate higher sound levels than one set to Slow time response when brief events are mixed into the overall sound, because it can respond more quickly.

In some cases, the maximum sound level that can be generated by a source is of concern. Likewise, the minimum sound level occurring during a monitoring period may be required. To measure these, the sound level meter can be set to capture and hold the highest and lowest levels measured during a given monitoring period. This is represented by the subscript "max", denoted as "L_{max}". One can define a "max" level with Fast response L_{Fmax} (1/8-second time constant), Slow time response L_{Smax} (1-second time constant), or Continuous Equivalent level over a specified time period $L_{eq\ max\ 1s}$.

ACCOUNTING FOR CHANGES IN SOUND OVER TIME

A sound level meter's time response settings are useful for continuous monitoring. However, they are less useful in summarizing sound levels over longer periods. To do so, acousticians apply simple statistics to the measured sound levels, resulting in a set of defined types of sound level related to averages over time. An example is shown in Figure 34. The sound level at each instant of time is the grey trace going from left to right. Over the total time it was measured (1 hour in the figure), the sound energy spends certain fractions of time near various levels, ranging from the minimum (about 27 dB in the figure) to the maximum (about 65 dB in the figure). The simplest descriptor is the average sound level, known as the Equivalent Continuous Sound Level. Statistical levels are used to determine for what percentage of time the sound is louder than any given level. These levels are described in the following sections.

Equivalent Continuous Sound Level - L_{eq}

One straightforward, common way of describing sound levels is in terms of the Continuous Equivalent Sound Level, or L_{eq}. The L_{eq} is the average sound pressure level over a defined period of time, such as one hour or one day. L_{eq} is the most commonly used descriptor in noise

[9] There is a third-time response defined by standards, the "Impulse" response This response was defined to enable use of older, analog meters when measuring very brief sounds, it is no longer in common use

standards and regulations. L_{eq} is representative of the overall sound to which a person is exposed. Because of the logarithmic calculation of decibels, L_{eq} tends to favor higher sound levels: loud and infrequent sources have a larger impact on the resulting average sound level than quieter but more frequent sounds. For example, in Figure 34, even though the sound levels spends most of the time near about 34 dBA, the L_{EQ} is 41 dBA, having been "inflated" by the maximum level of 65 dBA and other occasional spikes over the course of the hour.

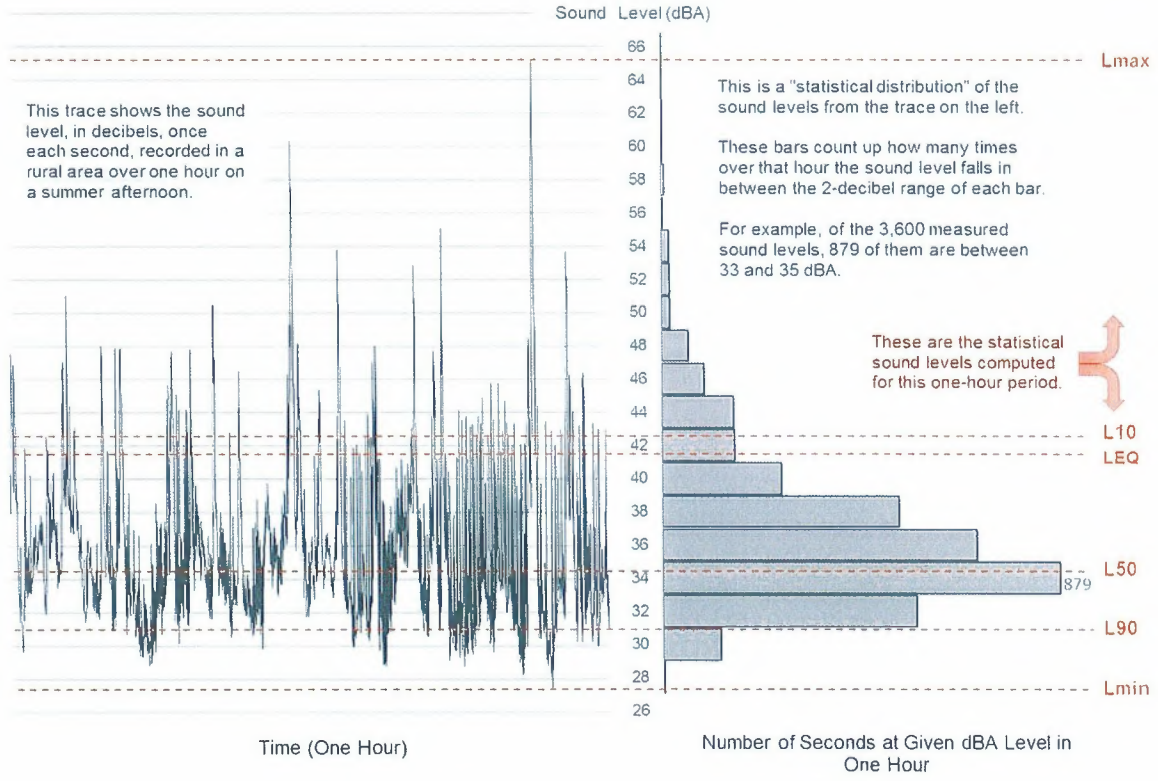


FIGURE 34: EXAMPLE OF DESCRIPTIVE TERMS OF SOUND MEASUREMENT OVER TIME

Percentile Sound Levels – L_N

Percentile sound levels describe the statistical distribution of sound levels over time. "L_N" is the level above which the sound spends "N" percent of the time. For example, L_{90} (sometimes called the "residual base level") is the sound level exceeded 90% of the time: the sound is louder than L_{90} most of the time. L_{10} is the sound level that is exceeded only 10% of the time. L_{50} (the "median level") is exceeded 50% of the time: half of the time the sound is louder than L_{50}, and half the time it is quieter than L_{50}. Note that L_{50} (median) and L_{eq} (mean) are not always the same, for reasons described in the previous section.

The L_{90} is the sound that persists for longer periods, and below which the overall sound level seldom falls. It tends to filter out other short-term environmental sounds that aren't part of the

source being investigated. L_{10} represents the higher, but less frequent, sound levels. These could include such events as barking dogs, vehicles driving by and aircraft flying overhead, gusts of wind, and work operations.

Note that if one sound source is very constant and dominates the soundscape in an area, all of the descriptive sound levels mentioned here tend toward the same value. It is when the sound is varying widely from one moment to the next that the statistical descriptors are useful.

Sound Levels from Multiple Sources: Adding Decibels

Because of the way that sound levels in decibels are calculated, the sounds from more than one source do not add arithmetically. Instead, two sound sources that are the same decibel level increase the total sound level by 3 dB. For example, suppose the sound from an industrial blower registers 80 dB at a distance of 2 meters (6.6 feet). If a second industrial blower is operated next to the first one, the sound level from both machines will be 83 dB, not 160 dB. Adding two more blowers (a total of four) raises the sound level another 3 dB to 86 dB. Finally, adding four more blowers (a total of eight) raises the sound level to 89 dB. It would take eight total blowers, running together, for a person to judge the sound as having "doubled in loudness".

Recall from the explanation of sound levels that a difference of 10 decibels is a factor of 20 in sound pressure and a factor of 10 in sound power. (The difference between sound pressure and sound power is described in the next Section.) If two sources of sound differ individually by 10 decibels, the louder of the two is generating *ten times* more sound. This means that the loudest source(s) in any situation always dominates the total sound level. Looking again at the industrial blower running at 80 decibels, if a small ventilator fan whose level alone is 70 decibels were operated next to the industrial blower, the total sound level increases by only 0.4 decibels, to 80.4 decibels. The small fan is only 10% as loud as the industrial blower, so the larger blower completely dominates the total sound level.

The Difference between Sound Pressure and Sound Power

The human ear and microphones respond to variations in sound *pressure*. However, in characterizing the sound emitted by a specific source, it is proper to refer to sound *power*. While sound pressure induced by a source can vary with distance and conditions, the power is the same for the source under all conditions, regardless of the surroundings or the distance to the nearest listener. In this way, sound power levels are used to characterize noise sources because they act like a "fingerprint" of the source. An analogy can be made to light bulbs. The bulb emits a constant amount of light under all conditions, but its perceived brightness diminishes as one moves away from it.

Both sound power and sound pressure levels are described in terms of decibels, but they are not the same thing. Decibels of sound pressure are related to 20 micropascals, as explained at the beginning of this primer. Sound power is a measure of the acoustic power emitted or radiated by a source, its decibels are relative to one picowatt.

Sound Propagation Outdoors

As a listener moves away from a source of sound, the sound level decreases due to "geometrical divergence": the sound waves spread outward like ripples in a pond and lose energy. For a sound source that is compact in size, the received sound level diminishes or attenuates by 6 dB for every doubling of distance: a sound whose level is measured as 70 dBA at 100 feet from a source will have a measured level of 64 dBA at 200 feet from the source and 58 dBA at 400 feet. Other factors, such as walls, berms, buildings, terrain, atmospheric absorption, and intervening vegetation will also further reduce the sound level reaching the listener.

The type of ground over which sound is propagating can have a strong influence on sound levels. Harder ground, pavement, and open water are very reflective, while soft ground, snow cover, or grass is more absorptive. In general, sounds of higher frequency will attenuate more over a given distance than sounds of lower frequency the "boom" of thunder can be heard much further away than the initial "crack".

Atmospheric and meteorological conditions can enhance or attenuate sound from a source in the direction of the listener. Wind blowing from the source toward the listener tends to enhance sound levels, wind blowing away from the listener toward the source tends to attenuate sound levels. Normal temperature profiles (typical of a sunny day, where the air is warmer near the ground and gets colder with increasing altitude) tend to attenuate sound levels, inverted profiles (typical of nighttime and some overcast conditions) tend to enhance sound levels.

APPENDIX B. APPROVED WORKPLAN

MEMO

TO: Suzanne Carter, Milwaukee County

FROM: Dana Lodico, RSG

DATE: October 24, 2022

SUBJECT: Rock Sports Complex – Sound Study Workplan

This workplan describes the methods and assumptions for conducting the Sound Study for the Rock Sports Complex (ROC), located in Franklin, Wisconsin.

1.1 PHASE I: PROJECT KICK OFF

Phase I of the Project includes an initial Project kick off meeting with Milwaukee County (the County), preparation of a workplan, and review of existing data. With the completion of this workplan, Phase I will be complete.

Kick Off Meeting

The RSG team has met virtually with the County multiple times to discuss project expectations, approach, deliverables, and project timeline. This task is complete.

Workplan Preparation

A workplan describing the methods for conducting long term sound monitoring for the ROC was prepared for the County on June 23, 2022. Due to the timing of the project approval relative to the ROC event schedule and the unknowns pertaining to the cooperation with the ROC facility, it was agreed that initial efforts should focus on getting monitoring conducted and the public meeting completed. The full workplan would follow once these unknowns were resolved. The ROC facility was contacted multiple times by the County and by the RSG team and has not agreed to cooperate with the project. This workplan documents the proposed sound study efforts, given the non-cooperation of the ROC. Since the initial scope was prepared with the assumption that the ROC would cooperate with the study, some changes in scope from the original are included in this workplan. With the completion of this workplan, this task is complete.

Data Review

The RSG team has reviewed the scheduling of ROC events, including the Milwaukee Milkmen, Milky Way Drive In, Umbrella Bar Summer Concert Series, and Rock League Baseball. Complaint records were also reviewed. This task is complete.

Additional Information Gathering

The RSG team has identifies noise-sensitive human use areas through review of aerial photography of the project area and confirmed these locations during our visits to the site. This task is complete.

1.2 PHASE II: SOUND STUDY

Phase II of the project includes the bulk of the sound study and field work, including the assessment of sound impacts of the site through public outreach, sound monitoring, sound modeling, and compliance evaluation. This phase is currently underway.

Topographical Review

Modeling for the project will be conducted in accordance with the standard ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors, Part 2· General Method of Calculation." The model takes into account source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain.

The acoustical modeling software used will be CadnaA, from Datakustik GmbH. CadnaA is a widely accepted acoustical propagation modeling tool, used by many noise control professionals in the United States and internationally. ISO 9613-2 assumes downwind sound propagation between every source and every receiver, consequently, all wind directions, including the prevailing wind directions, are considered. Inputs to the model will include topographical data available from the County, ground types, foliage, structures and other manmade barriers, and sensitive receptor locations. Preliminary sound source information, based on data measured by the RSG team for similar use facilities, will be utilized for the preliminary model to help identify areas of concern in the surrounding community.

Event Sound Impact

The event sound impact task includes public outreach, attended and unattended sound monitoring, and sound modeling.

Public Outreach

The RSG team conducted a virtual public meeting for the project on Monday August 29, 2022. The objective of the meeting was to share information on the purpose of the sound study and receive input from the public.

The meeting was a three-hour long event, with presentations occurring on each hour (4:00, 5:00, and 6:00 pm). Presenters included Regina Flores (Milwaukee County), Beth Foy (Beth Foy Associates), and Dana Lodico (RSG). Following each presentation, the public was given the opportunity to give comments. Presenters responded to comments, as time allowed.

Notice of the meeting was mailed in a post card format to owners and occupants of properties closest to ROC and to the primary operators of the ROC. The meeting was also posted on the Milwaukee County Events page. The City of Franklin and County Supervisors also shared meeting information.

Attendance at the meeting included four County Supervisors, the Mayor of Franklin, the Franklin Director of Administration, County staff from Procurement, Parks, and Economic Development, developer Mike Zimmerman and managers of sites at the ROC, and approximately 15 to 20 residents, with some representing more than one resident. In addition, two residents that were unable to attend the meeting asked that statements be read by others.

Input was received by residents adjacent to the ROC and those up to a mile and a half from the facility. All reported being disturbed by sound from the ROC, with some discussing the negative impact of these sounds on their quality of life. One resident requested that the ROC inform nearby residents when louder events, such as fireworks and helicopter activities, are to take place. Several residents negatively commented on the placement of the speakers along the outfield edge of the baseball stadium. These speakers point from the stadium and in the direction of neighborhoods. These residents asked that the speaker be turned toward the stadium and that the volume be turned down. A summary of the feedback received from the public outreach meeting was provided to the County on September 7, 2022.

This task is complete.

Sound Monitoring

Sound monitoring will include unattended long-term continuous monitoring in conjunction with attended short-duration monitoring.

Sound level monitoring is performed with ANSI/IEC Type 1 sound level meters with a minimum frequency range of 6.3 Hz to 20 kHz. The sound level meters are field calibrated during setup, tear down, and all meter checks.

Long-Term Continuous Monitoring

The purpose of the long-term continuous monitoring is to assess the diurnal ambient sound levels occurring during periods with and without events occurring at the ROC. Three long-term monitors were installed in semi-permanent locations for up to a six-month period, with field staff accessing the sound levels meters to download data and change batteries and/or maintain the equipment as needed. Monitors were installed in early July 2022 and will be picked up in early January 2023. Long term monitoring locations are shown in Figure 1. Note that the ski hill monitor may be relocated slightly in November to accommodate snow making equipment and recreational users of the Facility.

Sound level meters are covered with windscreens to minimize the impact of wind distortion on measurements. The meters also record audio in .wav format to aid in sound

source identification. An ultrasonic anemometer is also installed to measure wind speed, direction, and temperature.

FIGURE 1: NOISE MONITORING LOCATIONS

Short-Term Attended Monitoring

Attended monitoring at five events has occurred, as follows:

- Evening of Saturday, August 6, 2022: Baseball game, parade, fireworks, live band in Umbrella Bar (The Playlist)
- Evening of Saturday, August 20, 2022: Baseball game, live band in stadium, fireworks, live band in Umbrella Bar (The Toys)
- Evening of Saturday, August 27, 2022: Baseball game, parade, movie in stadium, live band in Umbrella Bar (Superfly)

- Afternoon of Sunday, August 28, 2022: Baseball game, planned movie in stadium and helicopter drop (which was cancelled due to weather)
- Evening of Saturday, September 10, 2022 Live band in Umbrella Bar (33 RPM)

In addition to the events that have already been monitored, the RSG team plans on monitoring at one or more of the following events, weather and schedules permitting:

- Evening of Saturday, October 29, 2022: Haunted Hills Event, drive-in movie at Milky Way Drive-In
- Representative event occurring at the Ski Hill (event schedule not yet available)

The project team did not receive permission to monitor on ROC property. As a result, attended monitoring has been and will continue to be conducted at the Ski Hill and in the surrounding communities. Field staff will typically attend each site for a period of approximately 30 minutes and then move to the next site. Attended monitoring sites include locations on the Ski Hill and in neighborhoods to the east, west, and north of the ROC.

Attended sound level meters are mounted on tripods at a height of approximately 1.5 meters (5 feet) and covered with windscreens to minimize the impact of wind distortion on measurements. Field staff attend each monitor and document sound levels attributable to facility and non-facility related activities occurring during the attended events.

Note that without permission to make sound measurements on the ROC property, measurements during each attended event were made by a single field staff, moving from site to site. The revised scope proposed 1 to 2 field staff to monitor both within the facility and in the surrounding areas. Budget for this additional field staff has been reallocated to allow for further low frequency analysis of the data and review of the existing ROC sound monitors, as described in the appropriate sections of this workplan.

Data Analysis

Analysis of the attended event data will occur following each attended event. This data will be provided to the County in the form of a technical memo. The purpose of the memo will be to document the data acquired during these events including the sound level time history, spectral content of the sound, and sound level statistics, such as "time above", L10, L50, L90, and L_{eq}.

Analysis of the long-term monitors will occur following the completion of the long-term monitoring in January of 2023. This data will be used to determine statistical sound levels occurring during periods with and without events. We will then compare levels occurring during the attended events and other event periods to sound levels occurring under similar conditions without events (same time of day, day of week, etc.). This comparison, along with feedback received during the public outreach and the attended monitoring, will be used to inform our recommendations on appropriate thresholds.

Feedback received during public outreach and field staff experiences during attended monitoring have indicated that low frequency sounds are of particular concern to the community. Using budget reallocated from the sound system evaluation task, we will assess the low frequency content of the sounds generated at the ROC and compare these levels to those occurring during periods without events and to noise-induced vibration thresholds such as those found in ANSI S12.9 Part 4 and ANSI S12.2.

Sound Modeling

The preliminary sound model developed above will be updated with the data acquired during the sound monitoring survey. Sound contour maps will be developed for each of the six events selected for attended sound monitoring. These maps will visually show affected areas in the vicinity of the site. Sounds levels at discrete receptor locations, both at ground level and at upper stories, will also be provided. Sound contour lines can be provided to County staff in GIS format, suitable to be integrated into County GIS database. Modeled increases in sound levels between baseline, as determined through the long-term monitoring data, and baseline plus event sound scenarios will be calculated. Sound modeling will also allow for a comparison of sound levels between attended and unattended monitoring locations and with the existing ROC sound monitors. Modeling results will be provided as part of the final reporting.

Sound System Evaluation

The project team did not receive permission to monitor on ROC property or to have access to the existing ROC sound system. As a result, the RSG team is unable to evaluate the ROC sound system. Budget for this task item has been reallocated to allow for further low frequency analysis of the data and review of the existing ROC sound monitors, as described in the appropriate sections of this workplan.

Compliance Monitor Evaluation

The RSG team will evaluate the three existing sound monitors located at the facility to determine appropriateness of locations, appropriateness of quantity, and quality of data. This scope item utilizes budget reallocated from the sound system evaluation task.

Compliance Evaluation

The RSG team will review noise-related laws, regulations, ordinances, and other recommendations from the City of Franklin, Village of Greendale, Milwaukee County, State of Wisconsin, United States, World Health Organization, ANSI, and other applicable agencies. Based on this review, we will review the jurisdictional, regulatory, and contractual authority for regulating or restricting sound generated by the facility and make recommendations for thresholds to be used for the facility to assess sound impacts to humans.

1.3 PHASE III: RECOMMENDATIONS

In Phase III of the project, we will synthesize the information gathered in Phases I and II to understand and address the impact of sound generated by facility activities on the surrounding residential areas and develop sound thresholds for use in municipal code documents.

The RSG team is unable to recommend specific improvements to the design of the ROC facility without cooperation from the facility and access to the existing sound systems. However, we will develop general recommended best practices for design, appropriate thresholds to reduce noise impacts on the surrounding areas, and measures for the facility to comply with the proposed sound thresholds and processes for approval of any future proposed uses for the site.

Sound Impact Assessment

The RSG team will synthesize the information gathered in Phases I and II to understand and address the impact of sound generated by facility activities on the surrounding area. Potential impacts to residents will be compiled and we will suggest thresholds and / or mitigation to reduce identified impacts.

Ordinance

The RSG team will develop appropriate sound thresholds for use in the County's and/or other municipality's municipal code(s). We will meet with the County and other municipalities, as appropriate, to discuss the needs of the County with respect to balancing sounds generated by the facility and the concerns of nearby residents and businesses. Based on these discussions, we will develop draft municipal noise ordinance code language for County review. We will then respond to County feedback and provide a final version of the code language.

Contractual Compliance

The RSG team will recommend monitoring systems, procedures, and reporting required to track the Developer's sound-related contractual obligations to Milwaukee County with respect to the sound thresholds and associated ordinance developed above. These recommendations will be documented in the final report.

Compliance Monitoring

Based on the results of Phase II, the RSG team will recommend locations and number and type of monitoring devices to adequately measure and monitor sound at the facility, including recommendations with respect to existing and any potential future uses. These recommendations will be documented in the final report.

Engineering and Design

Without cooperation from the ROC and access to existing sound systems, the RSG team is unable to develop specific recommendations of best practices for staging, engineering, sound system design, and/or equipment to mitigate the sound emanating from all activities at the facility to nearby noise sensitive areas. Budget for this task item has been reallocated to allow for further low frequency analysis of the data and review of the existing ROC monitors, as described in the appropriate sections of this workplan.

Future Uses

The RSG team will develop recommendations for best practice(s) and process(es) for approval of future uses of the site, including recommendations with respect to sound thresholds, monitoring devices, engineering, and design. These recommendations will be documented in the final report.

1.4 PHASE IV: FINAL REPORTING

The RSG team will develop a final report for submission to the County. Data acquired over the course of study will be provided, including analyzed sound monitoring data, public outreach efforts, and sound modeling results. More extensive data will be provided as supplemental electronic files.[1]

The final report will include the following information:

a. Executive Summary
b. Methodology
c. Survey Findings
    i. Public Outreach
    ii Sound Monitoring Results
    iii. Sound Modeling Results
    iv. Compliance Evaluation
d. Recommendations
    i. Sound impacts
    ii. Draft Noise Ordinance
    iii. Compliance Procedures
    iv. Monitoring Locations

[1] Audio files will not be provided, as they may contain private conversations However, RSG may release examples of audio from different events that have been pre-screened to remove private conversations

1.5 SCOPE MODIFICATIONS

The ROC has not cooperated with RSG requests for collaboration on the Sound Study and did not grant permission for RSG to make sound measurements on ROC property. Some items in the scope provided at the September 14th, 2022 Milwaukee County Audit Committee Meeting are unable to be completed without collaboration with the ROC. As a result, the following scope have been removed / changed from the scope provided to the Audit Committee on September 14, 2022.

- On site sound measurements are no longer proposed as part of the scope. This reduces the number of staff making attended measurements to one staff for each attended event (the scope included one to two staff per event).
- Attended events were selected based on publicly available event schedules for the ROC. Therefore, private corporate events were monitored as they occurred and were not included as a separate attended event. The number of attended events remains the same (i.e., six) as in prior versions of the scope.
- RSG is unable to evaluate and conduct inventory of the staging, engineering, and sound systems in place at the ROC without cooperation from the Facility (Phase II-C). This scope item is removed.
- RSG is unable to make recommendations of best practices for the staging, engineering, and sound systems in place at the ROC without cooperation from the Facility (Phase III-E). This scope item is removed.

With the additional budget that would have been allotted to the items above, RSG will provide the following services that were part of the original scope and were removed due to a reduction in budget from the original RFP.

- RSG will review available data from ROC sound monitoring equipment and compare these with data compiled in the course of the sound study on select dates.
- In the course of the study to date, it has become apparent that low frequency sounds are of particular annoyance to local residents. To address this concern, RSG will provide low frequency analysis of the data and develop recommendations at which to set municipal sound regulations/ordinance with respect to low frequency sounds.
- RSG will assess and document background and event sound levels with respect to time of day and day of the week.

For clarity, the following correspondence occurred between the County / RSG and ROC Ventures concerning potential collaboration for the Sound Study:

- RSG is collaborating with ski hill staff (Mike Schmitz and Rick Schmitz) to make measurements and understand snow making and other ski hill sound generating activities.

- County staff reached out by email to Tom Jones, Mike Zimmerman, Dan Kuenzi, and Paul Cimoch of ROC Ventures in June and July of 2022 (June 26, July 27). On July 27, 2022, Mike Zimmerman responded giving RSG permission to call his cellular telephone number.

- RSG left two phone messages with Mike Zimmerman (July 28 and August 1, 2022). No response was received.

- RSG reached out by email to Tom Jones, Mike Zimmerman, Dan Kuenzi, and Paul Cimoch on multiple occasions in July, August, and September 2022 (July 28, August 1, 2 and 9, and September 8). Mike Zimmerman responded to some of these emails but would not commit to collaboration with the RSG team, to participating in a 30-minute phone call with the RSG team to discuss potential collaboration, or to allowing RSG staff on ROC property to make sound measurements or assess the staging, engineering, and sound systems in place at the ROC. In each email from RSG, dates and times were provided to encourage collaboration and information was provided on the exact request being make, the intent of the request, and the timeline needed for RSG to be able to complete the portion of the scope that required collaboration with the ROC.

- The final email provided from RSG to ROC Ventures (September 8, 2022) explained that the window of opportunity for collaboration on attended events had ended (the events having been completed by this time). However, collaboration on facility design could still be made available to ROC if they were able to respond with interest by the date of the Audit Committee meeting (September 14, 2022). RSG has not received a response to this email.

APPENDIX C. PUBLIC MEETING MATERIALS

The Rock Public meeting – preliminary summary

Online meeting

- August 29, 2022, 4:00-7:00pm

Purpose of meeting

- Purpose: share information on the purpose of the sound study and receive input from the public that may inform the data analysis and recommendations

How advertised

- Mailing was sent to the owners and occupants of properties closest to The Rock.
- Mailing was sent to the primary operators at The Rock.
- The meeting was posted on the Milwaukee County Events pages.
- City of Franklin shared information on their website
- County Supervisors shared information with their constituents

Attendance

- Officials were not asked to self-identify, though a number signed in: Four County Supervisors, the Mayor of Franklin, Franklin Director of Administration
- County staff from Procurement, Parks, and Economic Development all logged in or participated.
- Developer Mike Zimmerman and managers of sites at The Rock attended.
- 15-20 residents signed in, with some of the sign-ins representing more than one resident. Two residents asked that statements be read by others.

Information Shared

- The project team initially shared information on the history of the site and the current roles of Milwaukee County, the City of Franklin, and the Village of West Milwaukee.
- The bulk of the presentation focused on the sound study objectives, explaining the scope of work for the study, the types of monitoring being done, the monitor locations and why they were chosen, the sound modeling and analysis which will be done, and what will be included in the final report. A schedule was also shared.

Input received

- Residents adjacent to The Rock and those up to a mile and a half away report being disturbed by sound from The Rock both inside and outside their home.
- Neighbors asked that they have access to information about when fireworks will be used, bands booked, and games played.
- Speakers along the outfield edge of the baseball stadium point away from the stadium and in the direction of neighborhoods. The residents asked that the speaker be turned toward the stadium and that the volume be turned down.
- One resident commented that the sound used to be later at night, into the early hours of the morning, though it seems to be ending earlier.
- Several commenters discussed the negative impact to their quality of life.

Questions answered

- The purpose of the public input was to receive testimony from the attendees. The team planned to only answer questions if there was time available and answers readily available.
    - Specific answer was given to the location of the east monitor and why is was located back from the road so it would capture sound from the Rock and less sound from traffic on 76th Street.
    - Questions were addressed regarding the impact of weather on sound; the specifics on the type of sound measured by the equipment in place and the difference in phone app sound measurements; report logistics; quality of life impacts; low frequency base noise as compared to higher frequency noise; details of sound modeling software.

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Public Meeting

Thanks for joining us!

The meeting will begin at the top of the ho
presentation at 4:00, 5:00, and 6:00

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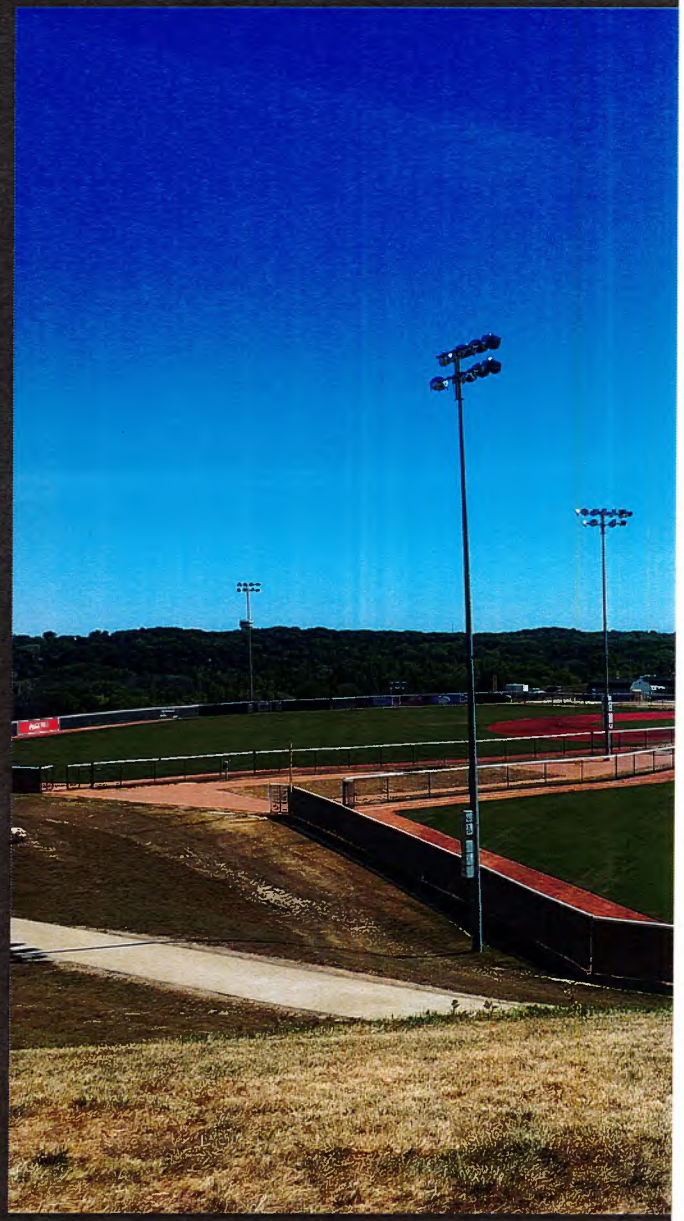
AGENDA

- Welcome and introductions
- Purpose of today's meeting
- Meeting format
- Project background
- Sound study scope and schedule
- Opportunity for public input

Note: the meeting is being recorded



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Welcome and Introductions

Welcome

- Regina Flores
  - Director of Procurement
  - Milwaukee County Department of Administration

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Meeting Purpose

Meeting Purpose

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Meeting Format

Timing

- Presentation at 4:00pm, 5:00pm, 6:0(
- Input opportunity to follow each pres
- Presentation will be the same during session

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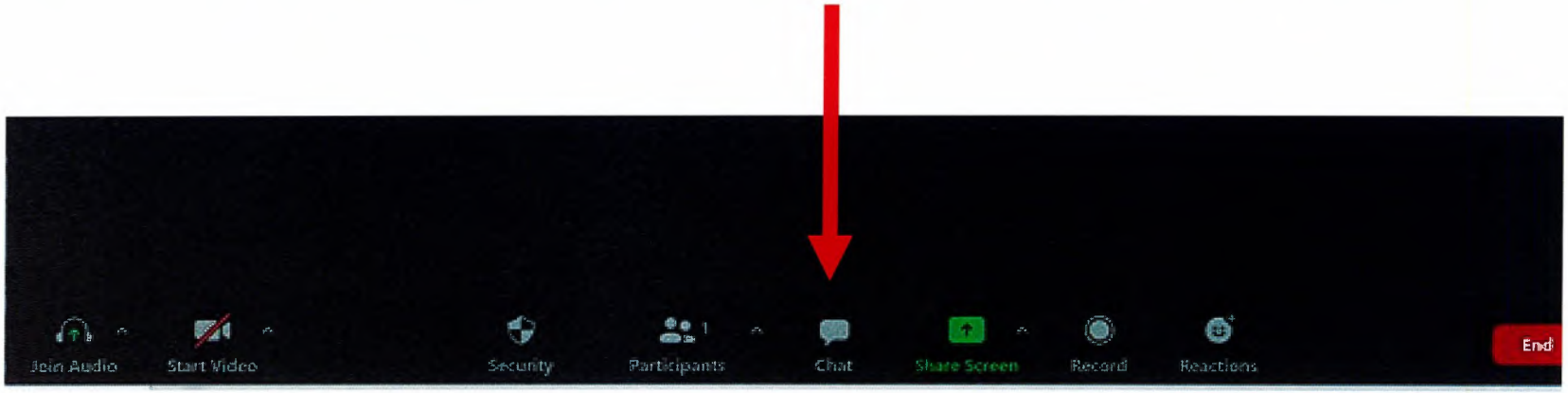
USE CHAT - QUESTION/COMMENTS



- Put your name in the chat to register to speak. The menu will give options – sent the chat message to Beth Foy.
- Speakers will be limited to three-minutes of spoken testimony.

OR:

- Put your comment in the chat (to Beth Foy) if you prefer to offer yo comment in writing and not speak.

OR:

- Mail your comments to: Milwaukee County Procurement, Attn: So Study, 633 W. Wisconsin Avenue, Milwaukee, WI 53203

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Project Background

History of Site

- 1955 - Crystal Ridge landfill opened in 19
  landfill was formally closed in the 1990s
- 1983 – County entered into an agreemer
  hill operator
- 2012 - Milwaukee County leased land to
  Complex
- 2017 - Milwaukee County approved a sal
  Ridge landfill, establishing the opportunit
  development of the park
  - Development of Ballpark Commons i
    minor-league baseball stadium, a gol
    range, and other amenities

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Current Role of Milwaukee County

- As part of the Rock/County contract, sound r were set up to get real time information. Mc are in place to help developer achieve comp with local ordinance.
- Contract with Rock – More than four materi violations in one year may result in County a the City of Franklin does not take stepped-u enforcement measures.
- "Material violation" – A complaint is filed wi operator or City of Franklin of a noise violati which is evidenced by the monitoring data lc that noise violation is not corrected within 3 minutes of the Triggering Event (material vio ordinance)

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Role of Municipalities

- Franklin
  - Rock located in Franklin
  - Local noise ordinance- municipality has r and enforce ordinance
- Greendale
  - Residents impacted via proximity to Rocl

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Study Scope and Schedule

Sound Study: Objectives

- Clarity on what are the sound concerns
- Recommendations to make any adjustm
- Recommendations on sound thresholds

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Sound Study: Scope of Work

- Phase I
  - Meet with the County
  - Develop a plan to complete the pr
- Phase II
  - Public outreach
  - Sound monitoring
  - Sound modeling
  - Review applicable noise regulatio
  - Data analysis

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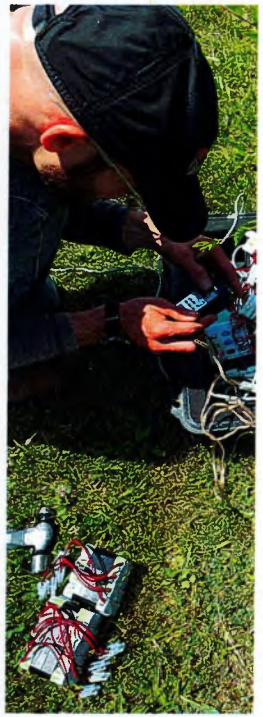
Sound Study: Monitoring Details

- Continuous unattended sound monitoring for 6-months
- Attended sound monitoring during 6 events
- Equipment
  - ANSI/IEC Class 1 sound level meters
  - Digital recordings
  - Meteorological data (wind, temperature, humidity)
- Data processing



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Sound Study: Monitoring Locations

- Ski hill – to capture direct noise from Ui Bar
- Neighborhoods to east and west of Roc Complex – capture representative noise
- 6 months of unattended monitoring
- Attended monitoring at additional locat

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Sound Study: Sound Modeling

- CadnaA Acoustical Modeling Sof
  - 3-dimensional acoustic model
  - Scenarios:
    - 6-events
  - Outputs:
    - Sound levels at discrete receptor locatio
    - Sound contour maps (GIS)
    - Event sound levels compared to ambien

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Sound Study: Analysis

- Documentation of measured data – I during events and during periods wit events
- Review of sound modeling results
- Comparison of periods with events t without
- Recommendations

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Sound Study: Scope of Work

- PHASE III TASKS
  - Review of data and literature dev in Phases I and II
  - Develop sound thresholds for hur
  - Recommend best practices to red noise impacts by use

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Sound Study – Anticipated Sche

Summer 2022:

- Installed monitors
- Conduct public meeting
- Monitor events
- Review local ordinances

What's next:

- Now through end of 2022 - Sound mor
- Spring 2023 – Analyze data
- Spring/Summer 2023 – Final report
  - Note: Final report will include recom

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Public Input

Public Input

- Enter your name in the chat (to Beth Foy provide input, we will call on you in orde unmute your microphone
- Each speaker is allowed no more than 3-
- Each speaker will be called on:
  - State your name, address and spell your nan record
  - State your relationship to the site (resident, employer/employee, site user)
  - **Keep comments pertinent to the Sound Stu**
- We will not be answering questions. Hov after every speaker has been given an op to speak, the team may provide addition on scope/approach, if time allows and if are readily available.

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Date Received	Contact Name	Contact Details	Topic	Questions	Applicable Documentation
8/19/2022	Regan Andersen	Regan.Andersen@milwaukee	Online Meeting details	Request for public meeting details to access the online meeting.	
8/22/2022	Cindy Hennen, 414-915-3627	cindyhennen@yahoo.com	Question & Comment	I hope this sound study will determine why the noise from the ROCK Sports & Entertainment Complex on some days is reasonable and on other days (the noise) is a public nuisance. What measures need to be taken to ensure this complex can co-exist with the residents nearby and not negatively impact their quality of life?	
8/25/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Meeting Invite inquiries	Can people submit comments now prior to the meeting	
8/25/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Meeting Invite inquiries	By postmarked do you mean the date of the email to this department? Or that documents actually need to be mailed through the postal system = postmark.	
8/25/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Meeting Invite inquiries	The notation indicates to be included in the record of the meeting, comments need to be postmarked on or before September 13, 2022. Where was this flyer mailed out to?	
8/25/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Meeting Invite inquiries	By postmarked do you mean the date of the email to this department? Or that documents actually need to be mailed through the postal system = postmark.	
8/25/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Meeting Invite inquiries	Will this file and all the information submitted by the public be accessible to the general public? Such as any input, materials, documents, information and comments submitted will be included / as part of the County CLIC system? If so, what will that CLIC file number be?	
8/25/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Meeting Invite inquiries	What information has been supplied to the company conducting the sound study in regard to what files / documents?	
8/25/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Meeting Invite inquiries	Will there be an additional public meeting similar to this prior to the end of the study? Or a couple more? Or one in person?	
8/25/2022	Jennarose Murdaugh	jennarose50@gmail.com	Comments	Looking to find out what the county will do to lessen the impact of the complex for neighborhood residences.	
8/25/2022	Jennarose Murdaugh	jennarose50@gmail.com	Request	Can the Rock Complex be required to put notices on residents doors to preemptively inform them of plans for fireworks to allow residents to prepare for the noise ahead of time.	
8/25/2022	Jennarose Murdaugh	jennarose50@gmail.com	Request	Email includes request to include attached letter in the record of the meeting	
8/27/2022	Terry and Deb McGuire 9100 W Hawthorne Lane, Franklin 414-425-7581	mcgs9100hawth@yahoo.com	Question & Comment	The decibel level is clearly much greater than needed for this venue that seats 4000.The sound level is compounded by the fact that the two speakers positioned at the corners of the field are positioned away from the stadium and towards the neighborhoods to the west (Franklin) and to the north (Greendale). What is the rationale for that?	
8/28/2022	Terry and Deb McGuire 9100 W Hawthorne Lane, Franklin 414-425-7581	mcgs9100hawth@yahoo.com	Comments	We support the Rock and feel it has put Franklin on the map. We do feel the citizens impacted by the noise, have a lower quality of life however when seeking comfort in their own homes, and are being dismissed regarding the noise pollution concerns.	
8/28/2022	Ed Vidmar 8925 Meadow Lane	EddieVidmar@hotmail.com	Comments	My home of 50 years at 8925 Meadow Lane now is noisy for half the year. Loud and irritating. Can feel the boom boom of music inside my home from music and the fireworks. I think there have been dozen nights woken up from noise, very upsetting. Why does it have to be so loud? I built my home was totally quiet. Now totally opposite. I like sports but want to pick the team I follow. My wife and I attended meetings what they promised was not done. Terrible. Should not hear the sound at my home so far away.	
8/29/2022	John Czakos 414-529-2339		Comment & Invite	Constantly coplaining to police departement. Music is outrageously loud. Cant read or entertain when events are taking place. Invite for representatives to conduct a sound study on his deck when an event is taking place. Address 8625 W. Hawthorne Lane.	
8/29/2022	Kelly Hersh 7867 S 8trd Street., Franklin 53132	hershkelly@gmail.com	Comment	My family and I live on 83rd and Drexel Ave in Franklin. We are not what you would refer to as a neighbor of The Roc and we can still hear the announcers for the ballgames from our property. Additionally, we have had a helicopter lowly circling our home for more than 20 minutes waiting to do a candy drop for the ballgames. Besides the fact that this was extremely off-putting, helicopters shouldn't be circling anywhere, the mere fact that they're a helicopter is reason for them to hover in place versus disrupting the peace of the surrounding neighborhoods.	
8/29/2022	Joe Troia 8645 W. Hawthorne lange 4144258992		Comment	House shakes, windows rattle. When events are taking place. Would like to register a complaint.	
8/29/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	comment	There is a map in the County Development Agreement that includes the Noise and Light Abatement Boundary line. This County established Noise Abatement Boundary has noise spilling over it consistently which is disruptive, annoying and an intrusion into our lives and homes. The lack of even understanding the harm created let alone neglecting a solution to this nuisance for the past 9 years the County participated in creating is egregious. Please control the sound level to protect my home and family over a 1/2 mile from this development.	

			The main factor to the noise pollution, and I hope this isn't overlooked during the sound study, is that the Ballpark and especially the Umbrella Bar are elevated and surrounded by subdivisions on all sides. Nowhere else in the country would put an open air concert venue on top of a hill surrounded by residential zones. It's just not a thing. With the exception of the ski hill, there are no natural or artificial sound barriers between the neighborhoods and the music. Even the Henry Maier Festival Park located downtown does a better job at sound mitigation. The umbrella bar was never designed as a concert venue, and never should have been approved to become a concert venue due to its location. The same goes for the ballpark, although the sound from the ballpark's PA system can be greatly reduced by other means. There's no reason that any sound from the public address system should be leaving the ballpark. No other stadium in the country has these types of issues with noise pollution. There are probably a dozen ways that the operators can lessen the noise pollution, they just won't until they're required to by noise ordinance. Please get this right. The rest of the city and the county get to enjoy reasonable noise limits. Please take action through ordinance, or try your hardest to convince the city of Franklin government to amend their current ordinance
8/29/2022	Eugene Aten	eraten@gmail.com	Comment
8/30/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Comment During the presentation yesterday it was noted that the report would come out in Spring / Summer of 2023. Which would mean that the hundreds of families surrounding this facility in Franklin plus hundreds of families in Greendale would suffer through another entire season of live bands, baseball and other events. So that would mean another 100 or more events before any recommendation or analysis is even supplied to the County. That is incredibly concerning. Measurements are being made now and have been for almost 2 months. There is likely a lot of data from the baseball / music events that can be evaluated so far to get a great start on the impact analysis and suggestions on mitigation. The bulk of the issues from noise are from May to the end of September.
8/30/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Request Please advise regarding the timeline that the report would not come out until Spring/Summer. Perhaps I misunderstood that part of the meeting.
8/30/2022	Robert Cera	speechless2@sbcglobal.net	Comment My one area of sound concern is that practically every Saturday night for what reason I do not know ,there is a rhythmic thumping sound which at times is endless. It is annoying to the point that you cannot escape and it actually interferes with watching a television program and your ability to concentrate on the programs audio. The code on the flyer is not easy to access - the digit after the 3 could either be an O or a zero, so when typing that in, it is confusing. And then after getting to the right site, then it required them to scroll through the County calendar to find this event which was at the very end of the page when I was searching, I tried a couple ways of searching. Several people told me they could not find this meeting in the calendar.
9/5/2022	Dana Kerr Kerr Consulting		Meeting access
9/5/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Comment Why is the noise study report not going to be completed until NEXT SUMMER? as presented, during the meeting. That would mean another ENTIRE season of baseball and live music prior to the noise evaluations being reported to the County. That would be over an additional 100 disruptive noise blasting events into my home. This is torture. It is a travesty that this has been allowed to go on this long. I thought when the scope was reduced to get the study done faster and less expensive it was not with the intention to wait an entire year to get the REPORT and recommendations on mitigation for the noise.
9/5/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Request I would like to suggest the County request the official online complaint forms submitted to the City for this year and 2019 (the opening of the stadium) regarding noise from the Rock. And/or the police calls during that time related to noise from the Rock. That would supply addresses and names of those impacted as part of the history of those impacted and give the Sound Study contractor more information. I think it would be very relevant for this study to understand the areas being disturbed by the noise from this facility. May to early November is the peak time for noise intrusion into our homes. I wanted to bring this information to your attention as the sponsor of the Comprehensive Sound Study for this development. I appreciate that the citizens around this facility are finally getting the noise examined that has destroyed our quiet enjoyment for 9 years. As the sponsor and supervisor for this district, did the County involve you in creating this flyer? Plus request your input for delivered / impacted areas? I am aware that people in Hales Corners hear the noise from this facility. Families within miles of this development are adversely impacted and should have been aware of this meeting and given a direct link / easy access. The noise should simply not be broadcast for miles across the County Development Noise Abatement Boundary, which is the property line of the development. It is in the Agreement with this developer. It is a violation of the Agreement. This crucial Abatement Boundary for the Noise was never even discussed in the shortsighted "audit" that took over 2 years to complete. Not even mentioned.
9/5/2022	Dana Kerr Kerr Consulting	kerrconsulting@msn.com	Comment

				I live 1.5m away from the Complex in Greendale, WI. We moved to the area in 2019 and since then the Rock Sports Complex has continued to become more and more of a nuisance. We all have memories of having a neighbor who plays music too loud (on weekends and even on the weekdays).... they have friends over and disrupt your whole evening and stay up later with music loud when you are trying to go to bed or your kids are going to bed..... THAT IS THE ROCK SPORTS COMPLEX. We can clearly hear the PA from games, movies from drive-in, music from concerts, fireworks, halloween stuff and even the light pollution at night. We moved to this area because of the quiet connection to nature and the sense of community. This complex continues to grow without anyone or anything holding them accountable for the disruption to the people living in the area. It is loud at all hours of the evening and at times we are even unable to have the windows open IN OUR OWN HOME due to the unnecessarily loud noises coming from the complex making it hard for us and our daughter.	
9/12/2022	Kyle & Eileen Baldwin	ebtklb@gmail.com	Comment	Something needs to be done. We are just asking for some basic considerations here.	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Comment	Surrounding neighbors like myself were told by County officials and staff that Exhibit C, the Light and Noise Addendum would be a "benefit to the neighbors".	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Question	Does allowing disruptive noise for hours upon hours protect me, my family, and neighbors? Does allowing this disruptive noise to be exceeded for up to 30 minutes per the interpretation of the developer and the City of Franklin make any sense	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Question	That this noise can be heard from 1½ miles away and must be consistent for 30 minutes, AND must happen for a minimum of three times a year before it is considered a "violation"?	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Question	Does that support the County intention and spirit of the noise addendum?	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Question	How does any of this mitigate noise?	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Comment	There is not a single sound ordinance found anywhere else in Milwaukee County that states anything about noise or sound issues being sustained for 30 minutes or any amount of time before it is considered a violation.	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Question	Do three solar-powered sound monitors, none of which were placed using scientific data, seem like adequate monitoring for a 140-acre entertainment district?	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Question	Franklin's engineer, Glen Morrow, inquired if there would be at least 2-3 dozen sound monitors in 2017. Why is only one Franklin ordinance noted in Exhibit C, and why not ALL of Franklin's other noise ordinances, such as 184-40, 15-3.1107, and 178-5?	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Question	How is all this representative of the spirit and intent of Exhibit C being a "benefit to the neighbors"?	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Comment	Little to nothing in Exhibit C "benefits" the neighbors. It essentially protects the developer and his entertainment district only.	
				Request for letter from Supervisor Staskunas be added to the digital record. Supervisor Staskunas states the following: "There continues to be an ongoing challenge at The Rock complex with noise and light. My office continues to receive complaints from neighbors regarding noise and light from the little league fields at The Rock complex and complaints regarding the music stage at The Rock the last few years. A large number of complaints were received after the opening of the concert season on Saturday, June 3rd. I have communicated with the Ballpark Commons developer and made it very clear that I will not support the Ballpark Commons Project unless a comprehensive solution to the noise and light problems is made a part of the option to purchase agreement. The solution to the noise and light issues will need to address the current issues, at the little league baseball fields and at the bandstand, as well as provide for sufficient noise and light protections for the neighborhood as a result of the construction of the new baseball stadium and the surrounding development."	
	Andy & Becky Kleist	abcdlkleist@gmail.com	Comment	Even prior to the stadium being approved, the noise issues were a longstanding problem to the surrounding communities. Despite Staskunas's stern warnings, neither he nor anyone else in the County or Franklin did anything further to assure the neighbors that noise would not be an issue and that sufficient protections were put in place. To this day, there is nothing that mitigates the noise. Mayor Olson wrote to the developer in September 2020: "Dear Mike, as a follow up from our many recent conversations, the noise intrusion into the lives of the neighbors must be reduced. The number of complaints this baseball season has risen and has included new complaints and the watch parties have made the problem even worse... effort is needed to help bring the neighbors more peace and quiet. The neighbors can no longer be forced to participate in the events at the development whether they want to or not. The city can no longer spend the time on processing the complaints that may not rise to a violation of ordinance or agreement but be a nuisance to the residents none the less. Solitude may not be achieved but improvement must be made. We're all tired of the problem so let's get it fixed, at least in terms of the stadium. We still need to deal with the Umbrella bar which was a big issue tonight."	Supervisor Letter https://drive.google.com/file/d/1o7GL8HDa9PHxsYamH9MNbuI1TglxNvwI/view Mayor Letter
	Andy & Becky Kleist	abcdlkleist@gmail.com	Comment	Shortly after this letter was sent to the developer, the City of Franklin Planning Director presented a detailed report regarding The Rock to the Franklin Common Council in November 2020. Attached is the Common Council document that contains the Planning Directors report, starting on page 70. Please include this document in the public record.	https://drive.google.com/file/d/1FUAhR5N0Rux-LD0Qu7hKmeJNGQM6u-CM/view

			This public document created by the professional planning/zoning staff in Franklin includes the following on page 76: "It should also be noted that the sound limit of 79 dBA is significantly higher than that permitted in "all residential districts," which is 50 dBA during the daytime and 45 dBA at night (10:00pm to 7:00am), as the UDO Section 15-3.1107 standards are understood to apply to the receiving district as well as the originating district. This means that technically speaking a violation of the sound standard at the district line is more material than one originating in PDD37. Therefore, the onus is on any operator in Ball Park Commons to apply a higher standard to noise beyond the limits of the higher noise generating locations." This paragraph indicates it is the Operator of The Rock/Ball Park Commons responsibility to follow more stringent standards to limit the noise. Nothing has been done to limit the noise to the property only. The City of Franklin is not even following their own ordinances. 79 decibels are 29 decibels above ANY residential district in Franklin and 15 decibels above ANY district in Milwaukee County, even the Manufacturing and Airport Overlay District.	
Andy & Becky Kleist	abcdlkleist@gmail.com	Comment		https://drive.google.com/file/d/1K
Andy & Becky Kleist	abcdlkleist@gmail.com	Comment	n page 73 of this report, it states the following below: "PDD 37 Approval History Regarding Noise/Sound Staff has reviewed the history of PDD 37 from the original approval of Ordinance 2012-2089 through the most recent reviews for Franklin Field, as relates to the issue of sound and noise reduction strategies. As the Council may be aware, the original approval incorporated a specific requirement to conduct a "comprehensive outdoor sound study as a condition of approval, as follows: Department of City Development "Prior to any new or revised concerts, live music venues, or outdoor events utilizing speakers, including but not limited to the proposed baseball stadium, the applicants shall prepare a comprehensive outdoor sound study of The Rock Sports Complex (incorporating both existing and proposed events and facilities), that such study shall identify and recommend such practices, equipment and systems to not only fully comply with all pertinent City noise regulations and standard, but which also reasonable addresses neighbors' concerns, that such study be reviewed by an independent party of the City's choosing and at the applicants' reasonable expense, for review and acceptance by the Common Council, prior to any further development within The Rock Sports Complex. Any recommendations from the Comprehensive Study that apply to existing facilities or events shall be implemented by the applicants within two years from the date of acceptance of the Study by the Common Council." The sound study was never completed. Clearly, there was an opportunity to design the stadium and other facilities to reduce the adverse impact of noise for miles around this development, and nothing was done. This required Comprehensive Sound Study was removed by the development team, including Supervisor/Alderman Steve Taylor (future foundation director for ROC Ventures). Additionally, Taylor and the developer misrepresented that the County did the sound study and approved 79 dBA at June 2018 City of Franklin meetings and 2019 Milwaukee County meetings. Both are misrepresentations. On page 76 of this same report, City staff acknowledges that the sound monitor on 76th St. is "essentially useless as a monitor for sound violations from the Rock Sports Complex." Additionally, during the placement of the sound monitors, the FPD's Captain of Police, Curtis Goens, wrote in an email dated 4-23-2019 to Greg Marso, City Planning Manager Joel Dietl, and Mayor Steve Olson that "The very north location in the woods depicted in Exhibit C I think would be ineffective due to the extreme elevation change from where the noise is originating from and the buffer from the tree foliage." Yet that monitor was still placed in that general location. So, 2 of the 3 sound monitors are effectively useless. What science or acoustic engineer was used in the placement of these monitors? Unfortunately, none were involved with any of this. The noise from this development should simply not be broadcast for miles across the County Development Noise Abatement Boundary, which is the property line of this development, and is in the Agreement with the developer. This crucial Abatement Boundary for the noise was never even discussed in the shortsighted "audit" that took over 2 years to complete. Even now, it is rarely mentioned and per the Agreement with the developer is regularly being violated.	CC_Mtg Packet 12-1-2020
Andy & Becky Kleist	abcdlkleist@gmail.com	Comment	Regarding this sound study, I have been disappointed by the County's ability to reach out to ALL the surrounding neighbors that have been affected by the noise. During the public meeting for this sound study, the presenter stated that flyers were sent to citizens that had complained about the noise. However, I have attended numerous meetings and submitted numerous complaints over the years and was not mailed a flyer at all. After further inquiry, I came to find out through my County Supervisor that no one in my neighborhood was notified of the sound study meeting, and I know of neighbors who have complained too. The same is true of other affected neighborhoods in Greendale. One would think the County would want to cast a wide net and get input from as many of the surrounding neighbors as possible, whether it be good or bad input, but that does not seem to be the case. It seems the County wants as little input as possible.	https://drive.google.com/file/d/1K9ztJAnj6NoTr31eHjtou4P2AlCb8bJc/view Noise Abatement Map https://drive.google.com/file/d/1PkWQorKrV2dmuKX7CnaUBEbyxqUynOoa/view

APPENDIX D. ROC FACILITY SCHEDULES AND INFORMATION

2022 SEASON SCHEDULE

MAY

SUN	MON	TUE	WED	THU	FRI	SAT
					13 LC 6:35PM	14 LC 6:00PM
15 LC 1:00PM	16 CLE 6:35PM	17 CLE 6:35PM	18 CLE 10:00AM	19 OFF	20 @SF	21 @SF
22 @SF	23 OFF	24 @FM	25 @FM	26 @FM	27 GAR 6:35PM	28 GAR 6:00PM
29 GAR 1:00PM	30 OFF	31 @SC				

JUNE

SUN	MON	TUE	WED	THU	FRI	SAT
			1 @SC	2 @SC	3 FM 6:35PM	4 FM 6:00PM
5 FM 1:00PM	6 OFF	7 @CLE	8 @CLE	9 @CLE	10 @CLE	11 @CLE
12 @CLE	13 OFF	14 CHI 6:35PM	15 CHI 6:35PM	16 CHI 6:35PM	17 @KC	18 @KC
19 @KC	20 OFF	21 @CHI	22 @CHI	23 @CHI	24 GAR 6:35PM	25 GAR 6:00PM
26 GAR 1:00PM	27 OFF	28 @LC	29 @LC	30 @LC		

JULY

SUN	MON	TUE	WED	THU	FRI	SAT
					1 @CHI	2 @CHI
3 @CHI	4 LIN 6:00PM	5 LIN 6:35PM	6 LIN 6:35PM	7 OFF	8 KCO 6:35PM	9 KCO 6:00PM
10 KCO 1:00PM	11 ALL-STAR BREAK	12	13	14 @KCO	15 @KCO	16 @KCO
17 @KCO	18 KC 6:35PM	19 KC 6:35PM	20 KC 6:35PM	21 KC 6:35PM	22 SC 6:35PM	23 SC 6:00PM
24 SC 1:00PM	25 OFF	26 @LIN	27 @LIN	28 @LIN	29 @KCO	30 @KCO
31 @KCO						

AUGUST

SUN	MON	TUE	WED	THU	FRI	SAT
	1 OFF	2 CLE 6:35PM	3 CLE 6:35PM	4 CLE 6:35PM	5 WPG 6:35PM	6 WPG 6:00PM
7 WPG 1:00PM	8 @WPG	9 @WPG	10 @WPG	11 OFF	12 @GAR	13 @GAR
14 @GAR	15 LC 6:35PM	16 LC 6:35PM	17 LC 6:35PM	18 LC 6:35PM	19 SF 6:35PM	20 SF 6:00PM
21 SF 1:00PM	22 @LC	23 @LC	24 @LC	25 OFF	26 KCO 6:35PM	27 KCO 6:00PM
28 KCO 1:00PM	29 OFF	30 CHI 6:35PM	31 CHI 6:35PM			

SEPTEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
				1 CHI 6:35PM	2 @GAR	3 @GAR
4 @GAR	5 @GAR					

HOME GAMES

AWAY GAMES

AMERICAN ASSOCIATION OF PROFESSIONAL BASEBALL

WEST DIVISION

- WPG - WINNIPEG GOLDEYES
- FM - FARGO-MOORHEAD REDHAWKS
- SF - SIOUX FALLS CANARIES
- SC - SIOUX CITY EXPLORERS
- LIN - LINCOLN SALTDOGS
- KC - KANSAS CITY MONARCHS

EAST DIVISION

- LC - LAKE COUNTRY DOCKHOUNDS
- MKE - MILWAUKEE MILKMEN
- GAR - GARY SOUTHSHORE RAILCATS
- CHI - CHICAGO DOGS
- KCO - KANE COUNTY COUGARS
- CLE - CLEBURNE RAILROADERS

FIREWORKS NIGHT

CANDY DROP

TURN BACK THE CLOCK DEAL
4 Tickets + 4 Sandwiches + 4 Drawstring Bags

LECHEROS DE MILWAUKEE

FUN DAYS
Milkmen + State Fair Ticket Bundles

JERSEY AUCTION

$1 BEER NIGHT

DELLS DAYS
Sunglasses Giveaway

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2022

SEASON SCHEDULE

*DOUBLE FEATURE

MAY

THU	FRI	SAT	SUN
		21 7:30 & 10:30	22 5:00

JUNE

THU	FRI	SAT	SUN
9 6:30 *	10 6:30 & 9:15	11 5:00, 7:30 & 10:30	12 5:00
	17 6:30 & 9:15	18 5:00, 7:30 & 10:30	19 5:00
30 6:30 *			

JULY

THU	FRI	SAT	SUN
	1 6:30 & 9:15	2 5:00, 7:30 & 10:30	3 5:00
14 6:30 *	15 6:30 & 9:15	16 5:00, 7:30 & 10:30	17 5:00
28 6:30 *	29 6:30 & 9:15	30 5:00, 7:30 & 10:30	31 5:00

AUGUST

THU	FRI	SAT	SUN
11 6:30 *	12 6:30 & 9:15	13 5:00, 7:30 & 10:30	14 5:00

SEPTEMBER

THU	FRI	SAT	SUN	MON
	2 6:30 & 9:15	3 5:00, 7:30 & 10:30	4 5:00 & 7:30	5 6:30
8 6:30 *	9 6:30 & 9:15	10 5:00, 7:30 & 10:30	11 5:00	
15 6:30 *	16 6:30 & 9:15	17 5:00, 7:30 & 10:30	18 5:00	
22 6:30 *	23 6:30 & 9:15	24 5:00, 7:30 & 10:30	25 5:00	
29 6:30 *	30 6:30 & 9:15			

OCTOBER

THU	FRI	SAT	SUN
		1 5:00, 7:30 & 10:30	2 5:00 & 7:45
6 6:30 *	7 6:30 & 9:15	8 5:00, 7:30 & 10:30	9 5:00 & 7:45
13 6:30 *	14 6:30 & 9:15	15 5:00, 7:30 & 10:30	16 5:00 & 7:45
20 6:30 *	21 6:30 & 9:15	22 5:00, 7:30 & 10:30	23 5:00 & 7:45
27 6:30 *	28 6:30 & 9:15	29 5:00, 7:30 & 10:30	30 5:00 & 7:45

PRESENTED BY: Educators CREDIT UNION

Summer Concert Series @ THE ROCK

EVERY SATURDAY NIGHT AT 6:30 PM
JUNE 4 THROUGH SEPTEMBER 17

JUNE 4	GENERATION Z
JUNE 11	CHEAP SHOTS
JUNE 18	BOOTJACK ROAD
JUNE 25	LOVE MONKEYS
JULY 2	RADIO RADIO
JULY 9	THE NOW
JULY 16	ALMIGHTY VINYL
JULY 23	DETOUR
JULY 30	MT. OLIVE
AUGUST 6	THE PLAYLIST
AUGUST 13	STETSIN & LACE
AUGUST 20	THE TOYS
AUGUST 27	SUPERFLY
SEPT 3	FIRST WAVE
SEPT 10	33 RPM
SEPT 17	FAILURE TO LAUNCH

umbrella bar ROCK

AT THE Callen PAVILION

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BREWTOWN SUMMER SHOWDOWN

RLB FEATURED EVENT

2022 ROCK TOURNAMENTS

APRIL 1 - 3

APRIL 15 - 16

APRIL 22 - 24

MAY 13 - 15

MAY 27 - 29

JUNE 3-5

JUNE 10-12

JUNE 16 - 19

JULY 1 - 3

JULY 14 - 17

JULY 21 - 24

The Rock Sports Complex is uniquely defined by its major league specification baseball fields. Our fields are designed by the very best experts and built using the very best product, used by the vast majority of the 30 Major League Stadiums – from the drainage and irrigation to the sod, root zone mix, and turf. No detail was overlooked.

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Rock League Baseball is an all new brand of baseball for ages 8 through 88. Whether you're a youngster just joining the game or an adult that can't leave the game, we have a spot for you. All RLB players are treated like big league players.

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ROCK LEAGUE

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THE ROCK

THE HILL HAS EYES

4 OUTDOOR HAUNTS FOR THE PRICE OF 1

6PM - 8PM	GENERAL ADMISSION	VIP/ SPEED PASS
FRI	$35	$45
SAT	$40	$50

8PM - 10PM	GENERAL ADMISSION	VIP/ SPEED PASS
FRI	$37	$47
SAT	$42	$52

10PM - 12AM	GENERAL ADMISSION	VIP/ SPEED PASS
FRI	$39	$49
SAT	$44	$54

SELECT A DATE BELOW

Thursday	Friday	Saturday	Sunday
SEPT 29	SEPT 30 BUY TICKETS	OCT 1 BUY TICKETS	OCT 2 NOT SO SCARY HALLOWEEN PARTY BUY TICKETS
OCT 6	OCT 7 BUY TICKETS	OCT 8 BUY TICKETS	OCT 9 NOT SO SCARY HALLOWEEN PARTY BUY TICKETS

TICKETS & HOURS

ON-SITE BOX OFFICE HOURS

Fridays: 5:30pm – 11:00pm

Saturdays: 5:30pm – 11:00pm

We accept cash & credit cards for tickets at Box Office onsite ($5 more than online prices)

When tickets are SOLD OUT online that means we're officially sold out of all tickets for that time slot. That means you cannot purchase tickets on-site at the Box Office either. Please take a look at our future haunt dates & time slots for a good fit with your schedule

Park closes about an hour after the box office closes

Active/Reserve Military Members: Show your Military ID at the on-site box office and receive $5 off your cash ticket

GROUP TICKETS

Group rewards start at 10 or more individuals! **Click here** to learn more! **Group rewards are earned through 12pm noon Central on date of ticket.**

PURCHASE TICKETS TO THE BEST HAUNTED EXPERIENCE

Purchasing an **online general admission ticket** allows you to skip the general admission box office line and guarantees your entry into The Hill Has Eyes. Purchasing an **online VIP speed pass ticket** allows you to skip the general admission box office line plus the general admission lines for all four haunts and guarantees your entry into The Hill Has Eyes.

- Parking included free
- Tickets purchased online will be emailed to you
- Online same day ticket sales close at 11:15pm
- **All sales are final.** No Refunds or exchanges.

ONLINE GENERAL ADMISSION PASS

Buy an Online General Admission Pass and save yourself from the **horror** of missing out on Milwaukee's best haunted house.
Buying online is ALWAYS the most convenient way to purchase tickets for The Hill Has Eyes and GUARANTEES your admission, as we often sell out.

- Guarantee you get in and avoid a sold-out night
- Skip the general admission box office ticket line
- One ticket lets you into all four haunted attractions
- Only a limited number of passes are available
- Same day online ticket sales close at 11:15pm
- Parking is always free
- ALL SALES FINAL - NO REFUNDS OR EXCHANGES

VIP SPEED PASS

Skip the lines at Milwaukee's best haunted house!

Skip the lines with a VIP Speed Pass, available every night for online pre-sale.

In addition to skipping the General Admission Box office ticket line, Speed Pass holders will skip the General Admission waiting lines for each of the four outdoor Haunts. Drinks are available for purchase in our beer tent also enjoy nightly bonfires, feel free to wear your favorite costumes! Attractions open at 6:00pm every night, but be sure to arrive early, sell-outs are common.

And remember, wear your running shoes, because the mutants like to play with their food!

GENERAL ADMISSION PASS - ONSITE BOX OFFICE PURCHASE

General admission tickets provide access to all four outdoor Haunts. Drinks are available for purchase in our beer tent also enjoy nightly bonfires, feel free to wear your favorite costumes! Attractions open at 6:00pm every night, but be sure to arrive early, sell-outs are common.

And make sure you wear your running shoes, because the mutants like to play with their food!

NOT SO SCARY HALLOWEEN PARTY

Ideal for kids and families who want to experience The Hill Has Eyes attractions when its not so scary. Our actors will take you on a guided tour through the attractions and kids will get to Trick or Treat along the way. Kids are encouraged to dress up and be a part of the fun! **Click here** to learn more & get your tickets!

WAIVER & RELEASE

Waiver & Release for Online Consent via Checkbox

Adult Waiver for Signature

Under 18 Waiver for Signature

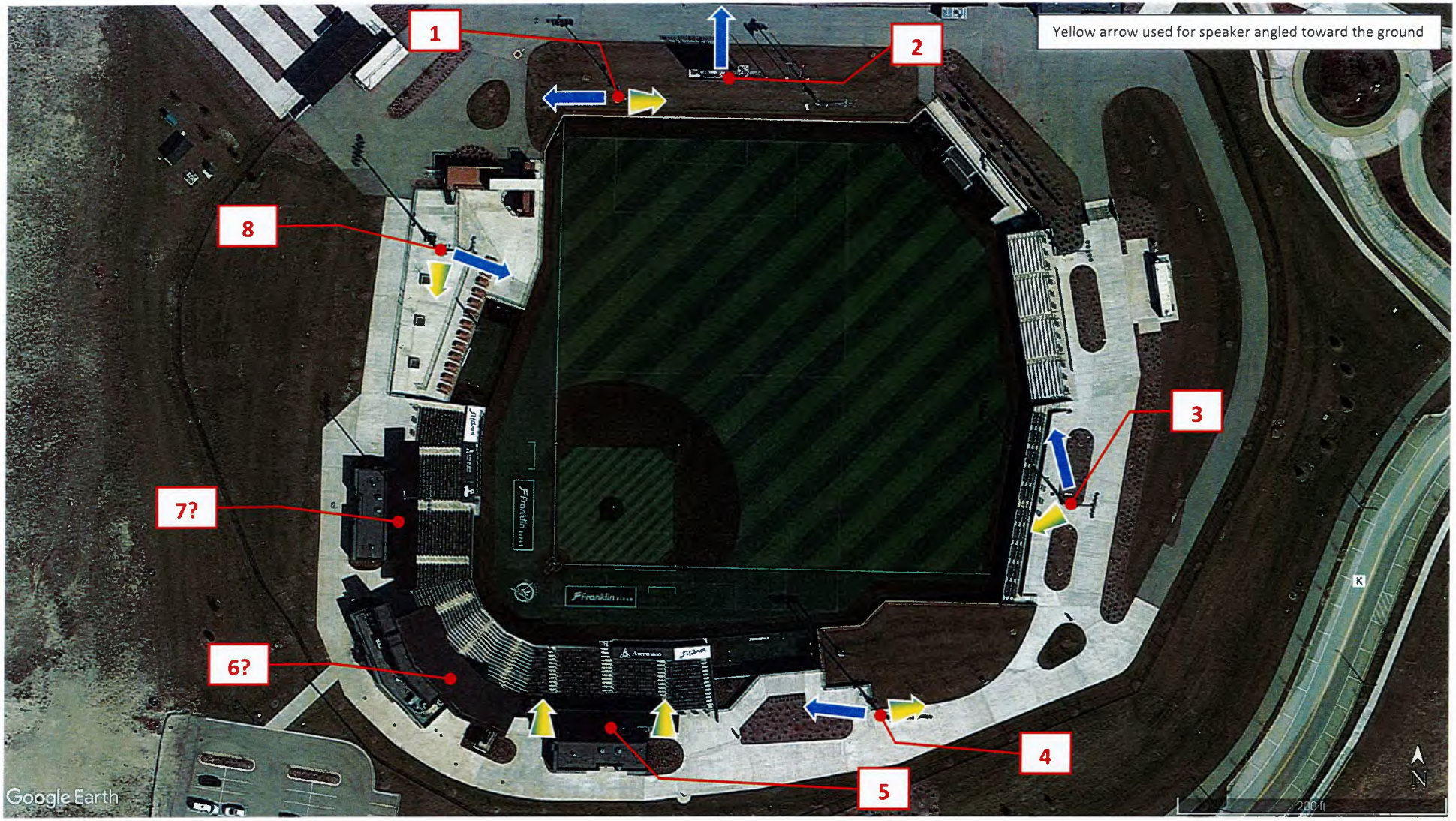
TICKETS AVAILABLE FOR WISCONSIN'S SCARIEST HAUNTED ATTRACTION

Milwaukee's most frightening outdoor haunted house experience, The Hill Has Eyes, features four terrifying attractions. Enjoy snacks, refreshment and nightly music and hang out at the bonfire with your friends.

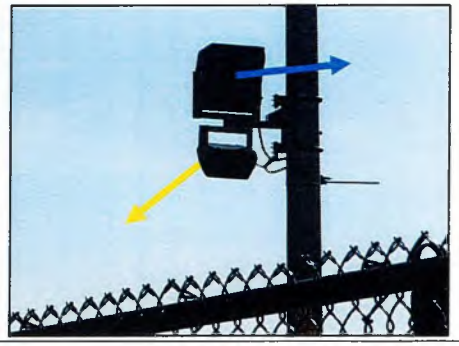
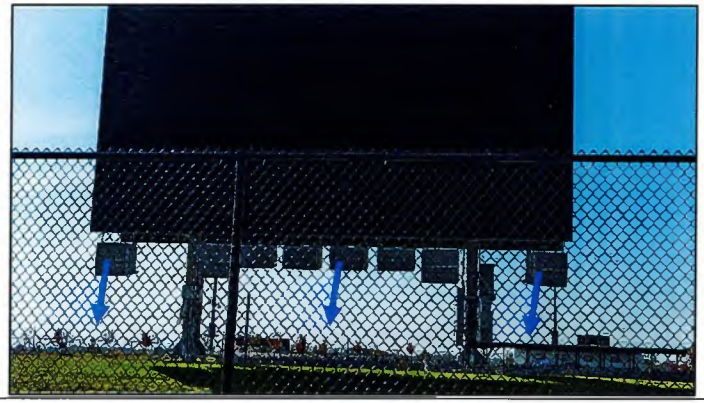
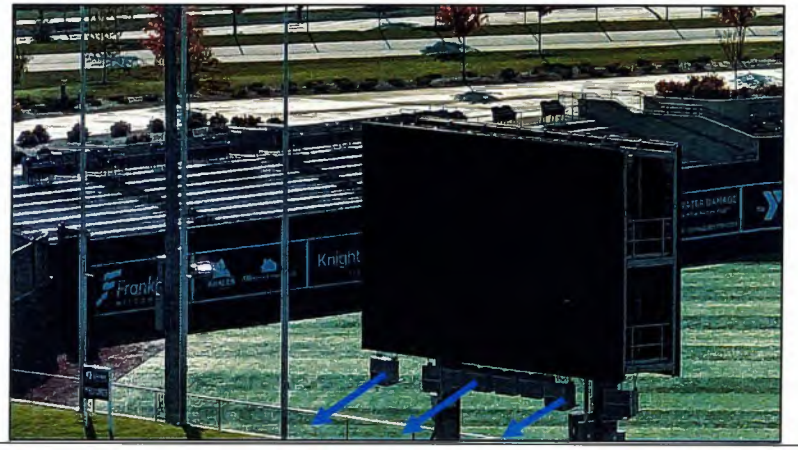
After being contained and led to the gates of the haunted trailer park, our cast of mutant cannibal hillbillies will chase you and your friends through the warped trailer park of Failed Escape. All exits lead to Hunger Hollow, where you're corralled into the toxic Lemberger landfill, where more than a million gallons of waste lie below. Here, the full depravity of the landfill dwellers is revealed, as the captured are skinned alive, butchered and eaten before their

souls are committed to Satan and their husks rise again with infernal life Survive the haunted trails with your soul intact Only then can you become one of Them, cursed to an eternity of torment in the devil's carnival

They know you're coming They're always watching you, waiting for you They know you can't resist their call, and it's only a matter of time before they make you one of their own This October, there is no escape There is no mercy There is only The Hill, and The Hill Has Eyes



1. One facing west; Another one facing east pointed ~45 degrees toward the ground
2. About eight speakers facing north
3. One facing north; Another one facing southwest and pointed ~45 degrees toward the ground)
4. One facing west; Another one facing east (pointed straight down toward the ground)
5. Multiple speakers tilted ~45 degrees toward the seats
6. (No pics; however, I assume speakers exist here)
7. (No pics; assume speakers set up similar to #5)
8. One facing east w/slight ~25-degree tilt downward; one facing south pointed toward the ground

Location #1	Location #2
(Picture taken facing southeast)  	(Picture taken facing south) 
(Picture taken facing northwest)  	(Picture taken facing southeast) 

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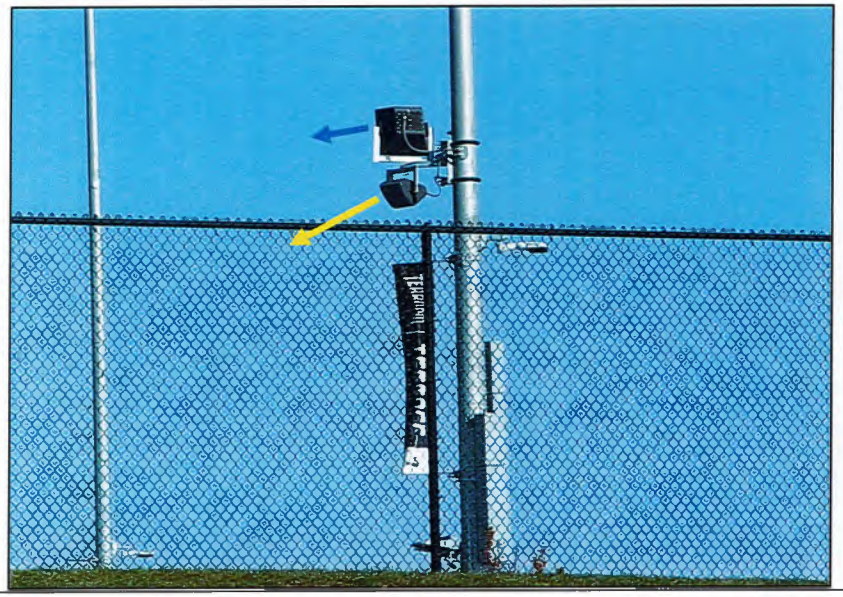
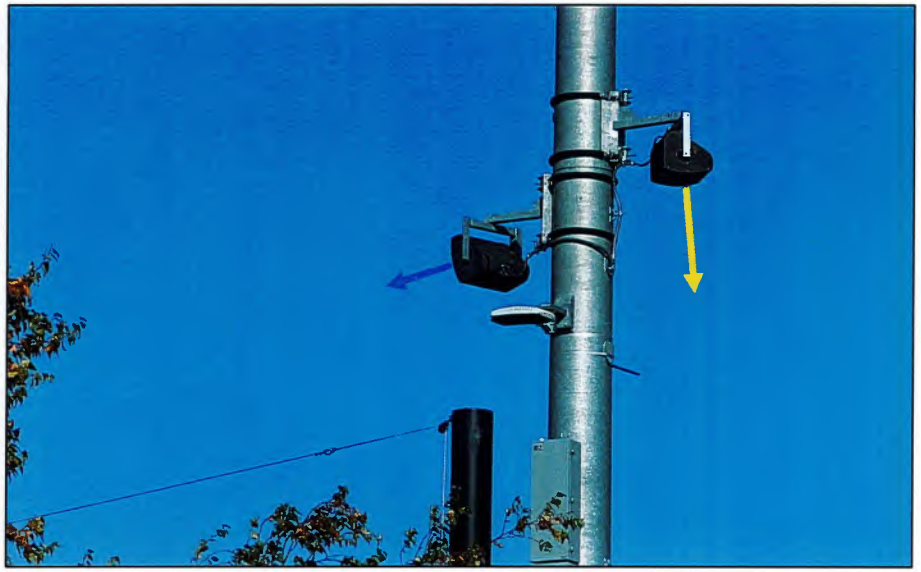
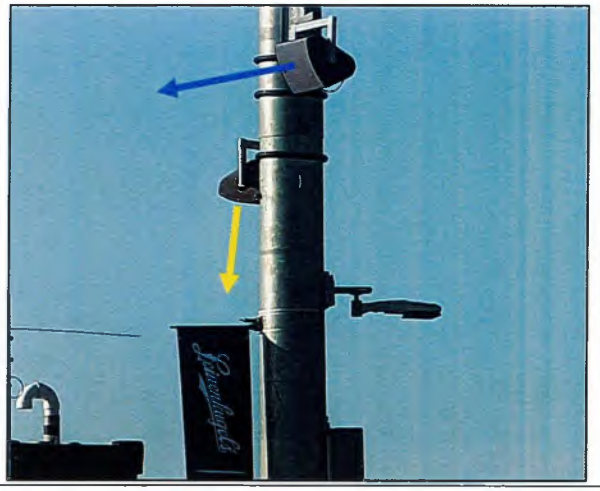
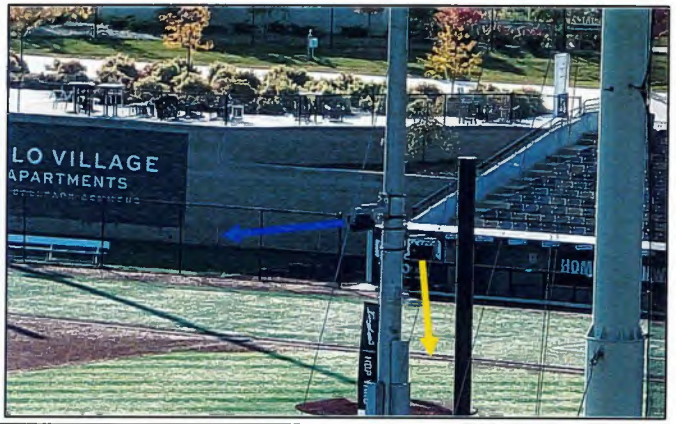
(Picture taken facing north-northeast) 	(Picture taken facing north-northwest) 
(Picture taken facing northwest) 	(Picture taken facing north-northwest) 

Location #5	Location #8
(Picture taken facing northwest) 	(Picture taken facing southwest) 
(Picture taken facing north) 	(Picture taken facing southeast) 


Exit Street View
Dave Jashek
Images may be subject to copyright
Google Earth
42°55'15.15" N 88°00'44.32" W elev 852 ft eye alt 843 ft

APPENDIX E. ATTENDED SOUND MONITORING RESULTS

MEMO

TO: Suzanne Carter, Milwaukee County

FROM: Dana Lodico, RSG

DATE: October 10, 2022

SUBJECT: ROC – Results of Attended Sound Monitoring August 6, 2022

This purpose of this memo is to document and provide preliminary interpretations of the results of attended sound monitoring at locations adjacent to the Rock Sports Complex (ROC) on the evening of August 6, 2022. During this time, the following ROC events took place (times approximate):

- Prior to baseball game start: pre-game parade, private event with low level music, little league
- 6:00 to 10:00 pm: Baseball game at Stadium
- 6:30 pm: Live band in Umbrella Bar (The Playlist)
- 10:00 to 10:06 pm: Fireworks

A more detailed analysis of both attended and unattended results will be documented in the Final Report, once all data has been collected and analyzed.

Attended Sound Monitoring Procedures

Sound level meters were mounted on tripods at a height of approximately 1.5 meters (5 feet) and covered with 180 mm (7 inch) windscreens to minimize the impact of wind distortion on measurements. Field staff attended each monitor and documented sound levels attributable to facility and non-facility related activities occurring during the attended events.

Sound level monitoring was performed with ANSI/IEC Type 1 sound level meters with a minimum frequency range of 6.3 Hz to 20 kHz. The sound level meters were field calibrated during at the start and end of the attended monitoring session and found to be within 0.2 dB.

The project team did not receive permission to monitor on ROC property. As a result, attended monitoring was conducted at the Ski Hill and in the surrounding communities. Three sites were attended on the evening of August 6, 2022;

1) A Ski Hill location with direct sound and visual exposure to the Stadium and Umbrella bar (5:27 to 6:40 pm),

2) The front yard of 7573 Highview Drive in Greendale (7:17 to 7:40 pm), and

3) The backyard of 8610 West Hawthorn Lane in Franklin (8:13 to 8:46 pm and 9:38 to 10:07 pm).

Attended measurements were also planned at 9011 West Hawthorn Lane; however, event noise was found not to be audible at this location and monitoring was moved back to 8610 West Hawthorn Lane. Monitoring locations are shown in Figure 1.

Concurrent to the attended monitoring, unattended monitoring continued to occur at the three long-term monitoring sites that are described in the Workplan, dated September 14, 2022. This memo only describes the results of the short-term attended monitoring; the long-term unattended monitoring results will be discussed in the Final Report.

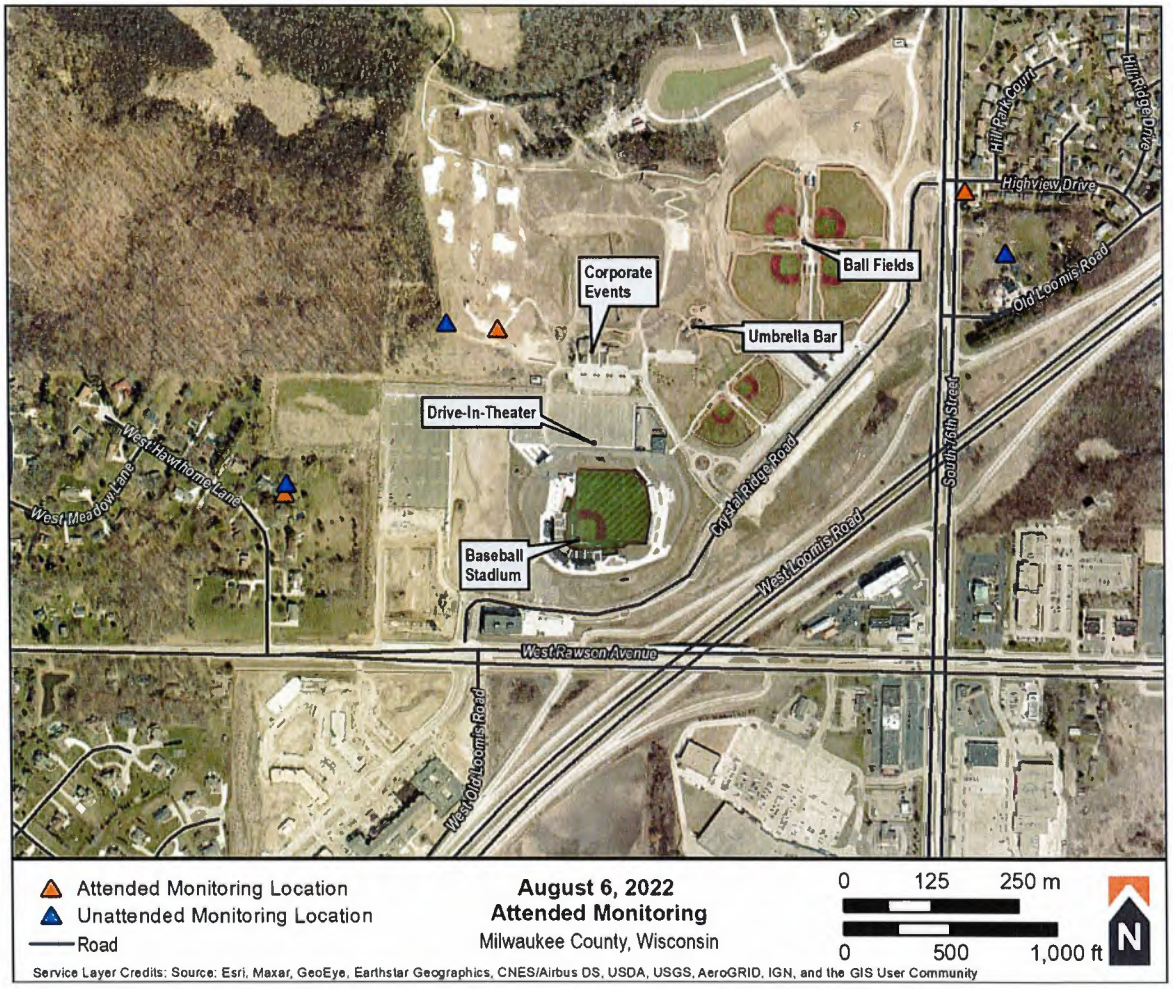


FIGURE 1: NOISE MONITORING LOCATIONS

Sound Monitoring Results

A summary of results of the attended sound monitoring is given in Table 1, including equivalent continuous average (L_{eq}), upper 5th percentile (L_5), and lower 5th percentile (L_{95}) sound levels. The results include sounds from all sounds sources, including event and non-event sources. Sounds levels attributed exclusively to event sources will be provided in the Final Report, once all data has been acquired and analyzed.

TABLE 1: SUMMARY OF ATTENDED MONITORING SOUND LEVELS

LOCATION	EVENT SOURCES	PRIMARY BACKGROUND SOURCES	Sound Pressure Level, dBA		
			L_{eq}	L_{05}	L_{95}
Site 1: Ski Hill (5:27 to 6:40 pm)	Minimal	Distant traffic, geophonic and biogenic sounds, and occasional aircraft flyovers	51	54	47
	Baseball Game Umbrella Bar Concert		56	60	48
Site 2: 7573 Highview Drive (7:17 to 7:40 pm)	Baseball Game Umbrella Bar Concert	Vehicles on South 76th Street	65	71	49
Site 3: 8610 Hawthorn Lane (8:13 to 8:46 pm and 9:38 to 10:07 pm)	Baseball Game Umbrella Bar Concert	Geophonic and biogenic sounds, occasional aircraft flyovers, children playing	53	54	46
	Fireworks		70	77	43

Site 1: Ski Hill

Attended sound monitoring at the Ski Hill site occurred from 5:27 pm until 6:40 pm on August 6, 2022. Photographs of the Ski Hill site are shown in Figure 2, facing east towards the Umbrella Bar and southeast toward the Baseball Stadium. As indicated in the photographs, the site has direct sound and visual exposure to both the Stadium and the Umbrella bar. The westernmost portion of the Stadium is shielded by a portion of the Ski Hill. Ambient (non-ROC activity) sounds at this site included distant traffic, geophonic and biogenic sounds, and occasional aircraft flyovers. Aircraft events not associated with ROC clearly dominated the sound environment when they occurred.

The results of attended sound monitoring on August 6, 2022 at the Ski Hill are shown in Figure 3. At the start of the monitoring, a private event with music was being held at the Corporate Event Center and baseball practice was being held in the ball fields to the east. While both of these activities were audible, including spectator cheering and ball strikes at the ball fields and music at the private event, they were indistinguishable in the overall A-weighted sound level from other ambient sounds (distant traffic, geophonic and biogenic sounds). These activities ended prior to the start of the baseball game.

Announcements from the Public Address (PA) system and music at the ball field began at approximately 5:43 pm, players were introduced by the announcer at 5:55 pm, the Star Spangled Banner was played at 5:58 pm, and the baseball game at the Stadium

began at approximately 6:00 pm. Pre-game announcements, music, and "Mooo"ing were clearly audible and distinguishable above ambient during this period. As shown in Figure 3 and Table 1, sound levels increased on average by about 5 dB, from 51 dBA L_{eq} to 56 dBA L_{eq}, above those occurring prior to the start of game activities. The spectrum during this period includes more low frequency sound content at 125 Hz and below.

Once the baseball game was underway, the primary sound sources included occasional speech, music, and 'Mooo'ing, amplified over the PA system. Cheering by spectators was lower in sound level than these amplified activities. Beginning at approximately 6:15 pm, music at the Umbrella Bar started up. Drums and bass from the Umbrella Bar band were the most distinctive sound sources from the Umbrella Bar. Review of Figure 3 shows an average increase of 6 dB in sounds in the 63 Hz frequency band during the Umbrella Bar performance.

Ski Hill Site, Facing East Towards Umbrella Bar

Ski Hill Site, Facing Southeast Towards Baseball Stadium

FIGURE 2: PHOTOGRAPHS OF SKI HILL MONITORING SITE

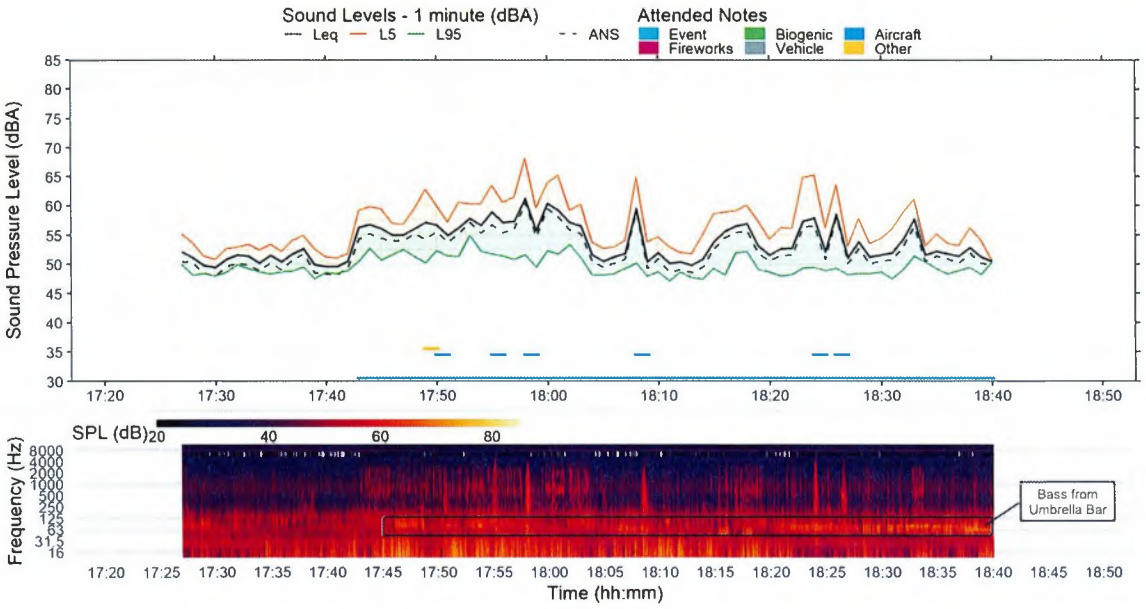
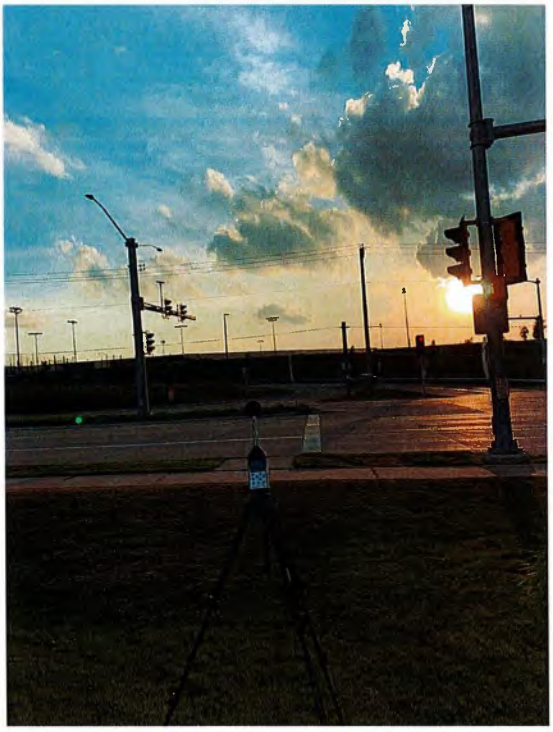


FIGURE 3: ATTENDED SOUND MONITORING AT SKI HILL ON AUGUST 6, 2022

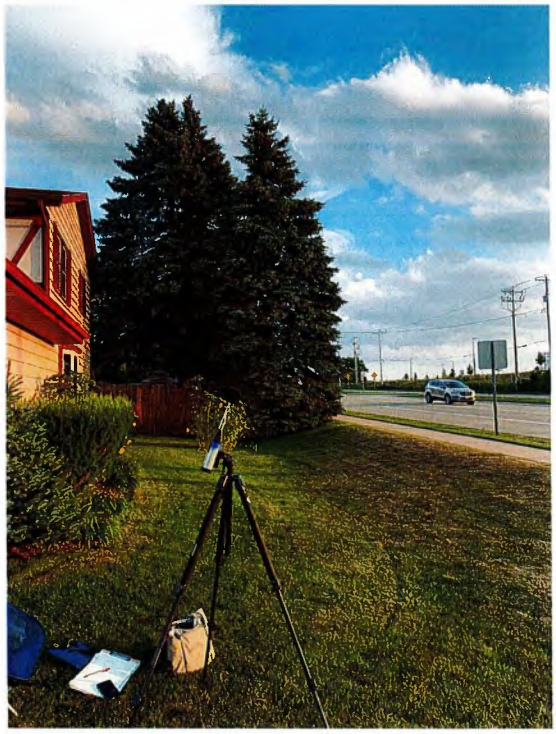
Site 2: 7573 Highview Drive, Greendale

Attended sound monitoring at 7573 Highview Drive occurred from 7:17 pm until 7:40 pm on August 6, 2022. Photographs of the 7573 Highview Drive site are shown in Figure 4, facing west and southwest towards the ROC. As shown in the photographs, the site is well shielded from the ROC by the intervening berm.

The results of attended sound monitoring on August 6, 2022 at 7573 Highview Drive are shown in Figure 5. This site was located approximately 75 feet from the center of South 76th Street and the background sound environment was dominated by traffic noise from vehicles traveling along the roadway, as indicated by the spikes occurring throughout the spectrogram shown in Figure 5 . A total of 57 light vehicles and 0 heavy trucks passed the site during a 5-minute traffic count from 7:31 to 7:36 pm, equating to approximately 684 vehicles per hour. 'Slaps' as vehicles traveled over joints in the pavement were clearly audible. Bass from the Umbrella Bar band was clearly distinguishable during lulls in traffic. Figure 3 shows elevated levels in the 63 Hz frequency band that are can be attributed to the Umbrella Bar band performance. No other ROC event noise was audible during the attended monitoring.



7573 Highview Drive, Facing West Toward ROC



7573 Highview Drive, Facing Southwest

FIGURE 4: PHOTOGRAPHS OF 7573 HIGHVIEW DRIVE MONITORING SITE

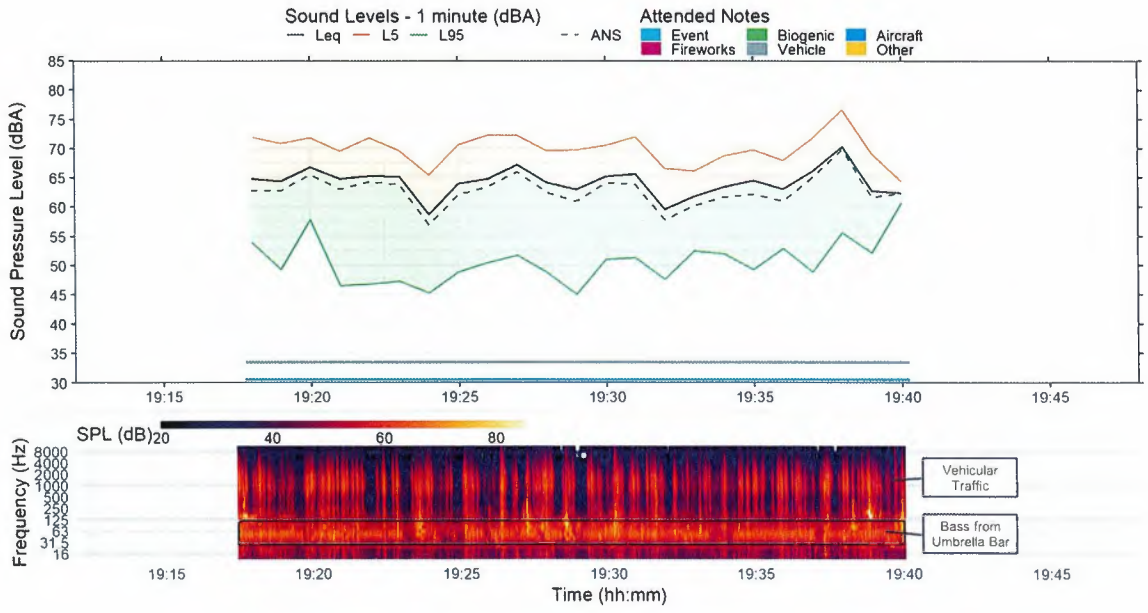


FIGURE 5: ATTENDED SOUND MONITORING AT 7573 HIGHVIEW DRIVE ON AUGUST 6, 2022

Site 3: 8610 West Hawthorn Lane, Franklin

Attended sound monitoring at 8610 Hawthorn Lane occurred from 8:13 pm until 8:46 pm and from 9:38 pm until 10:07 pm. Photographs of the 8610 Hawthorn Lane site are shown in Figure 6, facing east towards the ROC and southeast towards the neighboring property. The site is shielded from the ROC by an intervening berm. Although not apparent from the photographs, Stadium speakers were pointed away from the Stadium and towards the neighbors to the west, including 8610 Hawthorn Lane.

The results of attended sound monitoring on August 6, 2022 at 8610 Hawthorn Lane are shown in Figure 7. Background (non-ROC activity) sounds at this site included geophonic and biogenic sounds, occasional aircraft flyovers and, beginning around 9:38 pm, kids playing the neighbor's yard and pool.

Until approximately 9:50 pm, ROC events included a baseball game at the Stadium and a live band at the Umbrella Bar. During the baseball game and Umbrella Bar concert, biogenic (insect) sounds were a prominent sound source. This is indicated in Figure 7 by the difference between the L_{eq} and ANS levels, which were 5 dB lower on average and as much as 14 dB lower during some periods. Insect sounds can also be seen in the spectrogram in the 4,000 Hz frequency band.

ROC sound sources from the Stadium, including occasional speech, cheering of baseball game spectators, music, and 'Mooo'ing, amplified over the PA system were clearly audible and distinguishable from ambient background levels other than aircraft during this time. Umbrella Bar music was not audible or discernable and review of Figure 7 indicates that low frequency sound levels were lower at this site than at the Ski Hill and 7573 Highview Drive. Aircraft events dominated the sound environment when they occurred, as indicated by the elevated sound levels in Figure 7. Children playing in the neighboring yard generated levels similar to those generated by ROC event activities. Sound levels during fireworks (occurring from 9.59 to 10:06 pm) were on average 17 dB louder than sound levels during other ROC events.

8610 Hawthorn Lane, Facing Southeast Toward Neighbor's Residence

8610 Hawthorn Lane, Facing East Towards ROC

FIGURE 6: PHOTOGRAPHS OF 8610 HAWTHORN LANE MONITORING SITE

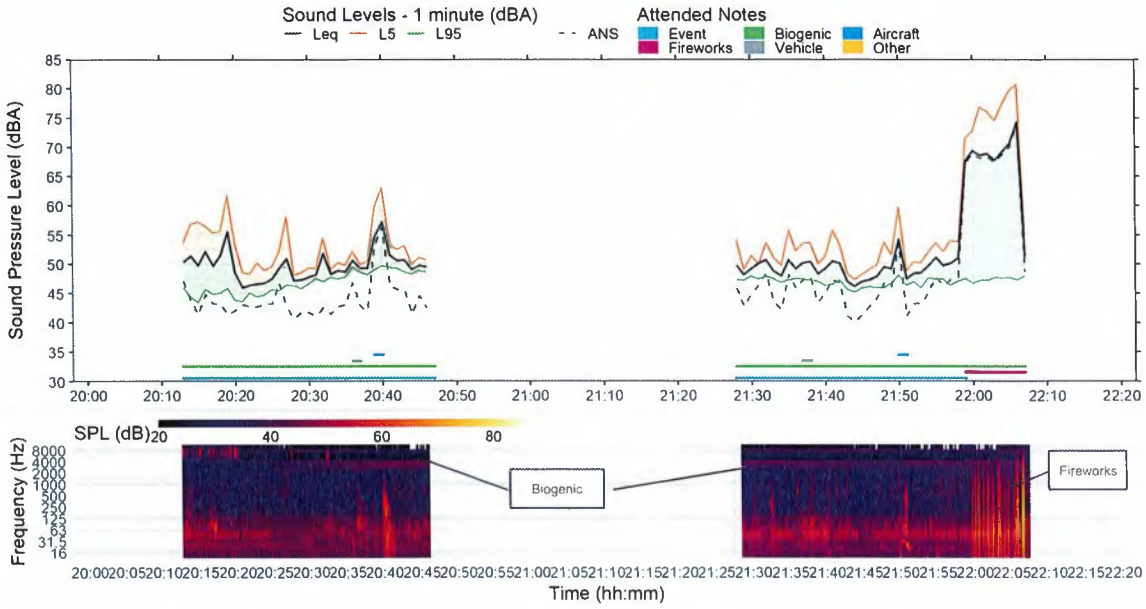


FIGURE 7: ATTENDED SOUND MONITORING AT 8610 HAWTHORN LANE ON AUGUST 6, 2022

MEMO

TO: Suzanne Carter, Milwaukee County

FROM: Dana Lodico, RSG

DATE: October 11, 2022

SUBJECT: ROC – Results of Attended Sound Monitoring August 20, 2022

This purpose of this memo is to document and provide preliminary interpretations of the results of attended sound monitoring at locations adjacent to the Rock Sports Complex (ROC) on the evening of August 20, 2022. During this time, the following ROC events took place (times approximate):

- 6:00 to 9:00 pm: Baseball game and live band at Stadium
- 6:30 pm until after end of monitoring: Live band in Umbrella Bar (The Toys)
- 9:06 to 9:15 pm: Fireworks

A more detailed analysis of both attended and unattended results will be documented in the Final Report, once all data has been collected and analyzed.

Attended Sound Monitoring Procedures

Sound level meters were mounted on tripods at a height of approximately 1.5 meters (5 feet) and covered with 180 mm (7 inch) windscreens to minimize the impact of wind distortion on measurements. Field staff attended each monitor and documented sound levels attributable to facility and non-facility related activities occurring during the attended events.

Sound level monitoring was performed with ANSI/IEC Class 1 sound level meters with a minimum frequency range of 6.3 Hz to 20 kHz. The sound level meters were field calibrated during at the start and end of the attended monitoring session and found to be within 0.2 dB.

The project team did not receive permission to monitor on ROC property. As a result, attended monitoring was conducted at the Ski Hill and in the surrounding communities. Five sites were attended on the evening of August 20, 2022;

1) Backyard of 8610 West Hawthorn Lane, Franklin (5:50 to 6:40 pm),
2) A Ski Hill location with direct sound and visual exposure to the Stadium and Umbrella bar (7:00 to 7:30 pm),
3) Front yard of 7573 Highview Drive, Greendale (8:00 to 8:40 pm),

4) Front yard of 8750 Hawthorn Lane, Franklin (9:00 to 9:35 pm), and

5) Front yard of 9011 Hawthorn Lane, Franklin (9:55 to 10:25 pm).

Monitoring locations are shown in Figure 1.

Concurrent to the attended monitoring, unattended monitoring continued to occur at the three long-term monitoring sites that are described in the Workplan, dated September 14, 2022. This memo only describes the results of the short-term attended monitoring; the long-term unattended monitoring results will be discussed in the Final Report.

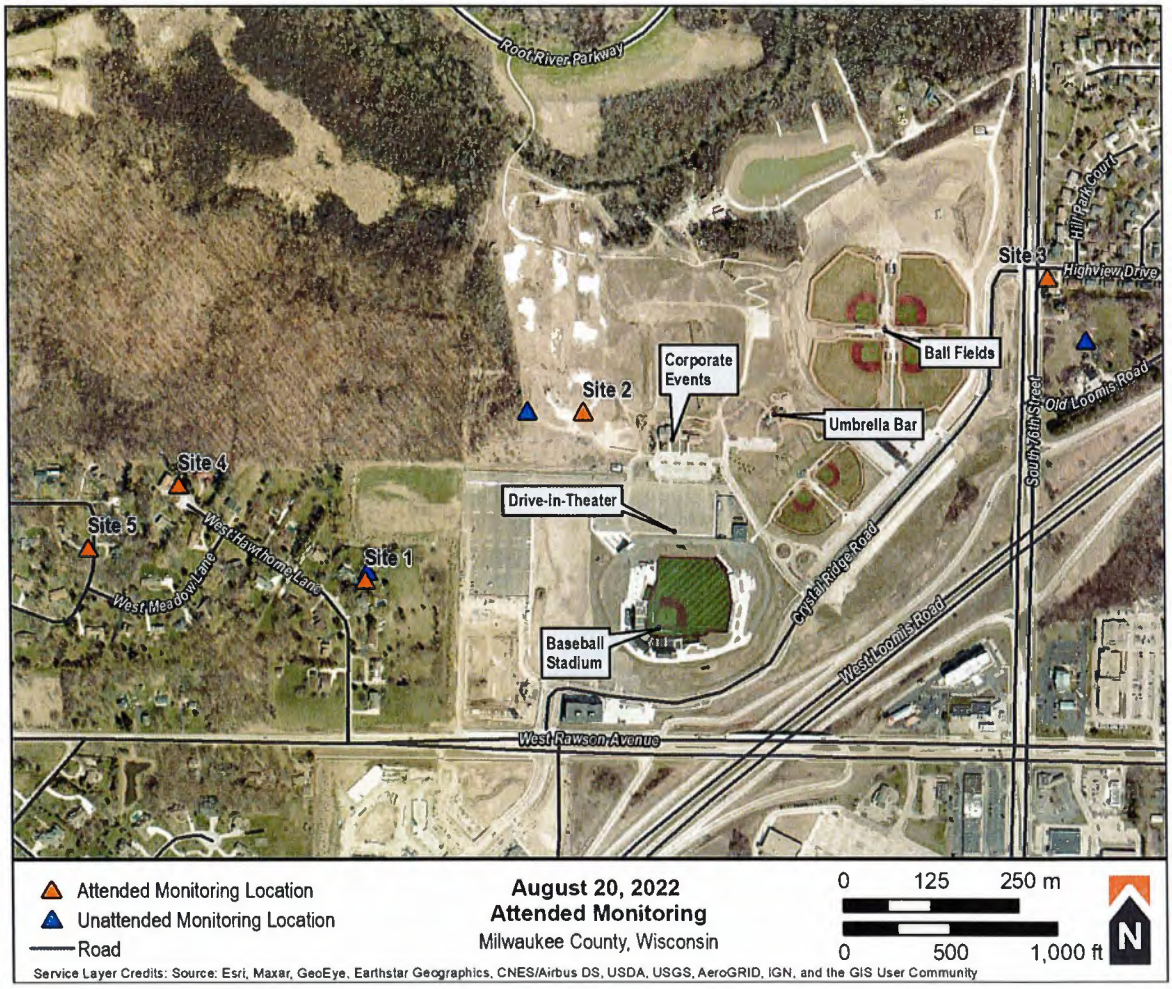


FIGURE 1: NOISE MONITORING LOCATIONS

Sound Monitoring Results

A summary of results of the attended sound monitoring is given in Table 1, including equivalent continuous average (L_{eq}), upper 5th percentile (L_5), and lower 5th percentile (L_{95}) sound levels. The results include sounds from all sounds sources, including event

and non-event sources. Sounds levels attributed exclusively to event sources will be provided in the Final Report, once all data has been acquired and analyzed.

TABLE 1: SUMMARY OF ATTENDED SOUND LEVELS

LOCATION	EVENT SOURCES	PRIMARY AMBIENT SOURCES	Sound Pressure Level, dBA		
			L_{eq}	L_{05}	L_{95}
Site 1: 8610 Hawthorn Lane (5:50 to 6:40 pm)	Baseball Game Umbrella Bar Concert	Geophonic and biogenic sounds, occasional aircraft flyovers, local traffic, mechanical equipment	48	52	42
Site 2: Ski Hill (7:00 to 7:30 pm)	Baseball Game Umbrella Bar Concert	Distant traffic and occasional aircraft flyovers	63	66	54
Site 3: 7573 Highview Drive (8:00 to 8:40 pm)	Baseball Game Umbrella Bar Concert	Vehicles on South 76th Street	66	71	55
Site 4: 8750 Hawthorn Lane (9:00 to 9:35 pm)	Baseball Game Umbrella Bar Concert	Geophonic and biogenic sounds, occasional aircraft flyovers, children playing	49	53	46
	Fireworks		69	75	48
Site 5: 9011 Hawthorn Lane (9:55 to 10:25 pm)	Baseball Game Umbrella Bar Concert	Distant traffic, geophonic and biogenic sounds, and occasional aircraft flyovers	48	50	47

Site 1: 8610 West Hawthorn Lane, Franklin

Attended sound monitoring at 8610 Hawthorn Lane occurred from 5:50 pm until 6:40 pm on August 20, 2022. Photographs of the 8610 Hawthorn Lane site are shown in Figure 2, facing east towards the ROC and west towards the residence. The site is shielded from the ROC by an intervening berm. Although not apparent from the photographs, Stadium speakers were pointed away from the Stadium and towards the neighbors to the west, including 8610 Hawthorn Lane.

The results of attended sound monitoring are shown in Figure 3. Background (non-ROC activity) sounds at this site included geophonic and biogenic sounds, occasional aircraft flyovers, periods with mechanical equipment noise from adjacent residences, and occasional local vehicles on Hawthorne Lane.

Aircraft events dominated the sound environment when they occurred, as indicated by the elevated sound levels in Figure 3. ROC sound sources from the Stadium, including occasional speech, cheering of baseball game spectators, music, and 'Mooo'ing, amplified over the PA system were clearly audible and distinguishable from background levels other than aircraft. Umbrella Bar music was not audible or discernable and review of Figure 3 does not indicate elevated low frequency sound levels.

8610 Hawthorn Lane, Facing East Towards ROC

8610 Hawthorn Lane, Facing West Toward Residence

FIGURE 2: PHOTOGRAPHS OF 8610 HAWTHORN LANE MONITORING SITE

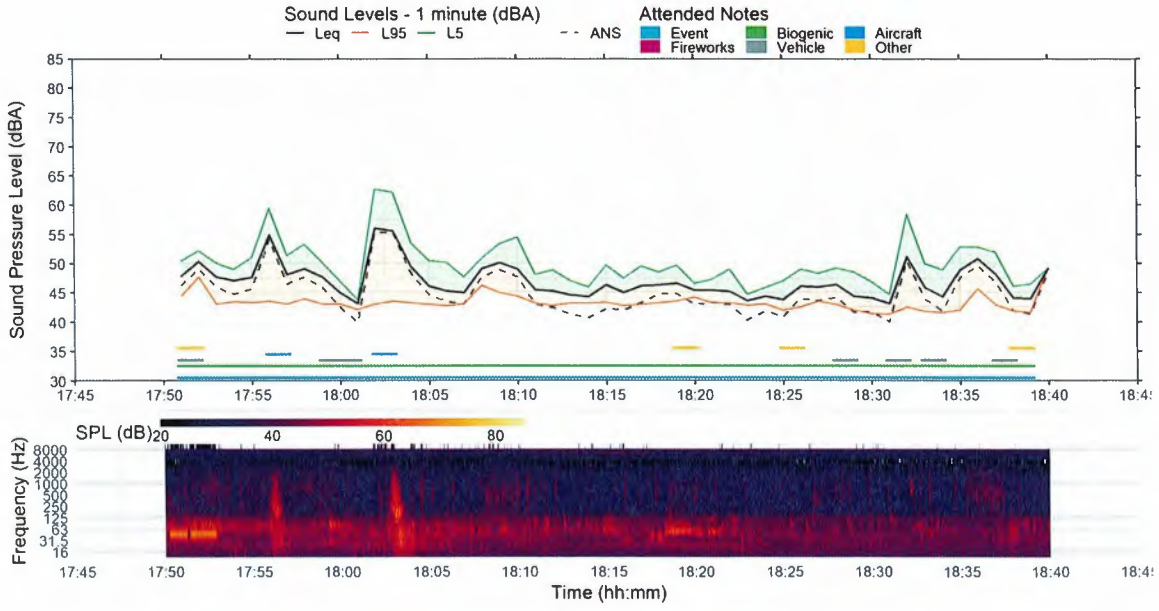
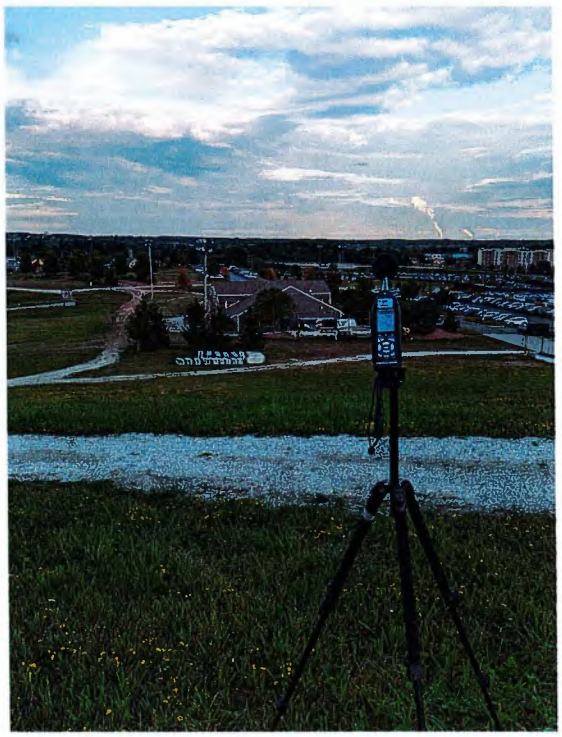


FIGURE 3: ATTENDED SOUND MONITORING AT 8610 HAWTHORN LANE ON AUGUST 20, 2022

Site 2: Ski Hill

Attended sound monitoring at the Ski Hill site occurred from 7:00 pm until 7:30 pm on August 20, 2022. Photographs of the Ski Hill site are shown in Figure 4, facing east towards the Umbrella Bar and southeast toward the Baseball Stadium. As indicated in the photographs, the site has direct sound and visual exposure to both the Stadium and the Umbrella bar. The westernmost portion of the Stadium is shielded by a portion of the Ski Hill. Background (non-ROC activity) sounds at this site included distant traffic and occasional aircraft flyovers. Aircraft events clearly dominated the sound environment when they occurred.

The results of attended sound monitoring on August 20, 2022 at the Ski Hill are shown in Figure 5. The primary sound sources included music from the Umbrella Bar, cheering at the Stadium, and speech, music, and 'Mooo'ing, amplified over the Stadium PA system. Music from the Umbrella Bar was the dominant sound source. Review of Figure 5 shows elevated sounds in the 63 and 31.5 Hz frequency bands throughout the monitoring period, attributed to the Umbrella Bar band.



Ski Hill Site, Facing East Towards Umbrella Bar

Ski Hill Site, Facing Southeast Towards Baseball Stadium

FIGURE 4: PHOTOGRAPHS OF SKI HILL MONITORING SITE

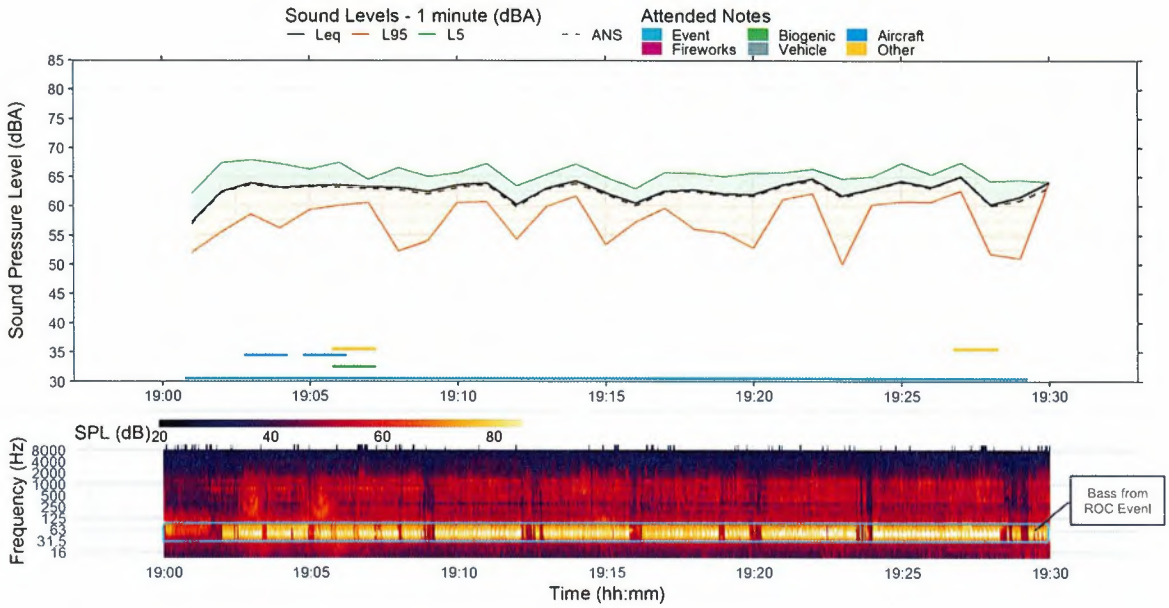
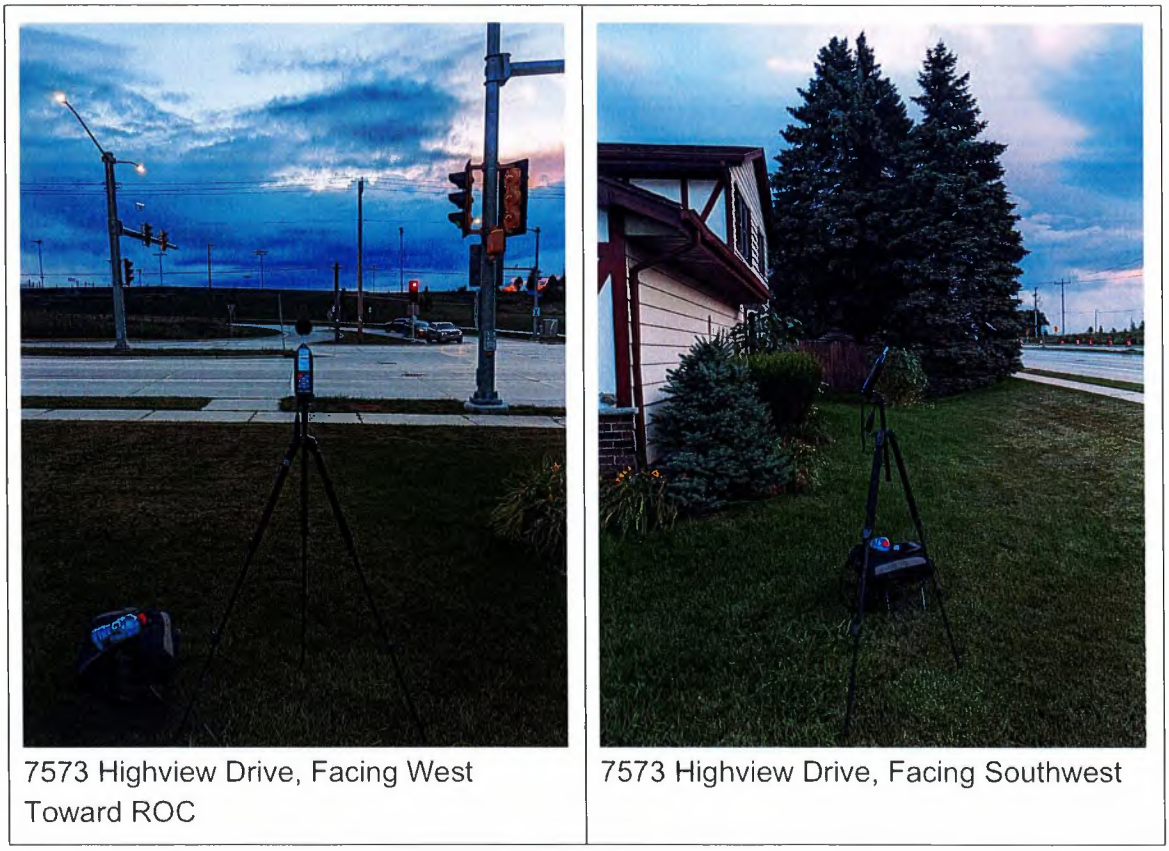


FIGURE 5: ATTENDED SOUND MONITORING AT SKI HILL ON AUGUST 20, 2022

Site 3: 7573 Highview Drive, Greendale

Attended sound monitoring at 7573 Highview Drive occurred from 8:00 pm until 8:40 pm on August 20, 2022. Photographs of the 7573 Highview Drive site are shown in Figure 6, facing west and southwest towards the ROC. As shown in the photographs, the site is well shielded from the ROC by the intervening berm.

The results of attended sound monitoring on August 20, 2022 at 7573 Highview Drive are shown in Figure 7. This site was located approximately 75 feet from the center of South 76th Street and the background sound environment was dominated by traffic noise from vehicles traveling along the roadway, as indicated by the spikes occurring throughout the spectrogram shown in Figure 7. 'Slaps' as vehicles traveled over joints in the pavement were clearly audible. Bass from the Umbrella Bar band was clearly distinguishable during lulls in traffic. Figure 5 shows elevated levels in the 63 Hz frequency band that are can be attributed to the Umbrella Bar band performance. No other ROC event noise was audible during the attended monitoring.



7573 Highview Drive, Facing West Toward ROC

7573 Highview Drive, Facing Southwest

FIGURE 6: PHOTOGRAPHS OF 7573 HIGHVIEW DRIVE MONITORING SITE

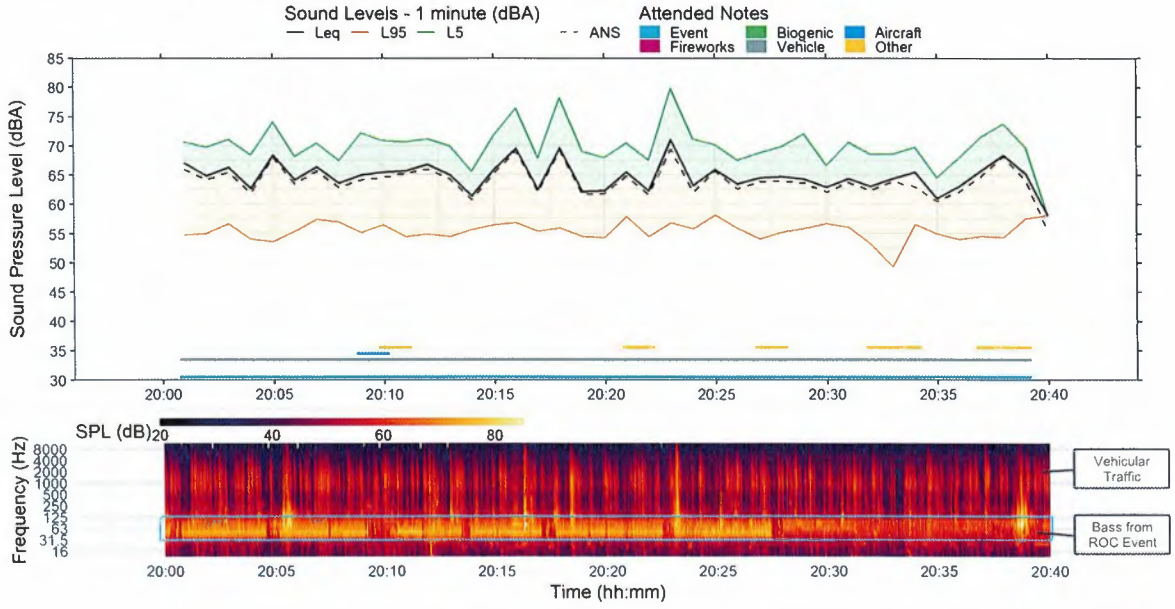


FIGURE 7: ATTENDED SOUND MONITORING AT 7573 HIGHVIEW DRIVE ON AUGUST 20, 2022

Site 4: 8750 West Hawthorn Lane, Franklin

Attended sound monitoring at 8750 Hawthorn Lane occurred from 9:00 pm until 9:35 pm on August 20, 2022. Photographs of the 8750 Hawthorn Lane site are shown in Figure 8, facing northeast towards the residence and southwest towards Hawthorn Lane. The results of attended sound monitoring are shown in Figure 9. Background sounds at this site included geophonic and biogenic sounds and occasional aircraft flyovers.

Fireworks occurred from 9:06 pm until 9:15 pm. During this period, fireworks were dominant and 20 dB louder on average than sound levels occurring during other ROC events. During periods without fireworks, ROC sound sources included occasional speech and fairly continuous music with notable low frequency content, which is apparent in the data shown in Figure 9.

8750 Hawthorn Lane, Facing Northeast Towards Residence

87500 Hawthorn Lane, Facing Southwest Toward Hawthorn Lane

FIGURE 8: PHOTOGRAPHS OF 8750 HAWTHORN LANE MONITORING SITE

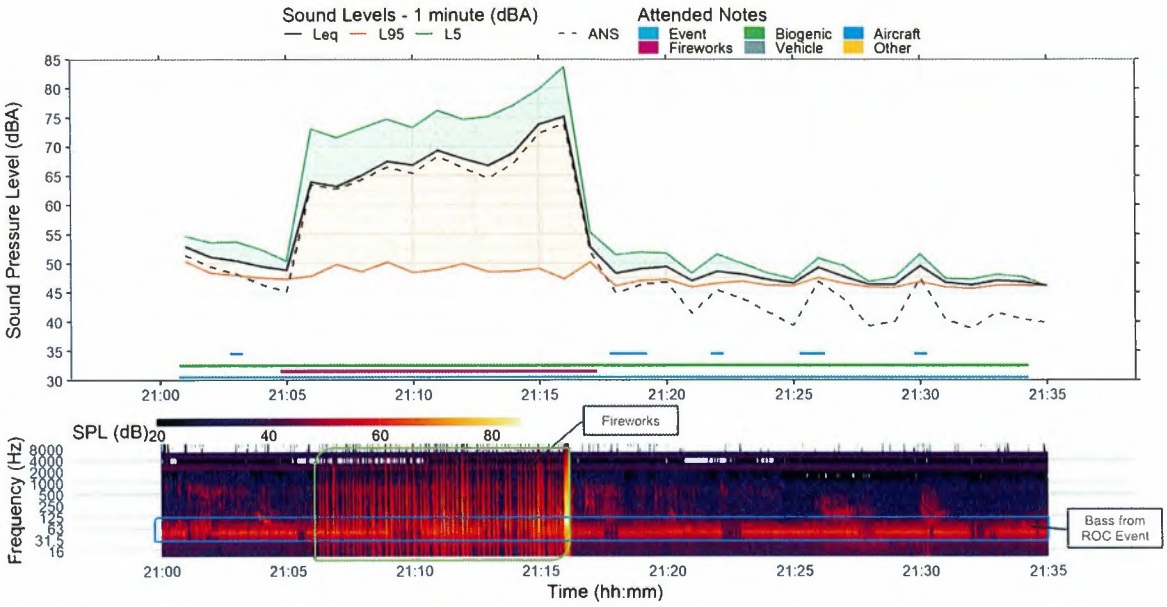
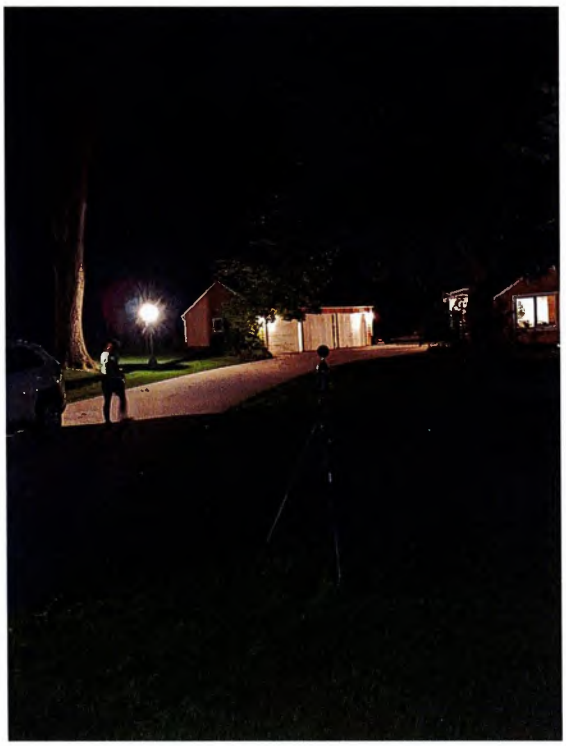


FIGURE 9: ATTENDED SOUND MONITORING AT 8750 HAWTHORN LANE ON AUGUST 20, 2022

Site 5: 9011 West Hawthorn Lane, Franklin

Attended sound monitoring at 9011 Hawthorn Lane occurred from 9:55 pm until 10:25 pm on August 20, 2022. Photographs of the 9011 Hawthorn Lane site are shown in Figure 10, facing northeast towards the residence and southwest towards Hawthorn Lane. The results of attended sound monitoring are shown in Figure 11. Background sounds at this site included geophonic and biogenic sounds and occasional aircraft flyovers. Music from the ROC continued to be audible throughout the majority of the monitoring period. Low frequency sound levels were distinctive, as indicated in Figure 9.



9011 Hawthorn Lane, Facing South Towards Residence

9011 Hawthorn Lane, Facing North Toward Hawthorn Lane

FIGURE 10: PHOTOGRAPHS OF 9011 HAWTHORN LANE MONITORING SITE

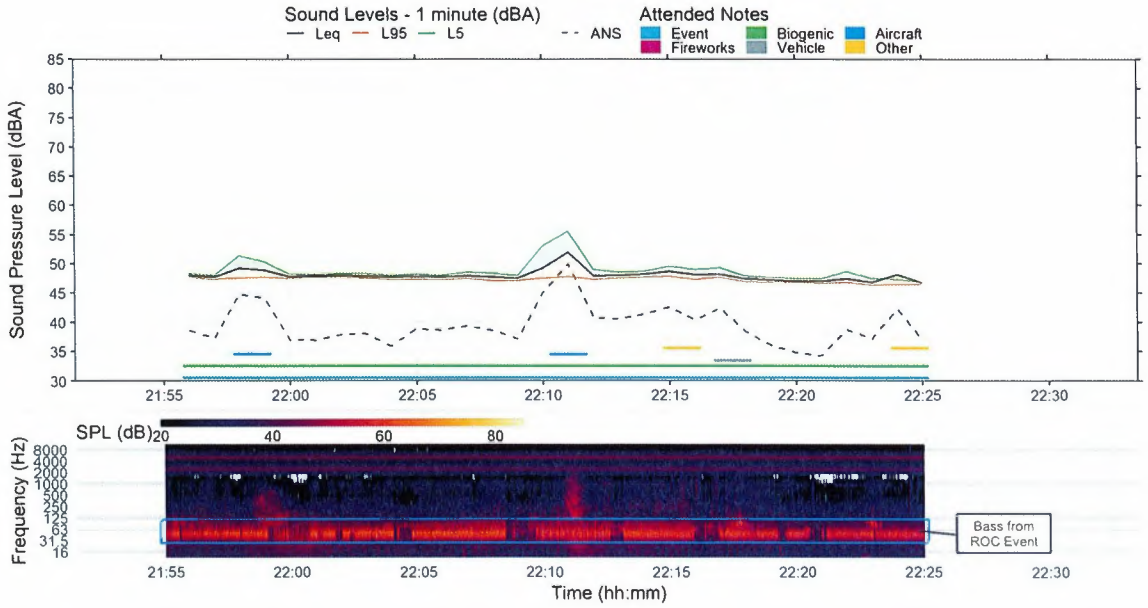


FIGURE 11: ATTENDED SOUND MONITORING AT 9011 HAWTHORN LANE ON AUGUST 20, 2022

MEMO

TO: Suzanne Carter, Milwaukee County

FROM: Dana Lodico, RSG

DATE: October 18, 2022

SUBJECT: ROC – Results of Attended Sound Monitoring August 27, 2022

This purpose of this memo is to document and provide preliminary interpretations of the results of attended sound monitoring at locations adjacent to the Rock Sports Complex (ROC) on the evening of August 27, 2022. During this time, the following ROC events took place (times approximate):

- 6:00 to 9:00 pm: Baseball game at Stadium
- 6:30 to 10:30 pm: Live band in Umbrella Bar (Superfly)
- 9:06 to 9:15 pm: Fireworks

A more detailed analysis of both attended and unattended results will be documented in the Final Report, once all data has been collected and analyzed.

Attended Sound Monitoring Procedures

Sound level meters were mounted on tripods at a height of approximately 1.5 meters (5 feet) and covered with 3-inch windscreens to minimize the impact of wind distortion on measurements. Field staff attended each monitor and documented sound levels attributable to facility and non-facility related activities occurring during the attended events.

Sound level monitoring was performed with an ANSI/IEC Class 1 sound level meter with a minimum frequency range of 6.3 Hz to 20 kHz. The sound level meters were field calibrated during at the start and end of the attended monitoring session and found to be within 0.2 dB.

The project team did not receive permission to monitor on ROC property. As a result, attended monitoring was conducted at the Ski Hill and in the surrounding communities. Five sites were attended in consecutive order on the evening of August 27, 2022;

1) Backyard of 8610 West Hawthorn Lane, Franklin (6:04 to 6:36 pm),
2) Front yard of 9011 Hawthorn Lane, Franklin (7:10 to 7:54 pm),
3) Inside second floor bedroom of 6928 South 90th Street (8:19 to 8:49 pm),

4) Front yard of 8750 Hawthorn Lane, Franklin (9 19 to 9:51 pm)

5) Front yard of 6025 Parkview Road, Franklin (10:10 to 10·36 pm)

Monitoring locations are shown in Figure 1.

Concurrent to the attended monitoring, unattended monitoring continued to occur at the three long-term monitoring sites that are described in the Workplan, dated September 14, 2022. This memo only describes the results of the short-term attended monitoring; the long-term unattended monitoring results will be discussed in the Final Report.

FIGURE 1: SOUND LEVEL MONITORING LOCATIONS

Sound Monitoring Results

A summary of results of the attended sound monitoring is given in Table 1, including equivalent continuous average (L_{eq}), upper 5th percentile (L_5), and lower 5th percentile (L_{95}) sound levels. The results include sounds from all sounds sources, including event and non-event sources. Sounds levels attributed exclusively to event sources will be provided in the Final Report, once all data has been acquired and analyzed.

TABLE 1: SUMMARY OF ATTENDED SOUND LEVELS

LOCATION	EVENT SOURCES	PRIMARY AMBIENT SOURCES	Sound Pressure Level, dBA		
			L_{eq}	L_{05}	L_{95}
Site 1: 8610 Hawthorn Lane (6:04 to 6:36 pm)	Baseball Game Umbrella Bar Concert	Occasional aircraft flyovers	55	59	45
Site 2: 9011 Hawthorn Lane (7:10 to 7:54 pm)	Baseball Game Umbrella Bar Concert	Geophonic and biogenic sounds, occasional aircraft flyovers, and community speech	52	56	44
Site 3: 6928 South 90th Street (Interior) (8:19 to 8:49 pm)	Baseball Game Umbrella Bar Concert	Geophonic and biogenic sounds, occasional local traffic, aircraft flyovers, and dog barks	51	53	49
Site 4: 8750 Hawthorn Lane (9:19 to 9:51 pm)	Baseball Game Umbrella Bar Concert	Geophonic and biogenic sounds, occasional aircraft flyovers	52	54	51
	Fireworks Umbrella Bar Concert		69	75	51
Site 5: 9011 Hawthorn Lane (10:10 to 10:36 pm)	Umbrella Bar Concert	Geophonic and biogenic sounds, and occasional local vehicles	55	58	52
	Minimal		53	55	52

Site 1: 8610 West Hawthorn Lane, Franklin

Attended sound monitoring at 8610 Hawthorn Lane occurred from 6:04 pm until 6:36 pm on August 27, 2022. A photograph of the 8610 Hawthorn Lane site is shown in Figure 2, facing east towards the ROC. The site is shielded from the ROC by an intervening berm. Although not apparent from the photographs, Stadium speakers were pointed away from the Stadium and towards the neighbors to the west, including 8610 Hawthorn Lane.

The results of attended sound monitoring are shown in Figure 3. Background (non-ROC activity) sounds at this site included minor geophonic and biogenic sounds and occasional aircraft flyovers.

Aircraft events dominated the sound environment when they occurred, as indicated by the elevated sound levels in Figure 3. ROC sound sources from the Stadium, including occasional speech, cheering of baseball game spectators, music, and 'Mooo'ing, amplified over the PA system were clearly audible and distinguishable from background levels other than aircraft. Umbrella Bar music was not audible or discernable; however, review of Figure 3 does indicate a change in low frequency sound levels in the period once the Umbrella Bar band started playing (6:30 pm), which may be attributable to the Umbrella Bar band.

8610 Hawthorn Lane, Facing East Towards ROC

FIGURE 2: PHOTOGRAPH OF 8610 HAWTHORN LANE MONITORING SITE

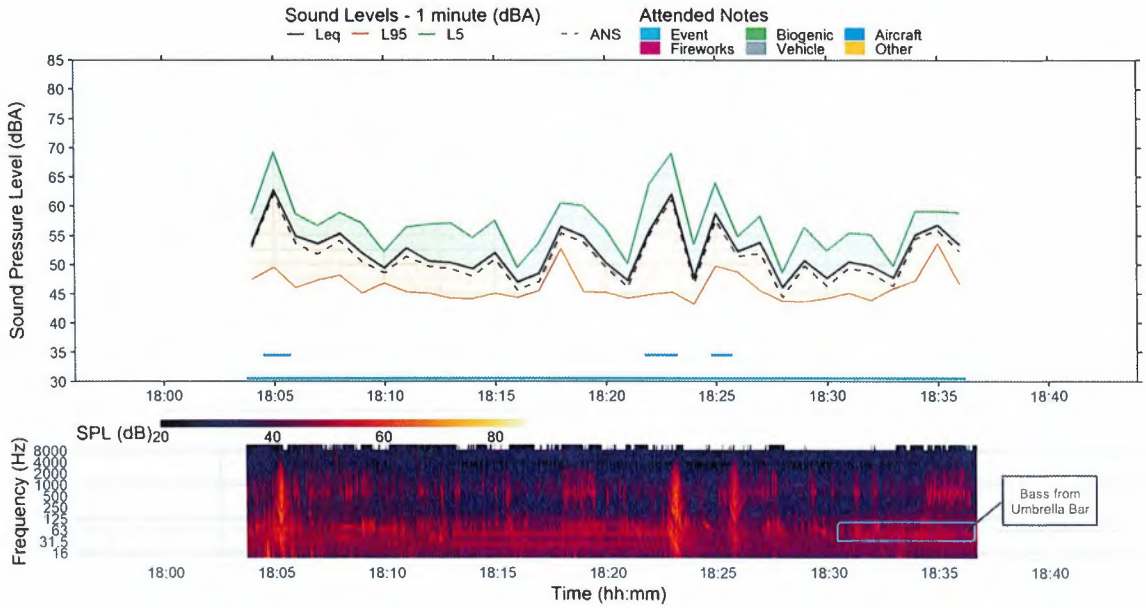


FIGURE 3: ATTENDED SOUND MONITORING AT 8610 HAWTHORN LANE ON AUGUST 27, 2022

Site 5: 9011 West Hawthorn Lane, Franklin

Attended sound monitoring at 9011 Hawthorn Lane occurred from 7:10 pm until 7:54 pm on August 27, 2022. A photograph of the 9011 Hawthorn Lane site is shown in Figure 4, facing northeast towards the residence. The results of attended sound monitoring are shown in Figure 5. Background sounds at this site included geophonic and biogenic sounds and occasional aircraft flyovers. Community conversations were audible during the period from 7:14 to 7:18 pm, as indicated by 'other' in Figure 5. Music from the ROC continued to be audible throughout the monitoring period. Low frequency sound levels were distinctive, as indicated in Figure 9.

9011 Hawthorn Lane, Facing South Towards Residence

FIGURE 4: PHOTOGRAPH OF 9011 HAWTHORN LANE MONITORING SITE

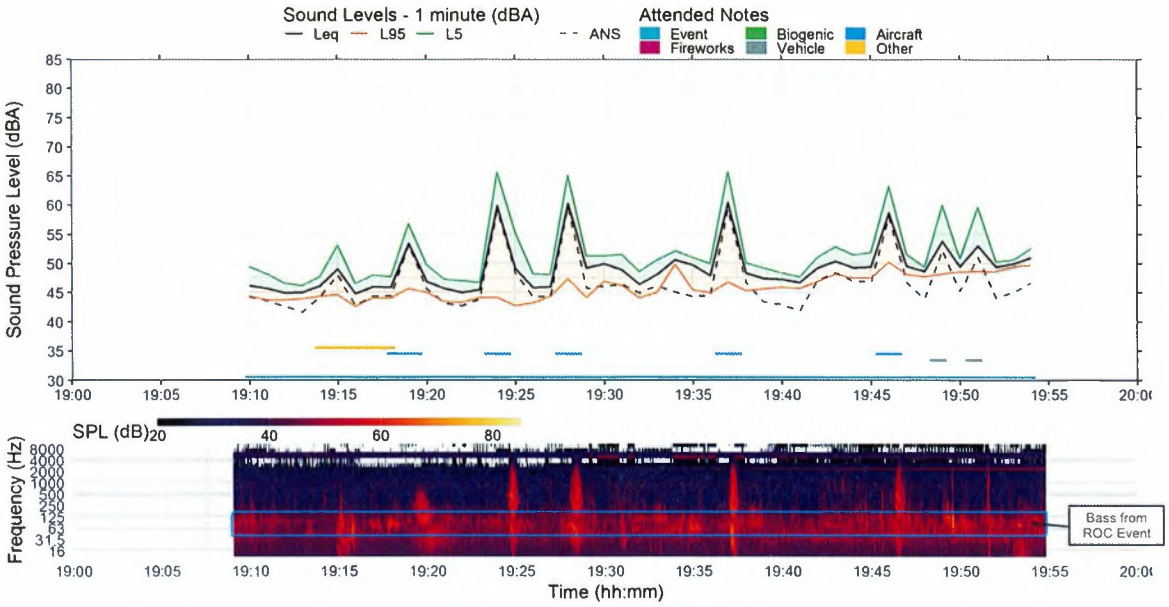


FIGURE 5: ATTENDED SOUND MONITORING AT 9011 HAWTHORN LANE ON AUGUST 27, 2022

Site 3: 6928 South 90th Street Interior

Attended sound monitoring inside a second story bedroom at 6928 South 90th Street occurred from 8:19 pm until 8:49 pm on August 27, 2022. Monitoring was made at a location directly inside the window with windows open. A photograph of this site is shown in Figure 6, facing east towards the ROC facility. Background (non-ROC activity) sounds at this site included geophonic and biogenic sounds and occasional aircraft flyovers, local vehicles, and dog barking (identified as 'other' in Figure 7). Aircraft events clearly dominated the sound environment when they occurred.

The results of attended sound monitoring on August 27, 2022, inside a second story bedroom at 6928 South 90th Street are shown in Figure 7. Music from the Umbrella Bar, cheering at the Stadium, and speech, music, and 'Mooo'ing, amplified over the Stadium PA system were clearly audible.

FIGURE 6: PHOTOGRAPH OF 6928 S. 90TH STREET MONITORING SITE

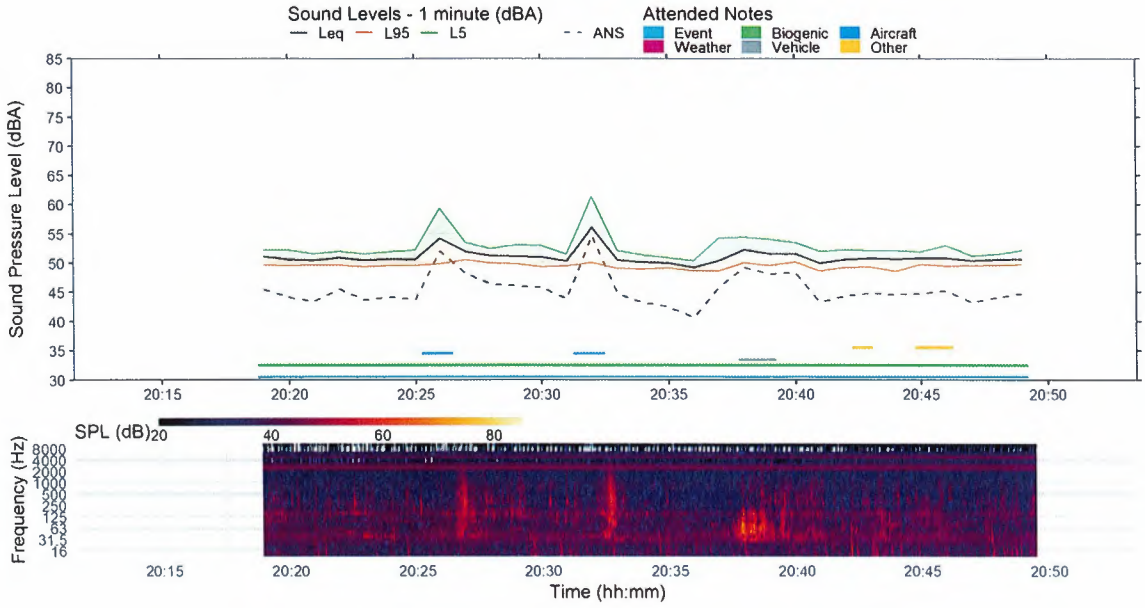


FIGURE 7: ATTENDED SOUND MONITORING AT 6928 S. 90TH STREET ON AUGUST 27, 2022

Site 4: 8750 West Hawthorn Lane, Franklin

Attended sound monitoring at 8750 Hawthorn Lane occurred from 9:19 pm until 9:51 pm on August 27, 2022. A photograph of the 8750 Hawthorn Lane site is shown in Figure 8, facing southwest towards Hawthorn Lane. The results of attended sound monitoring are shown in Figure 9. Background sounds at this site included geophonic and biogenic sounds and occasional aircraft flyovers and local traffic.

Fireworks occurred from 9:37 pm until 9:47 pm at the conclusion of the baseball game. During this period, fireworks were dominant and 17 dB higher on average than sound levels occurring during other ROC events. During periods without fireworks, ROC sound sources included occasional speech and fairly continuous music with notable low frequency content, which is apparent in the data shown in Figure 9.

8750 Hawthorn Lane, Facing Southwest Toward Hawthorn Lane

FIGURE 8: PHOTOGRAPH OF 8750 HAWTHORN LANE MONITORING SITE

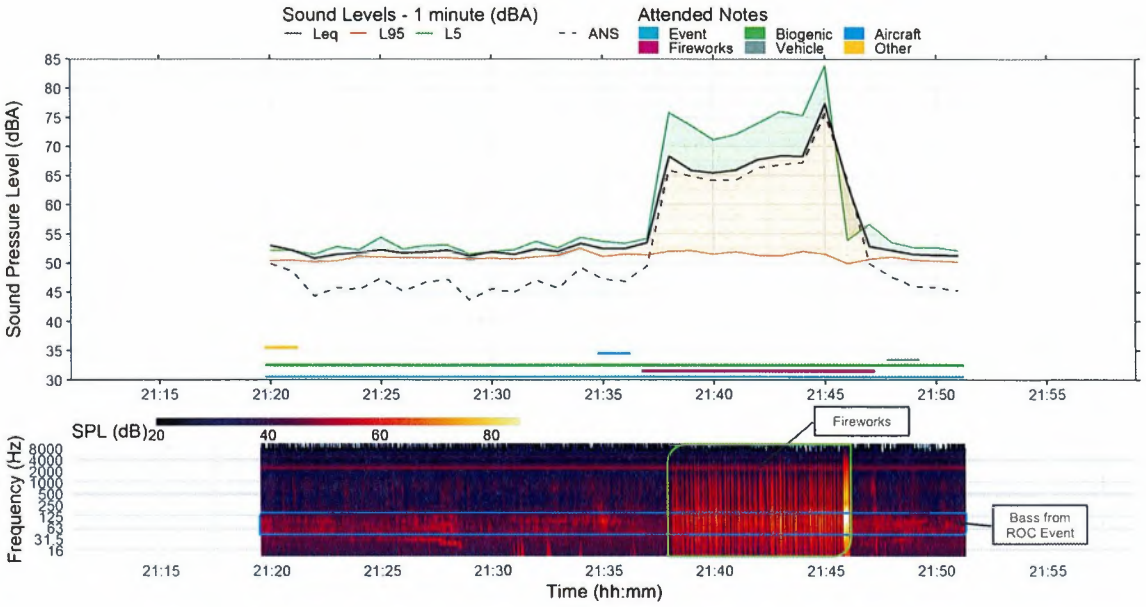


FIGURE 9: ATTENDED SOUND MONITORING AT 8750 HAWTHORN LANE ON AUGUST 27, 2022

Site 5: 6025 Parkview Road, Franklin

Attended sound monitoring at 6025 Parkview Road occurred from 10:10 pm until 10:36 pm on August 27, 2022. A photograph of the 6025 Parkview Road site is shown in Figure 10, facing south towards the ROC.

The results of attended sound monitoring on August 27, 2022 at 6025 Parkview Road are shown in Figure 11. Background sounds at this site included geophonic and biogenic sounds and occasional local traffic. Despite being more than a mile north of the Umbrella Bar and Baseball Stadium, ROC event sounds were clearly audible at this location.

Figure 11 shows elevated low frequency levels that are attributed to the Umbrella Bar band performance. The overall levels drop off by only 1 to 2 dB L_{eq} at the conclusion of the Umbrella Bar band; however, levels in the lower frequency bands drop off by as much as 13 dB.

6025 Parkview Road, Facing South Toward ROC

FIGURE 10: PHOTOGRAPHS OF 6025 PARKVIEW ROAD MONITORING SITE

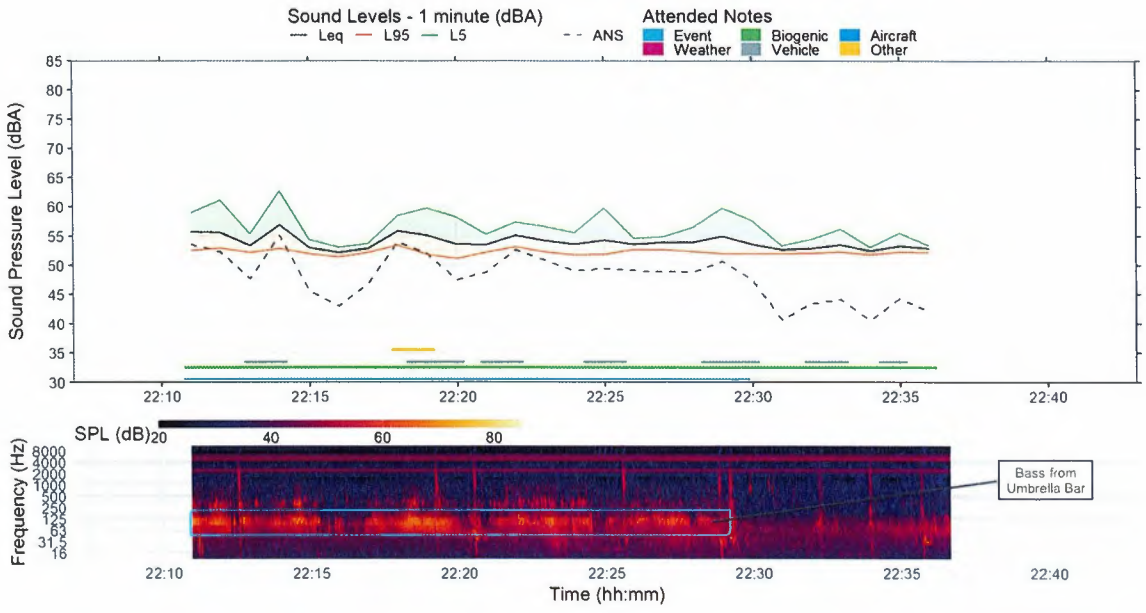


FIGURE 11: ATTENDED SOUND MONITORING AT 6025 PARKVIEW ROAD ON AUGUST 27, 2022

MEMO

TO: Suzanne Carter, Milwaukee County

FROM: Dana Lodico, RSG

DATE: November 1, 2022

SUBJECT: ROC – Results of Attended Sound Monitoring August 28, 2022

This purpose of this memo is to document and provide preliminary interpretations of the results of attended sound monitoring at locations adjacent to the Rock Sports Complex (ROC) during the day on August 28, 2022. During this time, the following ROC events were planned to take place (times approximate):

- 1:00 to 4:35 pm: Baseball game at Stadium
- Helicopter Candy Drop (Cancelled due to rain)
- Movie in Stadium (Cancelled due to rain)

Due to rain and thunderstorms, the helicopter candy drop and movie in the stadium were cancelled.

A more detailed analysis of both attended and unattended results will be documented in the Final Report, once all data has been collected and analyzed.

Attended Sound Monitoring Procedures

Sound level meters were mounted on tripods at a height of approximately 1.5 meters (5 feet) and covered with 3-inch windscreens to minimize the impact of wind distortion on measurements. Field staff attended each monitor and documented sound levels attributable to facility and non-facility related activities occurring during the attended events.

Sound level monitoring was performed with an ANSI/IEC Class 1 sound level meter with a minimum frequency range of 6.3 Hz to 20 kHz. The sound level meters were field calibrated during at the start and end of the attended monitoring session and found to be within 0.2 dB.

The project team did not receive permission to monitor on ROC property. As a result, attended monitoring was conducted at the Ski Hill and in the surrounding communities. Three sites were attended in consecutive order during the day of August 28, 2022;

1) Backyard of 8610 West Hawthorn Lane, Franklin (2:57 to 3:22 pm),
2) Backyard of 6928 South 90th Street, Franklin (3:39 to 4:00 pm), and

3) Backyard of 8630 West Hawthorn Lane, Franklin (4:22 to 4:49 pm).

Monitoring locations are shown in Figure 1.

Concurrent to the attended monitoring, unattended monitoring continued to occur at the three long-term monitoring sites that are described in the Workplan, dated October 24, 2022. This memo only describes the results of the short-term attended monitoring; the long-term unattended monitoring results will be discussed in the Final Report.

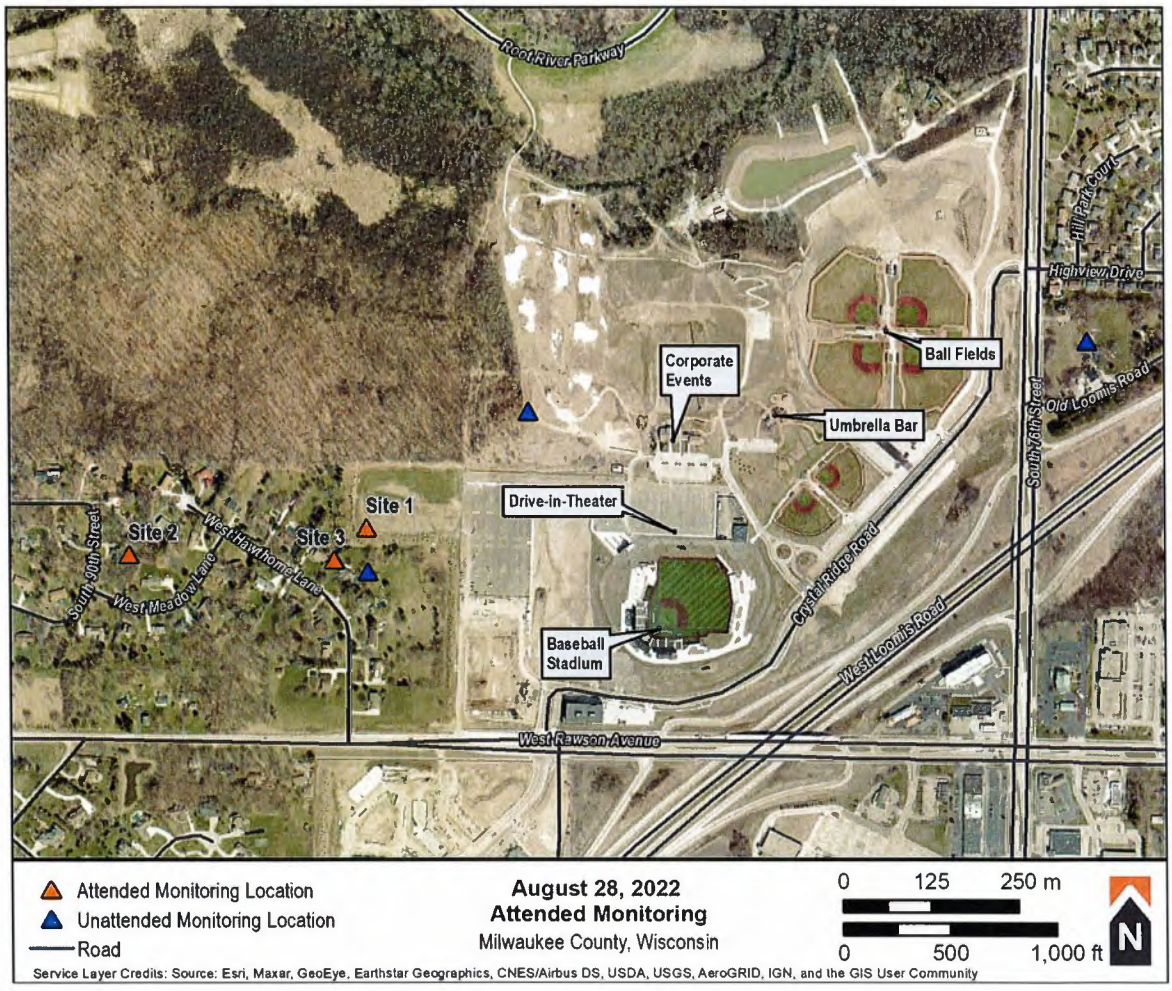


FIGURE 1: SOUND LEVEL MONITORING LOCATIONS

Sound Monitoring Results

A summary of results of the attended sound monitoring is given in Table 1, including equivalent continuous average (L_{eq}), upper 5th percentile (L_5), and lower 5th percentile (L_{95}) sound levels. The results include sounds from all sounds sources, including event and non-event sources. Sounds levels attributed exclusively to event sources will be provided in the Final Report, once all data has been acquired and analyzed.

TABLE 1: SUMMARY OF ATTENDED SOUND LEVELS

LOCATION	EVENT SOURCES	PRIMARY BACKGROUND SOURCES	Sound Pressure Level, dBA		
			L_{eq}	L_{05}	L_{95}
Site 1: 8610 Hawthorn Lane (2:57 to 3:22 pm)	Baseball Game	Occasional aircraft flyovers	56	62	45
Site 2: 6928 South 90th Street (3:39 to 4:00 pm)	Baseball Game	Lawn mowing, aircraft flyovers, rain and thunder (dominant)	Data not valid (rain, mower)		
Site 3: 8630 Hawthorn Lane (4:22 to 4:49 pm)	Baseball Game	Rain and thunder, aircraft flyovers (dominant)	Data not valid (rain and thunder)		

Site 1: 8610 West Hawthorn Lane, Franklin

Attended sound monitoring at 8610 Hawthorn Lane occurred from 2:57 to 3:22 pm on August 28, 2022. A photograph of the 8610 Hawthorn Lane site is shown in Figure 2, facing east towards the ROC. The site is shielded from the ROC by an intervening berm. Although not apparent from the photographs, Stadium speakers were pointed away from the Stadium and towards the neighbors to the west, including 8610 Hawthorn Lane.

The results of attended sound monitoring are shown in Figure 3. Background (non-ROC activity) sounds at this site included occasional aircraft flyovers.

Aircraft events dominated the sound environment when they occurred, as indicated by the elevated sound levels in Figure 3. ROC sound sources from the Stadium, including occasional speech, cheering of baseball game spectators, music, and 'Mooo'ing, amplified over the PA system were clearly audible and distinguishable from background levels other than aircraft.

8610 Hawthorn Lane, Facing East Towards ROC

FIGURE 2: PHOTOGRAPH OF 8610 HAWTHORN LANE MONITORING SITE

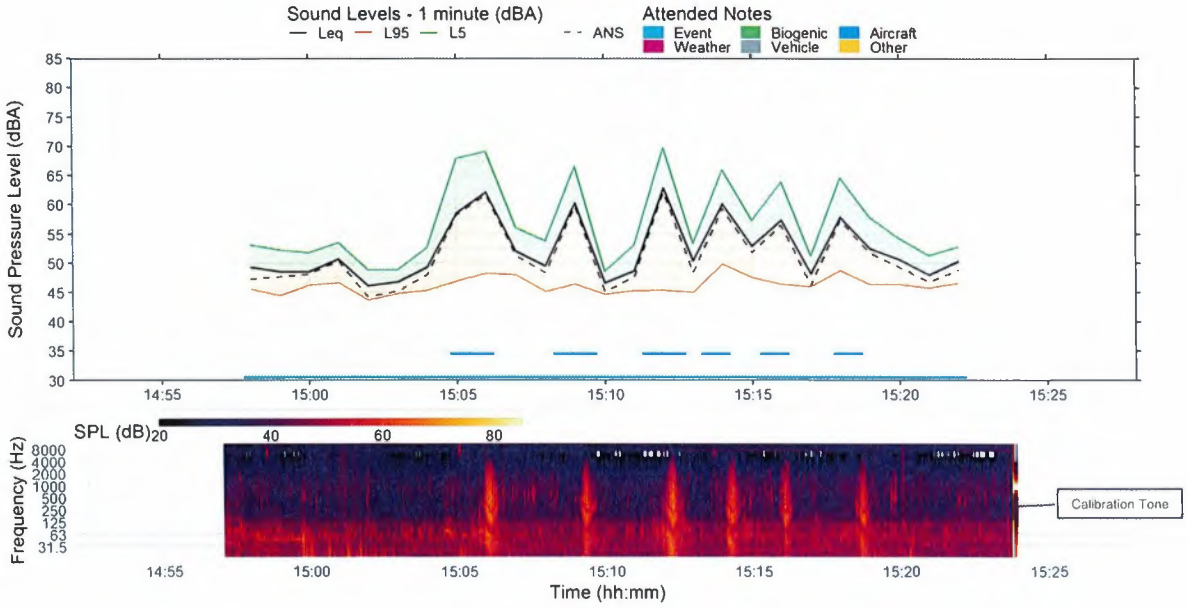


FIGURE 3: ATTENDED SOUND MONITORING AT 8610 HAWTHORN LANE ON AUGUST 28, 2022

Site 2: 6928 South 90th Street

Attended sound monitoring in the backyard of 6928 South 90th Street occurred from 3:39 until 4:00 pm on August 28, 2022. A photograph of this site is shown in Figure 4, facing east towards the ROC facility. The results of attended sound monitoring are shown in Figure 5. Lawn mowing activities occurred close to the sound monitor from 3:44 until 3:58 pm and dominated the soundscape during much of this time period (identified as 'other' in the line graph of Figure 5). Starting at 5:58 pm, weather events including thunder and rain dominated the sound scape. Prior to lawn mowing activities, cheering at the Stadium, and speech, music, and 'Mooo'ing, amplified over the Stadium PA system were clearly audible.

Backyard of 6928 S. 90th Street

FIGURE 4: PHOTOGRAPH OF 6928 S. 90TH STREET MONITORING SITE

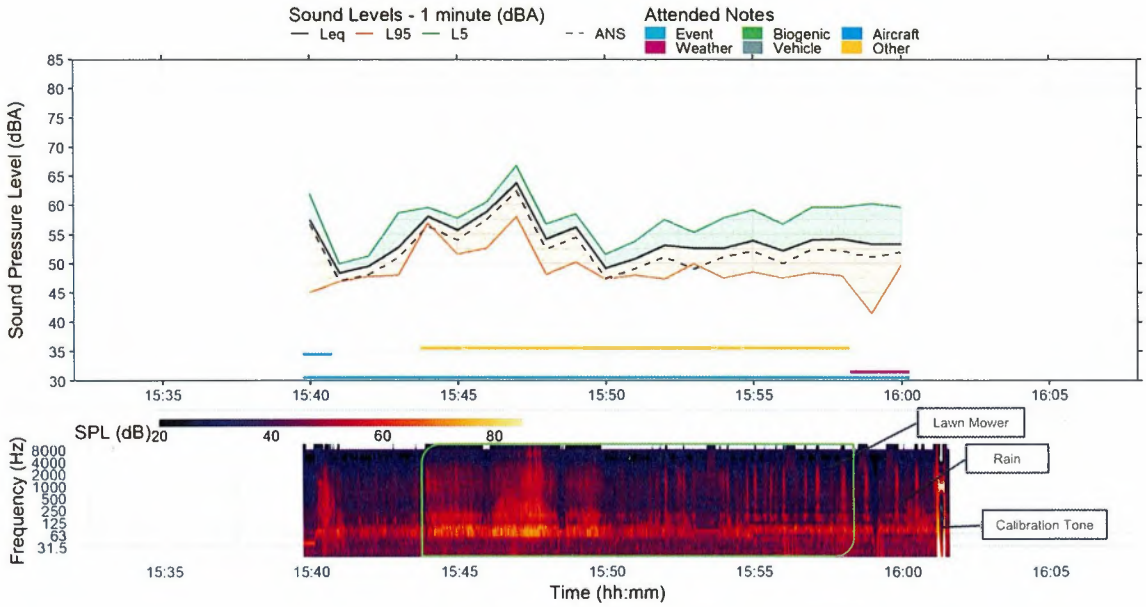


FIGURE 5: ATTENDED SOUND MONITORING AT 6928 S. 90TH STREET ON AUGUST 28, 2022

Site 3: 8630 West Hawthorn Lane, Franklin

Attended sound monitoring at 8630 Hawthorn Lane occurred from 4:22 pm until 4:49 pm on August 28, 2022. A photograph of the 8630 Hawthorn Lane site is shown in Figure 6. The results of attended sound monitoring are shown in Figure 7. Rain and thunder occurred during the entire monitoring period; therefore, the data is not valid. The baseball game ended at 4:37 pm, after which it was announced that the helicopter candy drop and Stadium movie were cancelled.

8750 Hawthorn Lane, Facing Southwest Toward Hawthorn Lane

FIGURE 6: PHOTOGRAPH OF 8750 HAWTHORN LANE MONITORING SITE

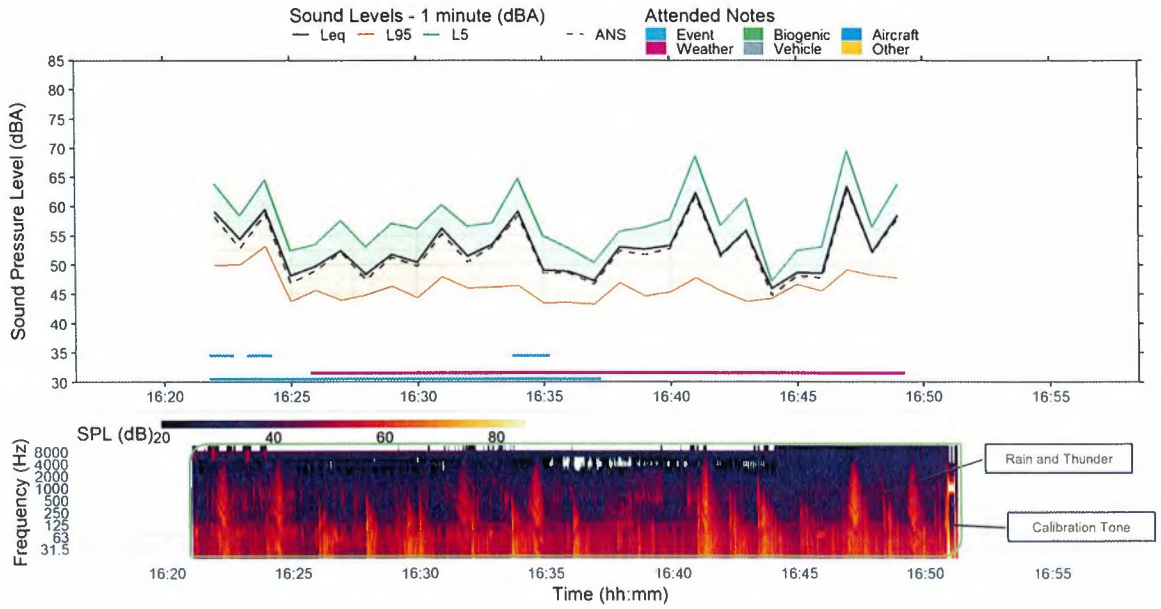


FIGURE 7: ATTENDED SOUND MONITORING AT 8750 HAWTHORN LANE ON AUGUST 28, 2022

MEMO

TO: Suzanne Carter, Milwaukee County

FROM: Dana Lodico, RSG

DATE: November 1, 2022

SUBJECT: ROC – Results of Attended Sound Monitoring September 10, 2022

This purpose of this memo is to document and provide preliminary interpretations of the results of attended sound monitoring at locations adjacent to the Rock Sports Complex (ROC) on the evening of September 10, 2022. During this time, the following ROC events took place (times approximate):

- 6:30 pm until after end of monitoring: Live band in Umbrella Bar (33 RPM)

A more detailed analysis of both attended and unattended results will be documented in the Final Report, once all data has been collected and analyzed.

Attended Sound Monitoring Procedures

Sound level meters were mounted on tripods at a height of approximately 1.5 meters (5 feet) and covered with windscreens to minimize the impact of wind distortion on measurements. Field staff attended each monitor and documented sound levels attributable to facility and non-facility related activities occurring during the attended events.

Sound level monitoring was performed with ANSI/IEC Class 1 sound level meters with a minimum frequency range of 6.3 Hz to 20 kHz. The sound level meters were field calibrated during at the start and end of the attended monitoring session and found to be within 0.2 dB.

The project team did not receive permission to monitor on ROC property. As a result, attended monitoring was conducted at the Ski Hill and in the surrounding communities. Five sites were attended consecutively on the evening of September 10, 2022;

1) Front yard of 7573 Highview Drive, Greendale (6:20 to 6:50 pm),
2) A Ski Hill location with direct sound and visual exposure to the Stadium and Umbrella bar (7:10 to 7:30 pm),
3) Backyard of 8610 West Hawthorn Lane, Franklin (7:50 to 8:20 pm),
4) Front yard of 8750 Hawthorn Lane, Franklin (8:37 to 9:07 pm), and
5) Front yard of 9011 Hawthorn Lane, Franklin (9:52 to 10:22 pm).

Monitoring locations are shown in Figure 1.

Concurrent to the attended monitoring, unattended monitoring continued to occur at the three long-term monitoring sites that are described in the Workplan, dated October 24, 2022. This memo only describes the results of the short-term attended monitoring; the long-term unattended monitoring results will be discussed in the Final Report.

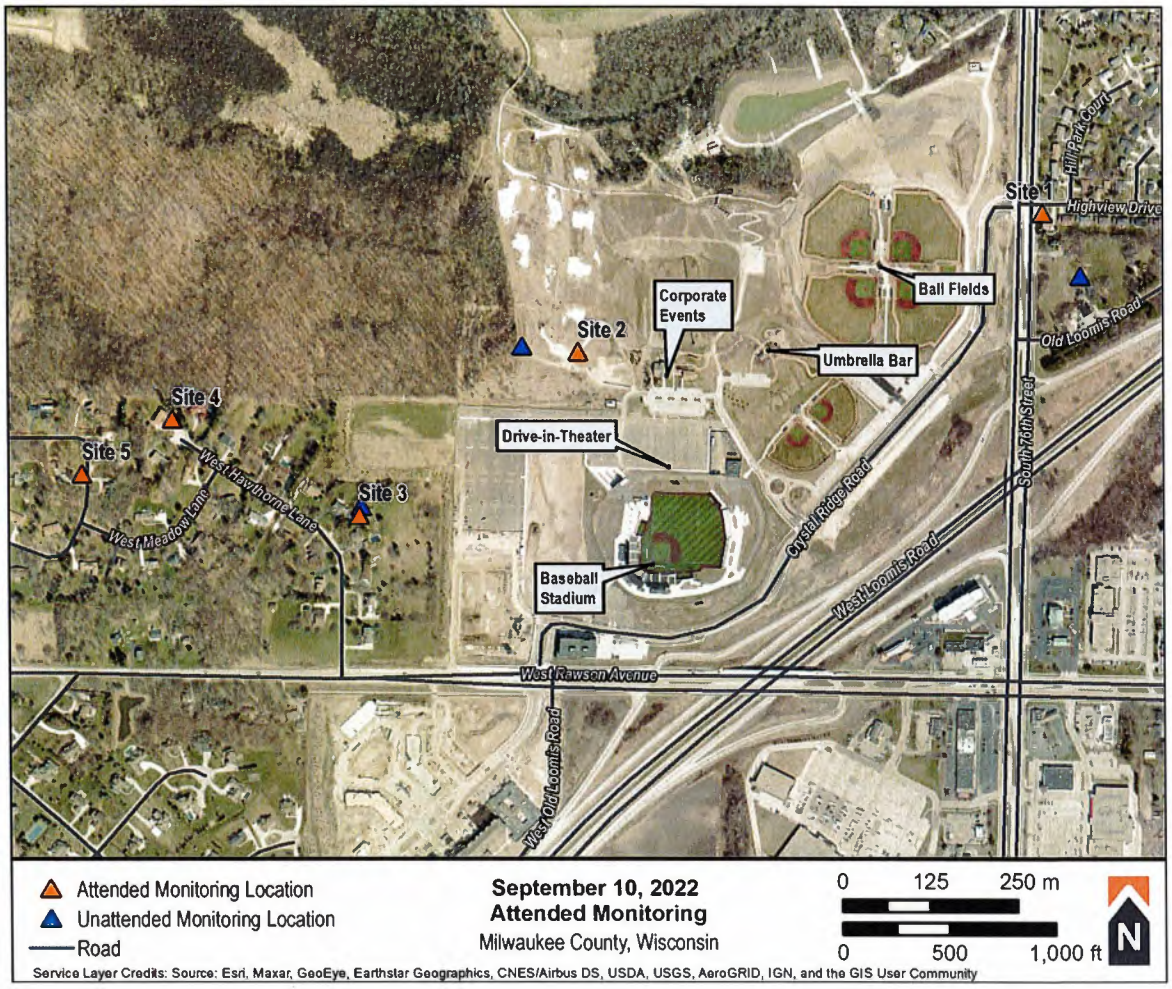


FIGURE 1: SOUND MONITORING LOCATIONS

Sound Monitoring Results

A summary of results of the attended sound monitoring is given in Table 1, including equivalent continuous average (L_{eq}), upper 5th percentile (L_5), and lower 5th percentile (L_{95}) sound levels. The results include sounds from all sounds sources, including event and non-event sources. Sounds levels attributed exclusively to event sources will be provided in the Final Report, once all data has been acquired and analyzed.

TABLE 1: SUMMARY OF ATTENDED SOUND LEVELS

LOCATION	EVENT SOURCES	PRIMARY BACKGROUND SOURCES	Sound Pressure Level, dBA		
			L_{eq}	L_{05}	L_{95}
Site 1: 7573 Highview Drive (6:20 to 6:50 pm)	Minimal	Vehicles on South 76th Street	68	72	54
	Umbrella Bar Concert		66	72	53
Site 2: Ski Hill (7:10 to 7:30 pm)	Umbrella Bar Concert	Distant traffic and occasional aircraft flyovers	58	62	53
Site 3: 8610 Hawthorn Lane (7:50 to 8:20 pm)	Umbrella Bar Concert	Geophonic and biogenic sounds, occasional aircraft flyovers and local vehicles	51	53	50
	Audience sounds only, no music		50	51	49
Site 4: 8750 Hawthorn Lane (8:37 to 9:07 pm)	Audience sounds only, no music	Geophonic and biogenic sounds, occasional aircraft flyovers and local vehicles	47	48	45
	Umbrella Bar Concert		47	49	45
Site 5: 9011 Hawthorn Lane (9:52 to 10:22 pm)	Umbrella Bar Concert	Geophonic and biogenic sounds, and occasional aircraft flyovers	48	50	46

Site 1: 7573 Highview Drive, Greendale

Attended sound monitoring at 7573 Highview Drive occurred from 6:20 pm until 6:50 pm on September 10, 2022. Photographs of the 7573 Highview Drive site are shown in Figure 2, facing west and southwest towards the ROC. As shown in the photographs, the site is well shielded from the ROC by the intervening berm.

The results of attended sound monitoring on September 10, 2022 at 7573 Highview Drive are shown in Figure 3. This site was located approximately 75 feet from the center of South 76th Street and the background sound environment was dominated by traffic noise from vehicles traveling along the roadway, as indicated by the spikes occurring throughout the spectrogram shown in Figure 3. 'Slaps' as vehicles traveled over joints in the pavement were clearly audible. Bass from the Umbrella Bar band was clearly distinguishable during lulls in traffic. The spectrogram in Figure 3 shows elevated levels in the 63 Hz frequency band that are can be attributed to the Umbrella Bar band performance. No other ROC event noise was audible during the attended monitoring.

7573 Highview Drive, Facing West Toward ROC

7573 Highview Drive, Facing Southwest

FIGURE 2: PHOTOGRAPHS OF 7573 HIGHVIEW DRIVE MONITORING SITE

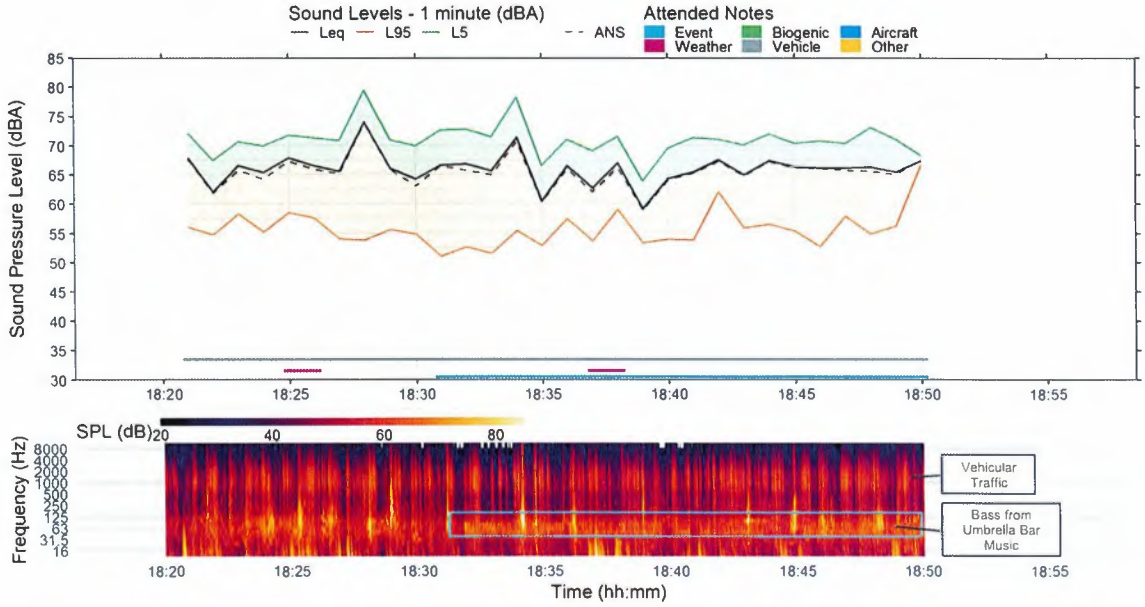
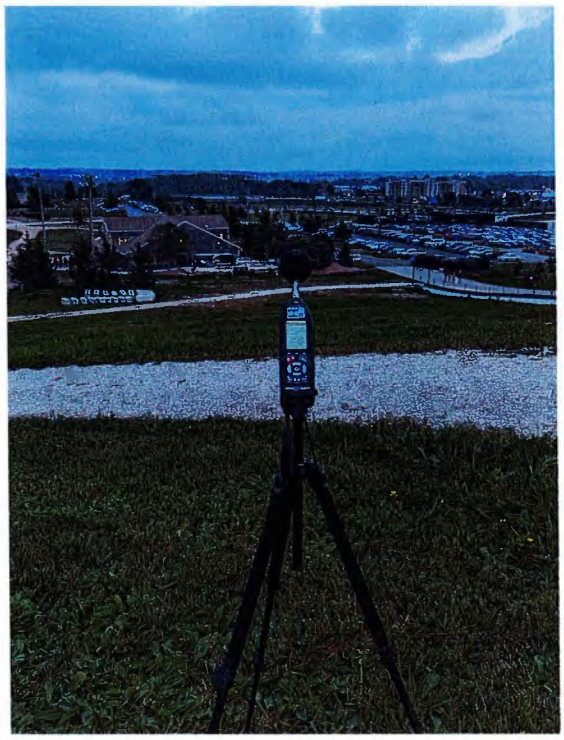


FIGURE 3: ATTENDED SOUND MONITORING AT 7573 HIGHVIEW DRIVE ON SEPTEMBER 10, 2022

Site 2: Ski Hill

Attended sound monitoring at the Ski Hill site occurred from 7:10 pm until 7:30 pm on September 10, 2022. Photographs of the Ski Hill site are shown in Figure 4, facing east towards the Umbrella Bar and southeast toward the Baseball Stadium. As indicated in the photographs, the site has direct sound and visual exposure to both the Stadium and the Umbrella bar. The westernmost portion of the Stadium is shielded by a portion of the Ski Hill. Background (non-ROC activity) sounds at this site included distant traffic and occasional aircraft flyovers. Aircraft events clearly dominated the sound environment when they occurred.

The results of attended sound monitoring on September 10, 2022 at the Ski Hill are shown in Figure 5. The primary sound sources included music and mechanical equipment sounds from the Umbrella Bar. Music from the Umbrella Bar was the dominant sound source. Review of the spectrogram in Figure 5 shows elevated sounds in the 63 and 31.5 Hz frequency bands throughout the monitoring period, attributed to the Umbrella Bar band.



Ski Hill Site, Facing East Towards Umbrella Bar

Ski Hill Site, Facing Southeast Towards Baseball Stadium

FIGURE 4: PHOTOGRAPHS OF SKI HILL MONITORING SITE

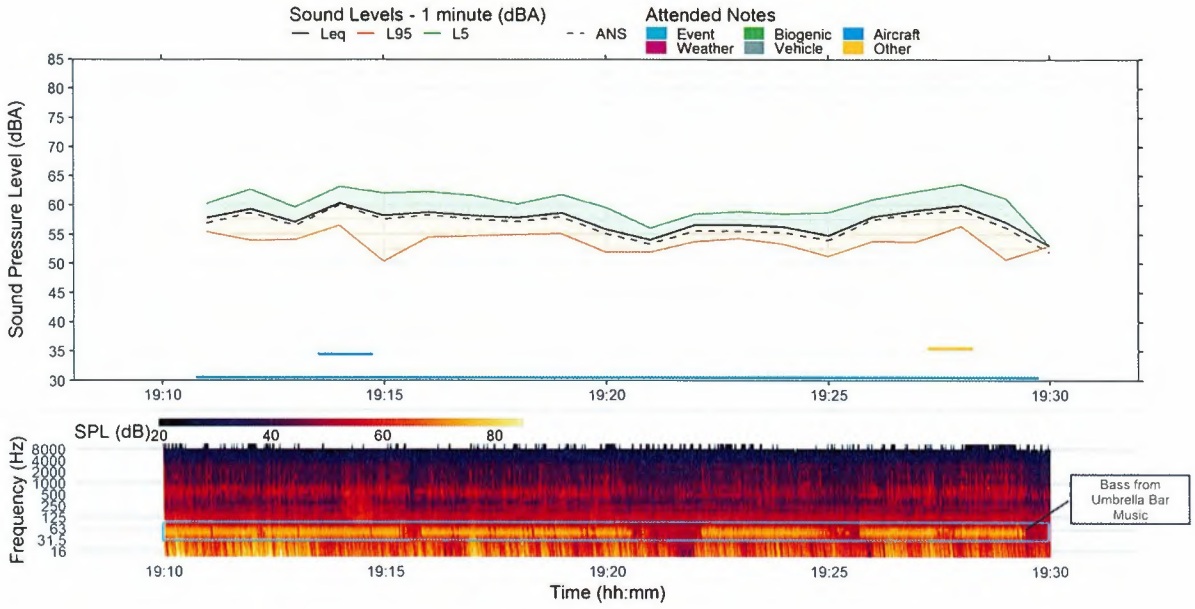


FIGURE 5: ATTENDED SOUND MONITORING AT SKI HILL ON SEPTEMBER 10, 2022

Site 3: 8610 West Hawthorn Lane, Franklin

Attended sound monitoring at 8610 Hawthorn Lane occurred from 7:50 pm until 8:20 pm on September 10, 2022. Photographs of the 8610 Hawthorn Lane site are shown in Figure 6, facing east towards the ROC and west towards the residence. The site is shielded from the ROC by an intervening berm.

The results of attended sound monitoring are shown in Figure 7. Background (non-ROC activity) sounds at this site included geophonic and biogenic sounds, occasional aircraft flyovers, and occasional local vehicles on Hawthorne Lane.

Umbrella Bar music was audible and review of Figure 7 indicates elevated low frequency sound levels during the period where the Umbrella Bar band was performing. During the period where the Umbrella Bar band was on break (starting at 8:09 pm), cheering and conversations from the ROC were audible. Although the overall A-weighted difference between the periods when the band was and was not performing was only 1 dB L_{eq}, sound levels in the 40 and 50 Hz bands decreased by 12 and 10 dB, respectively, when the band was not playing.

8610 Hawthorn Lane, Facing East Towards ROC

8610 Hawthorn Lane, Facing West Toward Residence

FIGURE 6: PHOTOGRAPHS OF 8610 HAWTHORN LANE MONITORING SITE

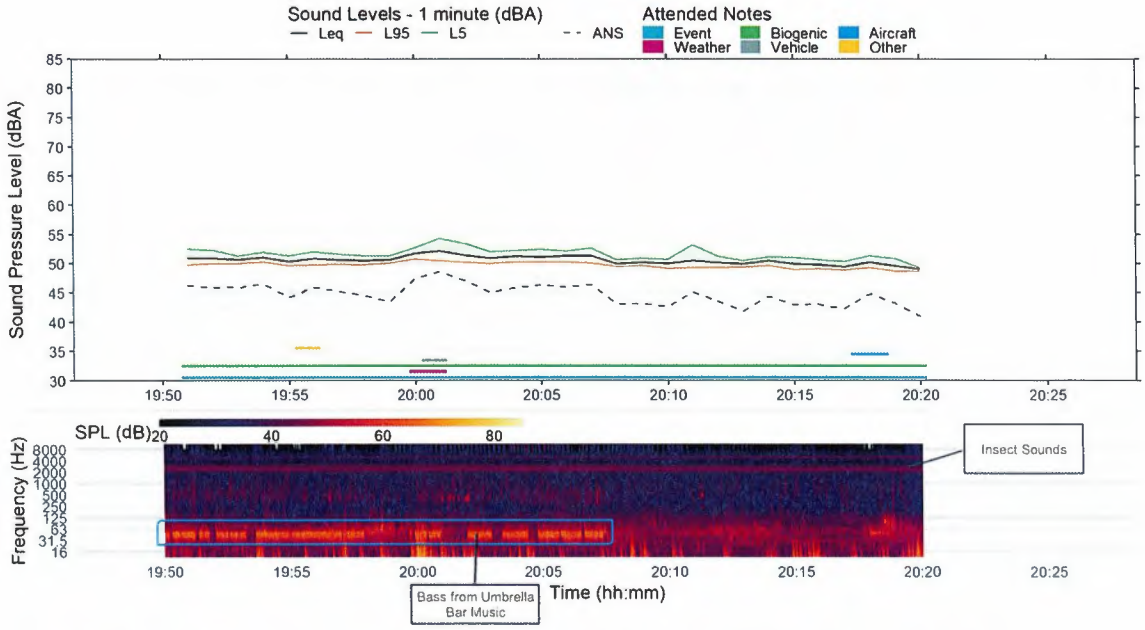


FIGURE 7: ATTENDED SOUND MONITORING AT 8610 HAWTHORN LANE ON SEPTEMBER 10, 2022

Site 4: 8750 West Hawthorn Lane, Franklin

Attended sound monitoring at 8750 Hawthorn Lane occurred from 8:37 pm until 9:07 pm on September 10, 2022. Photographs of the 8750 Hawthorn Lane site are shown in Figure 8, facing northeast towards the residence and southwest towards Hawthorn Lane. The results of attended sound monitoring are shown in Figure 9. Background sounds at this site included geophonic and biogenic sounds and occasional aircraft flyovers and local vehicles.

Music at the Umbrella Bar started back up at 8:47 pm. During this period, ROC sound sources included occasional speech and fairly continuous music with notable low frequency content, which is apparent in the spectrogram shown in Figure 9. While the Umbrella Bar band was on break, cheering and conversations were audible. Although the overall A-weighted difference between the periods when the band was and was not performing was minimal, sound levels in the 50 Hz bands increased by 7 dB during the period with the band playing.

8750 Hawthorn Lane, Facing Northeast Towards Residence

87500 Hawthorn Lane, Facing Southwest Toward Hawthorn Lane

FIGURE 8: PHOTOGRAPHS OF 8750 HAWTHORN LANE MONITORING SITE

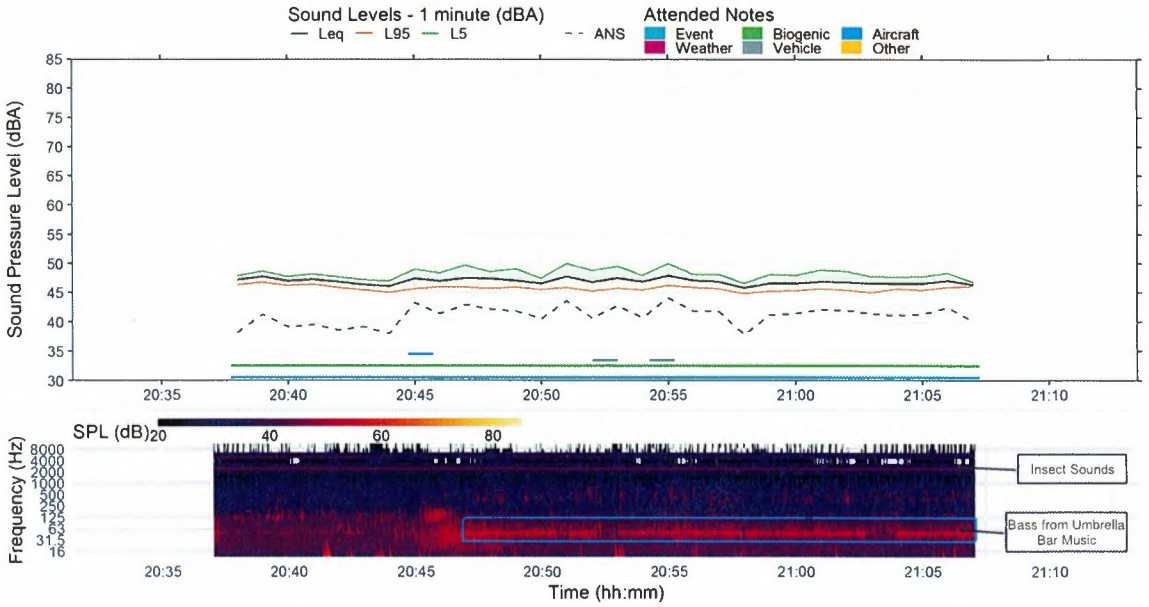


FIGURE 9: ATTENDED SOUND MONITORING AT 8750 HAWTHORN LANE ON SEPTEMBER 10, 2022

Site 5: 9011 West Hawthorn Lane, Franklin

Attended sound monitoring at 9011 Hawthorn Lane occurred from 9:52 pm until 10:22 pm on September 10, 2022. Photographs of the 9011 Hawthorn Lane site are shown in Figure 10, facing northeast towards the residence and southwest towards Hawthorn Lane. The results of attended sound monitoring are shown in Figure 11. Background sounds at this site included geophonic and biogenic sounds and occasional aircraft flyovers. Music from the ROC continued to be audible throughout the majority of the monitoring period. Low frequency sound levels were distinctive, as indicated in the spectrogram of Figure 11.

9011 Hawthorn Lane, Facing South Towards Residence

9011 Hawthorn Lane, Facing North Toward Hawthorn Lane

FIGURE 10: PHOTOGRAPHS OF 9011 HAWTHORN LANE MONITORING SITE

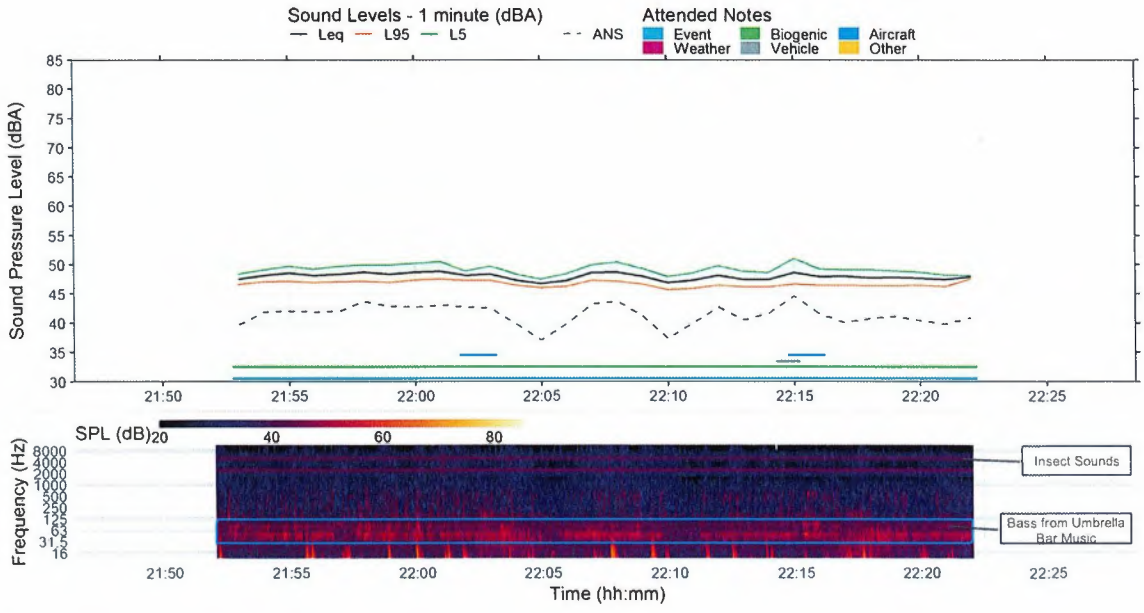


FIGURE 11: ATTENDED SOUND MONITORING AT 9011 HAWTHORN LANE ON SEPTEMBER 10, 2022

MEMO

TO: Suzanne Carter, Milwaukee County

FROM: Dana Lodico, RSG

DATE: December 12, 2022

SUBJECT: ROC – Results of Attended Sound Monitoring October 29, 2022

This purpose of this memo is to document and provide preliminary interpretations of the results of attended sound monitoring at locations adjacent to the Rock Sports Complex (ROC) on the evening of October 29, 2022. During this time, the following ROC events took place:

- The Hill Has Eyes on northern side of facility land
- Afterhours Party at Umbrella Bar

A more detailed analysis of both attended and unattended results will be documented in the Final Report, once all data has been collected and analyzed.

Attended Sound Monitoring Procedures

Sound level meters were mounted on tripods at a height of approximately 1.5 meters (5 feet) and covered with windscreens to minimize the impact of wind distortion on measurements. Field staff attended each monitor and documented sound levels attributable to facility and non-facility related activities occurring during the attended events.

Sound level monitoring was performed with ANSI/IEC Class 1 sound level meters with a minimum frequency range of 6.3 Hz to 20 kHz. The sound level meters were field calibrated during at the start and end of the attended monitoring session and found to be within 0.2 dB.

The project team did not receive permission to monitor on ROC property. As a result, attended monitoring was conducted at the Ski Hill and in the surrounding communities. Seven sites were attended consecutively on the evening of October 29, 2022;

1) A Ski Hill location with direct sound and visual exposure to the Haunted Hill Event (6:11 to 6:46 pm and 1:00 to 1:30 am),
2) Backyard of 8610 West Hawthorn Lane, Franklin (7:26 to 7:54 pm),
3) Front yard of 7573 Highview Drive, Greendale (8:20 to 8:31 pm),
4) Front yard of 6541 Hill Ridge Drive, Greendale (9:01 to 9:33 pm),

5) Front yard of 6025 Parkview Road, Greendale (10:04 to 10:45 pm),

6) Front yard of 6090 Parkview Road, Greendale (11:06 to 11:37 pm), and

7) Front yard of 7283 Huckleberry Court, Greendale (12:01 to 12:36 am).

Monitoring locations are shown in Figure 1.

Concurrent to the attended monitoring, unattended monitoring continued to occur at the three long-term monitoring sites that are described in the Workplan, dated October 24, 2022. This memo only describes the results of the short-term attended monitoring; the long-term unattended monitoring results will be discussed in the Final Report.

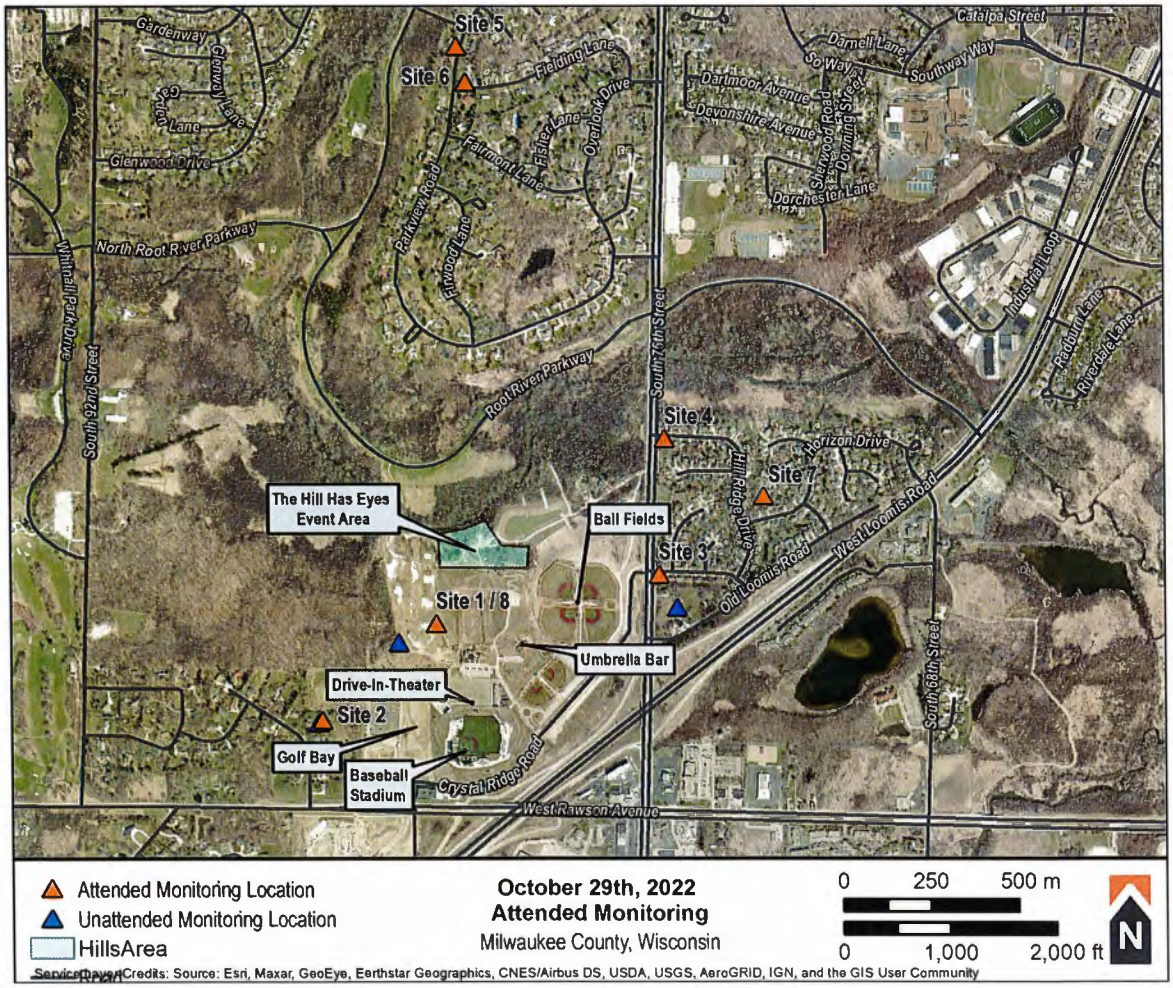


FIGURE 1: SOUND MONITORING LOCATIONS

Sound Monitoring Results

A summary of results of the attended sound monitoring is given in Table 1, including equivalent continuous average (L_{eq}), upper 5th percentile (L_5), and lower 5th percentile (L_{95}) sound levels. The results include sounds from all sounds sources, including event and non-event sources. Sounds levels attributed exclusively to event sources will be provided in the Final Report, once all data has been acquired and analyzed.

TABLE 1: SUMMARY OF ATTENDED SOUND LEVELS

LOCATION	EVENT SOURCES	PRIMARY BACKGROUND SOURCES	Sound Pressure Level, dBA		
			L_{eq}	L_{05}	L_{95}
Site 1a: Ski Hill (6:11 to 6:48 pm)	Hill Has Eyes	Occasional aircraft flyovers	56	60	52
Site 1b: Ski Hill (1:00 to 1:30 am)	Umbrella Bar Event, Hills Have Eyes completed but sound effects still audible	Distant traffic	50	54	47
Site 2: 8610 Hawthorn Lane (7:26 to 7:54 pm)	Golf, Hill Has Eyes inaudible	Occasional aircraft flyovers and local vehicles	53	55	46
Site 3: 7573 Highview Drive (8:20 to 8:31 pm)	Hill Has Eyes inaudible	Vehicles on South 76th Street	64	69	54
Site 4: 6541 Hill Ridge Drive (9:01 to 9:33 pm)	Hill Has Eyes	Vehicles on South 76th Street	61	66	52
Site 5: 6025 Parkview Road (10:04 to 10:45 pm)	Hill Has Eyes	Distant and local vehicular traffic	50	56	42
Site 6: 6090 Parkview Road (11:06 to 11:37 pm)	Hill Has Eyes	Distant and local vehicular traffic	45	49	41
Site 7: 7283 Huckleberry Court (12:01 to 12:36 am)	Hill Has Eyes	Distant vehicular traffic	48	51	45

Site 1: Ski Hill

Attended sound monitoring at the Ski Hill site occurred from 6:11 pm until 6:45 pm on October 29, 2022 and from 1:00 am until 1:30 am on October 30, 2022. Photographs of the Ski Hill site are shown in Figure 2, facing south towards the Hill Has Eyes event. As indicated in the photographs, the site has direct sound and visual exposure to this event. Background (non-ROC activity) sounds at this site included occasional aircraft flyovers during the first interval. Aircraft events clearly dominated the sound environment when they occurred.

The results of attended sound monitoring on October 29 and 30, 2022 at the Ski Hill are shown in Figure 3 and Figure 4. During the first measurement, The Hill Has Eyes was occurring. During the second measurement, The Hill Has Eyes had ended and was being shut down and an afterhours event was taking place at the Umbrella bar. The primary sound sources during The Hill Has Eyes included a chainsaw, the public

announcement system, music and special effects sounds. In the second interval, the sound effects continued to be audible, along with music from the Umbrella Bar for the afterhours event. Review of the spectrogram in Figure 3 and Figure 4 show elevated sounds in the 63 and 31.5 Hz frequency bands throughout the monitoring period, attributed to the event music.

Ski Hill Site, Facing South Towards Event (6:30 pm)

Ski Hill Site, Facing South Towards Event (1:15 am)

FIGURE 2: PHOTOGRAPHS OF SKI HILL MONITORING SITE

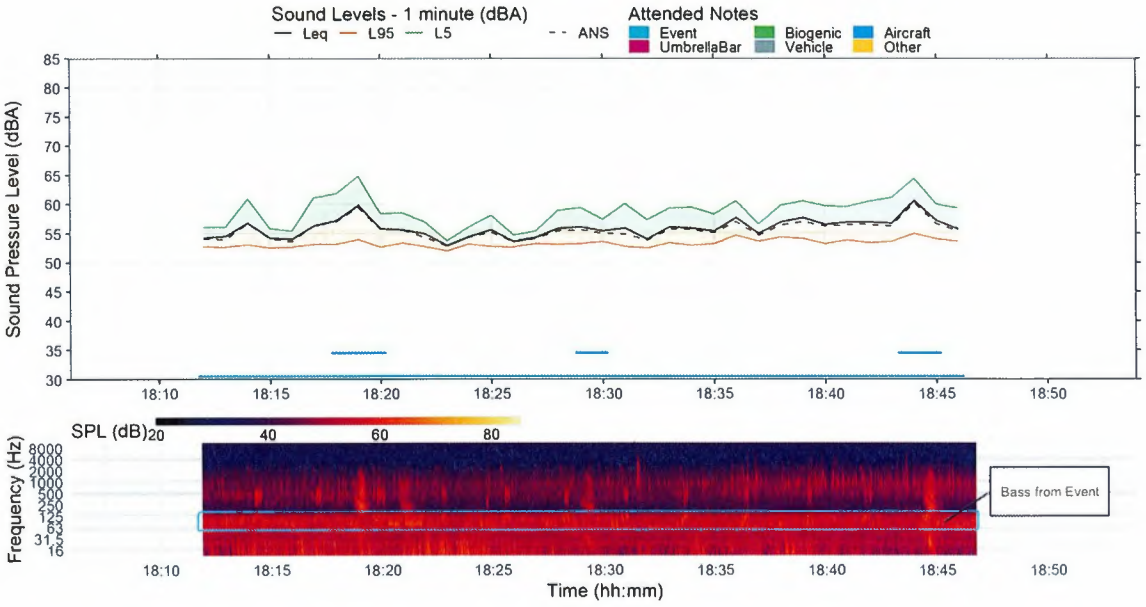


FIGURE 3: ATTENDED SOUND MONITORING AT SKI HILL ON OCTOBER 29, 2022 FROM 6:11 TO 6:45 PM

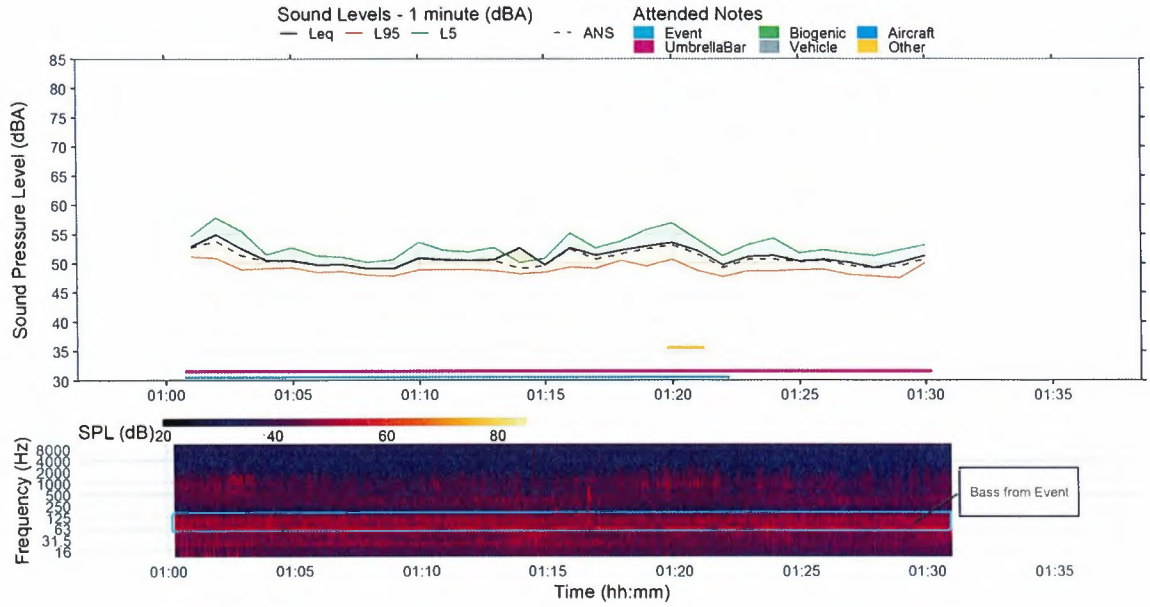


FIGURE 4: ATTENDED SOUND MONITORING AT SKI HILL ON OCTOBER 30, 2022 FROM 1:00 TO 1:30 AM

Site 2: 8610 West Hawthorn Lane, Franklin

Attended sound monitoring at 8610 Hawthorn Lane occurred from 7:26 pm until 7:54 pm on October 29, 2022. Photographs of the 8610 Hawthorn Lane site are shown in Figure 5, facing east towards the ROC and west towards the residence.

The results of attended sound monitoring are shown in Figure 6. The Hill Has Eyes event was not audible at this site. The primary sound source was activities at the adjacent golf facility, which opened recently and is indicated as 'Other' in Figure 6. Background (non-ROC activity) sounds at this site included occasional aircraft flyovers, and occasional local vehicles on Hawthorne Lane.

8610 Hawthorn Lane, Facing East Towards ROC

8610 Hawthorn Lane, Facing West Toward Residence

FIGURE 5: PHOTOGRAPHS OF 8610 HAWTHORN LANE MONITORING SITE

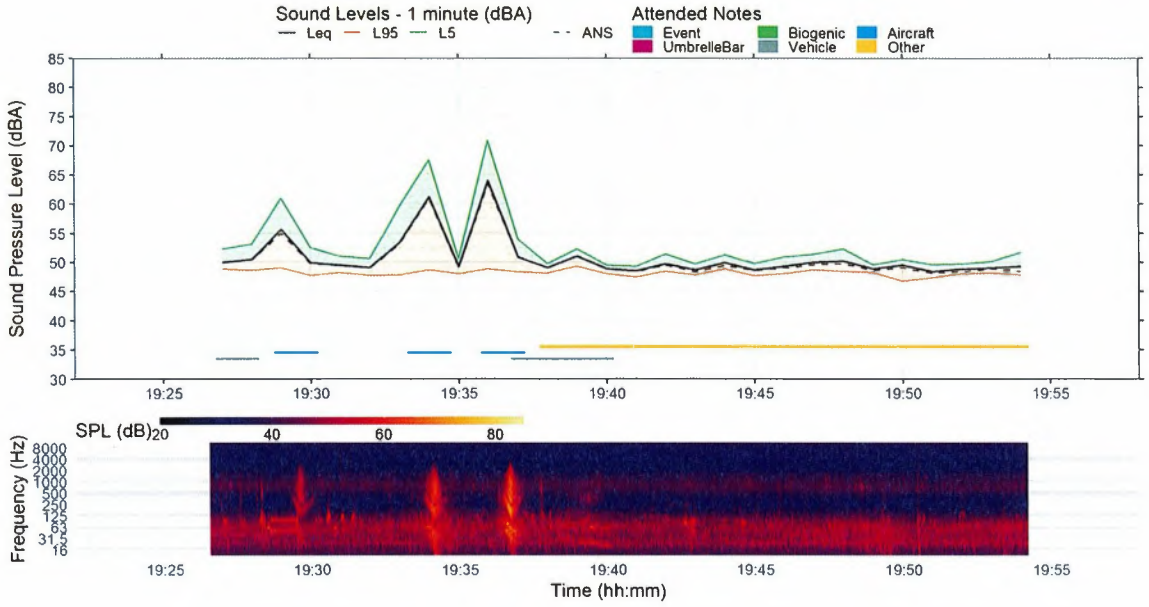


FIGURE 6: ATTENDED SOUND MONITORING AT 8610 HAWTHORN LANE ON OCTOBER 29, 2022

Site 3: 7573 Highview Drive, Greendale

Attended sound monitoring at 7573 Highview Drive occurred from 8:20 pm until 8:31 pm on October 29, 2022. Photographs of the 7573 Highview Drive site are shown in Figure 7, facing west and southwest towards the ROC. As shown in the photographs, the site is well shielded from the ROC by the intervening berm.

The results of attended sound monitoring on October 29, 2022 at 7573 Highview Drive are shown in Figure 8. This site was located approximately 75 feet from the center of South 76th Street and the background sound environment was dominated by traffic noise from vehicles traveling along the roadway, as indicated by the spikes occurring throughout the spectrogram shown in Figure 8. 'Slaps' as vehicles traveled over joints in the pavement were clearly audible. The Hill Has Eyes event was not audible at this location.

7573 Highview Drive, Facing West Toward ROC

7573 Highview Drive, Facing Southwest

FIGURE 7: PHOTOGRAPHS OF 7573 HIGHVIEW DRIVE MONITORING SITE

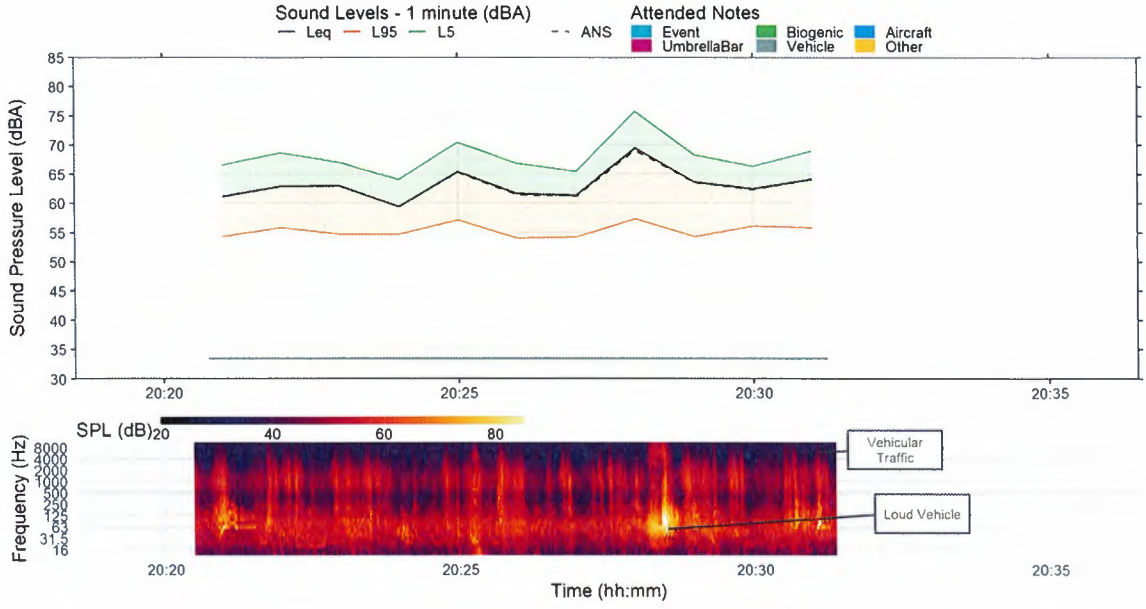


FIGURE 8: ATTENDED SOUND MONITORING AT 7573 HIGHVIEW DRIVE ON OCTOBER 29, 2022

Site 4: 6541 Hill Ridge Drive, Greendale

Attended sound monitoring at 6541 Hill Ridge Drive occurred from 9:01 pm until 9:31 pm on October 29, 2022. Photographs of the 6541 Hill Ridge Drive site are shown in Figure 9, facing south towards the residence and west towards South 76th Street.

The results of attended sound monitoring are shown in Figure 10. This site was located approximately 100 feet from the center of South 76th Street and the background sound environment was dominated by traffic noise from vehicles traveling along the roadway, as indicated by the spikes occurring throughout the spectrogram. Low frequency from music at The Hill Has Eyes event was audible at this location.

6541 Hill Ridge Drive, Facing South Towards Residence

6541 Hill Ridge Drive, Facing West Toward South 76th Street

FIGURE 9: PHOTOGRAPHS OF 6541 HILL RIDGE DRIVE MONITORING SITE

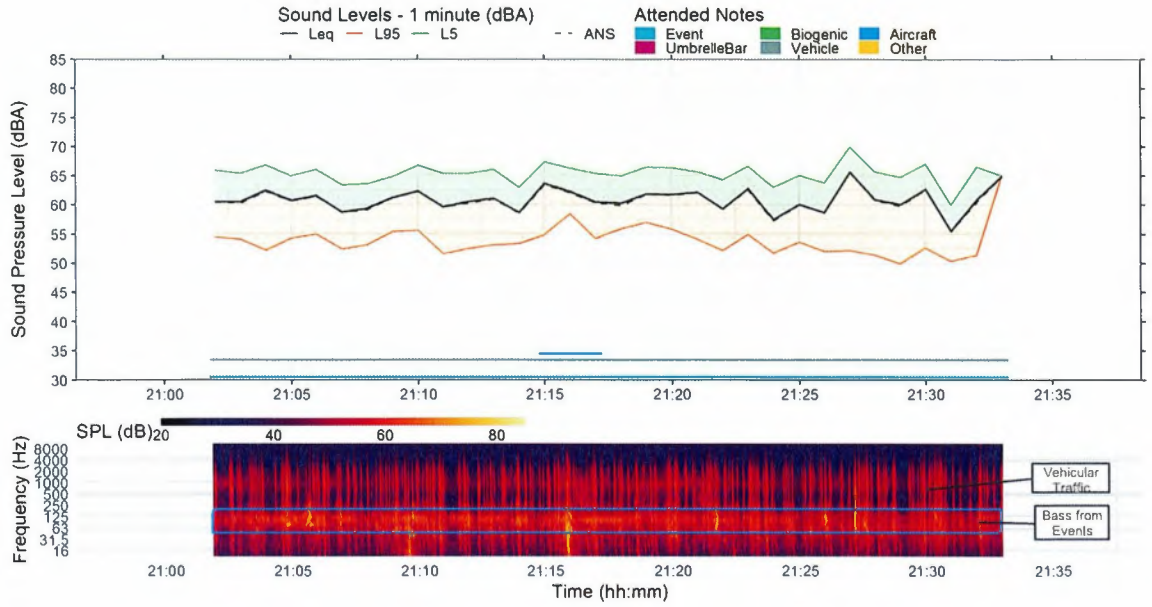
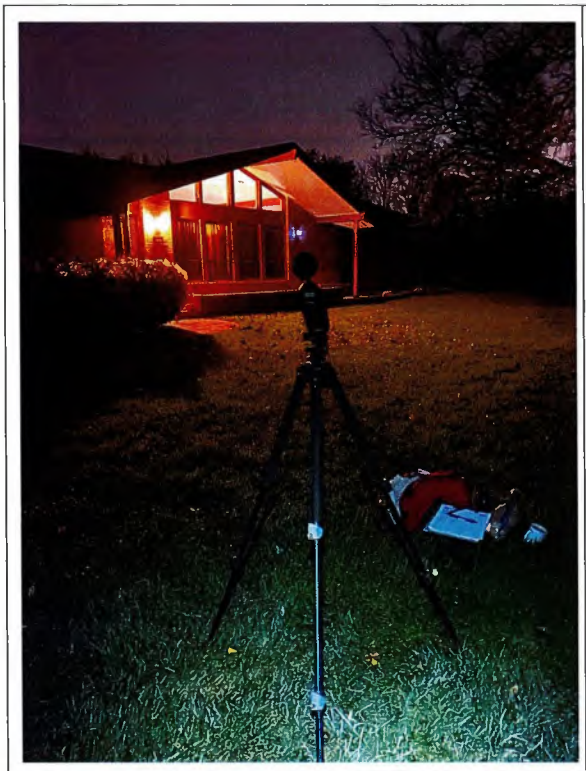


FIGURE 10: ATTENDED SOUND MONITORING AT 6541 HILL RIDGE DRIVE ON OCTOBER 29, 2022

Site 5: 6025 Parkview Road, Greendale

Attended sound monitoring at 6025 Parkview Road occurred from 10:04 pm until 10:45 pm on October 29, 2022. Photographs of the 6025 Parkview Road site are shown in Figure 11, facing west towards the residence and east towards Parkview Road. The results of attended sound monitoring are shown in Figure 12. The Hill Has Eyes event was clearly audible at this location despite being located more than a mile to the south of the monitoring. Background sounds at this site included distant and local traffic and local conversations.



6025 Parkview Road, Facing West Towards Residence

6025 Parkview Road, Facing East Toward Parkview Road

FIGURE 11: PHOTOGRAPHS OF 6025 PARKVIEW ROAD MONITORING SITE

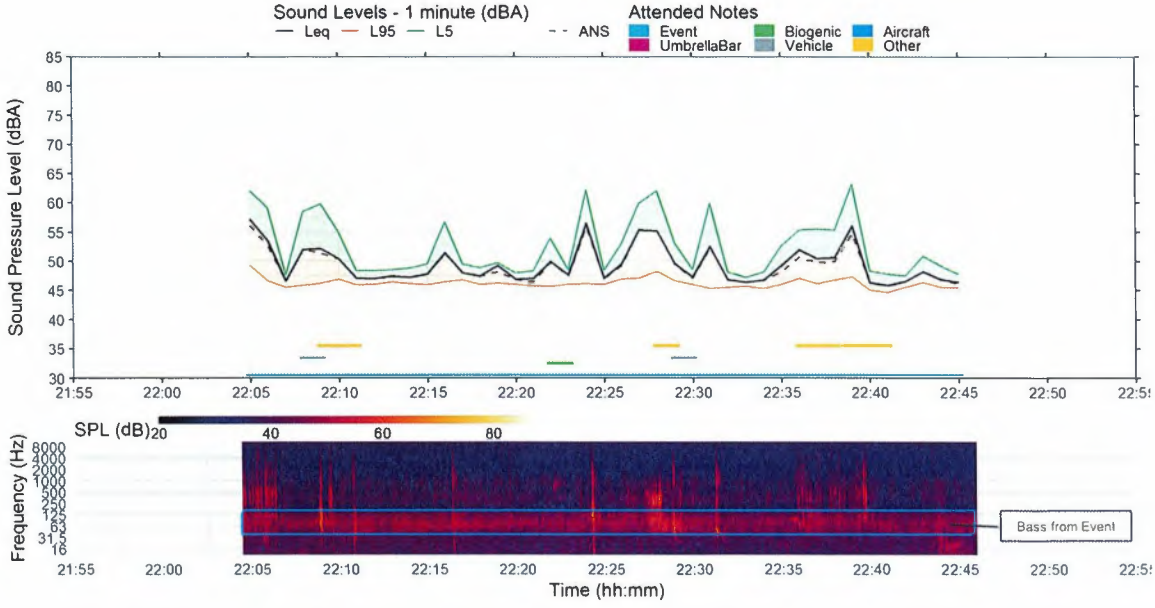


FIGURE 12: ATTENDED SOUND MONITORING AT 6025 PARKVIEW ROAD ON OCTOBER 29, 2022

Site 6: 6090 Parkview Road, Greendale

Attended sound monitoring at 6090 Parkview Road occurred from 11:06 pm until 11:37 pm on October 29, 2022. Photographs of the 6090 Parkview Road site are shown in Figure 11, facing west towards the residence and east towards Parkview Road. The results of attended sound monitoring are shown in Figure 12. The Hill Has Eyes event was clearly audible at this location despite being located more than a mile to the south of the monitoring. Background sounds at this site included distant and local traffic and occasional aircraft.

6090 Parkview Road, Facing Northeast Towards Residence

6090 Parkview Road, Facing Southwest Toward Parkview Road

FIGURE 13: PHOTOGRAPHS OF 6090 PARKVIEW ROAD MONITORING SITE

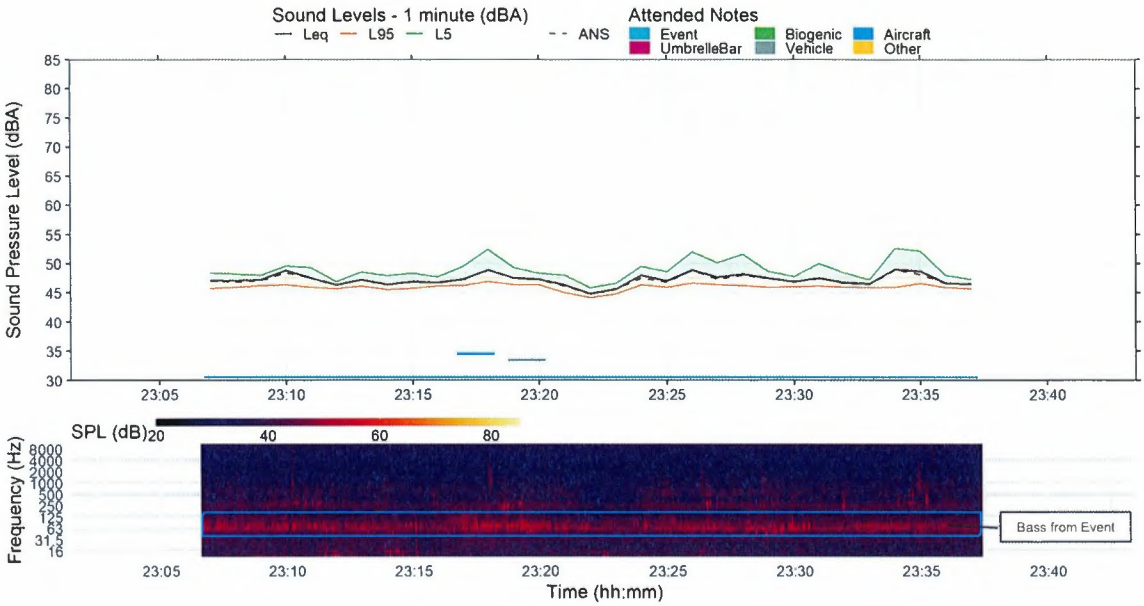


FIGURE 14: ATTENDED SOUND MONITORING AT 6090 PARKVIEW ROAD ON OCTOBER 29, 2022

Site 7: 7283 Huckleberry Court, Greendale

Attended sound monitoring at 7283 Huckleberry Court occurred from 12:01 am until 12:36 am on October 30, 2022. Photographs of the 7283 Huckleberry Court site are shown in Figure 11, facing east towards the residence and west. The results of attended sound monitoring are shown in Figure 12. The Hill Has Eyes event was clearly audible at this location. Background sounds at this site included distant and local traffic.

7283 Huckleberry Court, Facing East Towards Residence

7283 Huckleberry Court, Facing West

FIGURE 15: PHOTOGRAPHS OF 7283 HUCKLEBERRY COURT MONITORING SITE

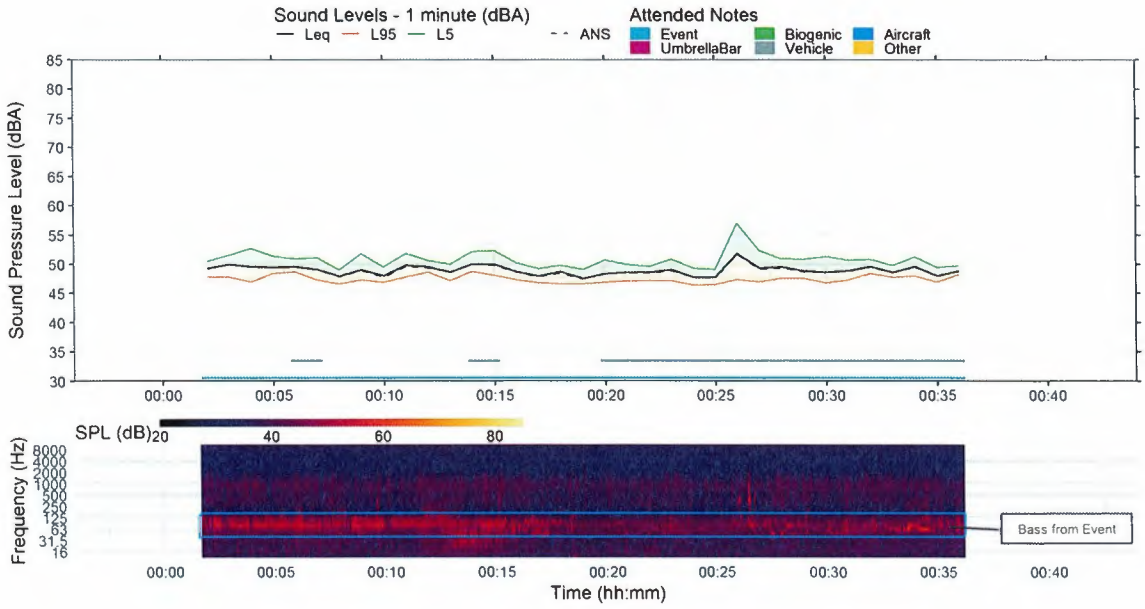


FIGURE 16: ATTENDED SOUND MONITORING AT 7283 HUCKLEBERRY COURT ON OCTOBER 30, 2022

APPENDIX F. PHOTOGRAPHS OF LONG-TERM MONITORING SITES

FIGURE 35: PHOTOGRAPHS OF EAST LONG-TERM MONITOR

FIGURE 36: PHOTOGRAPHS OF NORTH LONG-TERM MONITOR

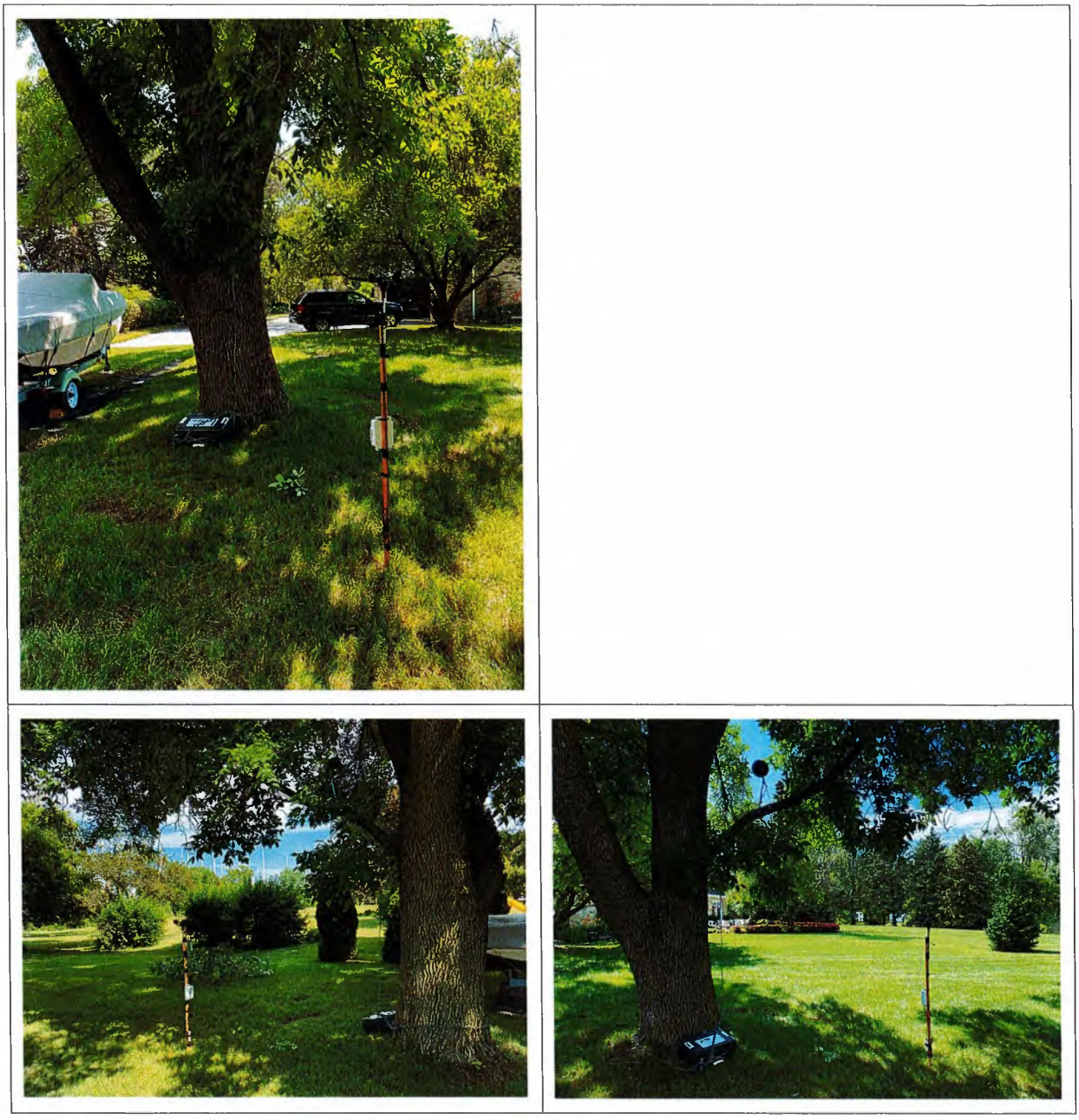


FIGURE 37: PHOTOGRAPHS OF WEST LONG-TERM MONITOR

APPENDIX G. LONG-TERM MONITORING DATA

Long-term monitoring data, including sound level and meteorological data, is available by request from Milwaukee County. Sound level data includes compiled spectrograms and 1/3 octave band sound levels in one-second and 10-minute intervals at all three long-term monitor locations over the full six-month monitoring period and in one-second and 1-minute intervals for all attended measurements. Meteorological data includes temperature, relative humidity, average wind speed and maximum wind gust speed in one-minute intervals over the full six-month monitoring period. To ensure the privacy of any recorded information, audio files can only be made available if funding is provided for RSG staff to listen to the files and remove any private conversations or other identifying information.

APPENDIX H. SOUND MODELING INPUTS

TABLE 12: MODEL PARAMETER SETTINGS

MODEL PARAMETER	SETTING
Atmospheric Absorption	Based on 10°C and 70% RH
Foliage	No foliage attenuation
Ground Absorption	ISO 9613-2 spectral, G=1.0
Search Radius	5,000 meters from each source
Receiver Height	1.5 meters for sound level isolines, and 1.5 and 4 meters for discrete receptors

TABLE 13: MODELED SOUND POWER SPECTRA, IN dBA

NAME	SOUND POWER LEVEL	OCTAVE BAND CENTER FREQUENCY (Hz)								
		31.5	63	125	250	500	1000	2000	4000	8000
Snow Machine	112	63	70	88	105	105	108	103	98	89
Field Speaker	112	65	83	106	106	101	107	104	94	--
Umbrella Bar Stage	126	100	109	118	118	122	119	110	107	90
Fireworks Ground Launch	150	99	121	136	142	143	146	143	131	121
Fireworks Burst	150	91	114	131	142	147	143	138	134	117
Hills have Eyes	80	-	69	77	-	-	-	-	72	75

TABLE 14: SOURCE INPUT DATA

NAME	SOUND POWER LEVEL (dBA)	HEIGHT (m)	COORDINATES (NAD83 UTM16N)		
			X (m)	Y (m)	Z (m)
Fireworks Ground Launch	150	0.5	417112	4752629	239
Fireworks Burst	150	183	417111	4752630	421
Baseball Field Speaker 1	112	6	417228	4752187	253
Baseball Field Speaker 2	112	6	417089	4752244	252
Baseball Field Speaker 3	112	6	417131	4752277	251
Baseball Field Speaker 4	112	6	417186	4752139	253
Baseball Field Speaker 5	112	3	417152	4752281	250
Baseball Field Speaker 6	112	6	417132	4752277	252
Baseball Field Speaker 7	112	6	417090	4752244	253
Baseball Field Speaker 8	112	4	417082	4752188	251
Baseball Field Speaker 9	112	5	417096	4752152	250
Baseball Field Speaker 10	112	4	417127	4752141	250
Baseball Field Speaker 11	112	6	417186	4752139	253
Baseball Field Speaker 12	112	6	417228	4752186	253
Umbrella Bar Stage Speaker	126	1.5	417311	4752477	253
Snow Machine 1	112	1.5	417042	4752463	257
Snow Machine 2	112	1.5	416979	4752502	271
Snow Machine 3	112	3	417089	4752558	244
Snow Machine 4	112	3	417090	4752599	239
Snow Machine 5	112	1.5	416989	4752542	260
Snow Machine 6	112	1.5	416994	4752602	245
Snow Machine 7	112	3	417093	4752514	252
Snow Machine 8	112	1.5	416929	4752474	284
Snow Machine 9	112	1.5	417002	4752669	229
Snow Machine 10	112	1.5	416891	4752761	218
Hills Have Eyes Area	80	1.5	417219	4752757	220

APPENDIX I. SOUND MODELING RESULTS

TABLE 15: MODELED SOUND LEVELS AT DISCRETE RECEPTOR LOCATIONS

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R001	A	8211 Fairmont Ln	Greendale	72	75	36	38	43	45	44	46	41	42	45	46
R002	A	8201 Fairmont Ln	Greendale	72	75	36	38	43	46	44	46	41	42	44	46
R003	A	6285 Parkview Rd	Greendale	75	78	38	40	44	46	45	47	44	46	47	48
R004	A	6266 Parkview Rd	Greendale	73	76	36	38	43	45	44	46	42	44	44	46
R005	A	8251 Firwood Ln	Greendale	75	78	38	39	44	47	45	47	44	46	47	48
R006	A	6275 Parkview Rd	Greendale	73	76	37	38	43	45	44	46	42	44	43	46
R007	A	6269 Parkview Rd	Greendale	73	76	37	38	43	45	44	46	42	44	44	46
R008	A	6283 Parkview Rd	Greendale	74	77	38	39	44	46	45	47	44	45	46	48
R009	A	6289 Parkview Rd	Greendale	76	79	39	40	45	47	46	48	46	47	49	49
R010	A	6280 Parkview Rd	Greendale	74	77	38	39	44	46	45	47	44	45	47	48
R011	A	6290 Parkview Rd	Greendale	76	79	39	40	45	47	46	48	45	47	49	49
R012	A	6279 Parkview Rd	Greendale	74	77	37	39	43	46	44	46	43	45	46	47
R013	A	6287 Parkview Rd	Greendale	75	79	39	40	44	47	45	48	45	47	47	49
R014	A	6293 Fleetwood Ct	Greendale	77	80	40	41	45	48	46	49	47	48	50	51
R015	A	6297 Fleetwood Ct	Greendale	77	80	40	41	46	48	47	49	47	48	51	51
R016	A	6270 Parkview Rd	Greendale	73	76	37	38	43	46	44	46	43	44	46	46
R017	B	6605 Hill Ridge Dr	Greendale	75	78	40	41	47	50	48	50	42	43	47	47
R018	B	7390 Hill Valley Ct	Greendale	75	79	40	42	48	50	48	51	42	44	47	48
R019	B	6978 Heathmeadow Ct	Greendale	71	74	37	39	41	43	43	44	38	39	41	42
R020	B	6687 Hill Ridge Dr	Greendale	75	79	41	42	49	51	49	51	42	44	48	48
R021	B	7351 Highview Dr	Greendale	76	79	43	44	42	45	45	48	43	44	47	48
R022	B	6720 Hill Ridge Dr	Greendale	75	78	41	43	42	46	45	48	42	43	46	47

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R023	A	6291 Fleetwood Ct	Greendale	76	79	39	41	45	47	46	48	46	48	49	50
R024	A	6295 Fleetwood Ct	Greendale	77	80	40	41	46	48	47	49	47	49	51	51
R025	A	8280 Flagstone Ct	Greendale	72	75	36	37	43	45	44	46	41	43	44	46
R026	A	8276 Flagstone Ct	Greendale	72	76	36	38	44	46	44	46	42	43	44	46
R027	A	6276 Parkview Rd	Greendale	74	77	37	39	44	46	45	47	43	45	47	47
R028	A	6286 Parkview Rd	Greendale	75	78	39	40	44	47	45	48	45	46	48	49
R029	B	6570 Hill Ridge Dr	Greendale	76	79	40	41	47	50	48	50	43	44	48	48
R030	E	8815 W Meadow Ln	Franklin	74	78	42	43	44	47	46	48	41	42	43	44
R031	D	7217 S Woelfel Rd	Franklin	69	73	37	38	34	37	39	40	35	37	39	40
R032	D	7145 S Woelfel Rd	Franklin	71	74	38	39	35	40	40	42	36	38	39	40
R033	D	7165 S Woelfel Rd	Franklin	70	74	37	39	34	38	39	41	36	37	39	40
R034	A	8267 Firwood Ln	Greendale	73	76	36	37	43	45	44	46	42	43	44	46
R035	A	8254 Firwood Ln	Greendale	74	77	37	38	44	46	45	47	43	45	47	48
R036	A	8242 Firwood Ln	Greendale	75	78	38	39	45	47	45	48	45	46	48	49
R037	A	8264 Firwood Ln	Greendale	73	77	36	38	44	46	44	47	43	44	46	47
R038	A	8243 Firwood Ln	Greendale	76	79	38	40	45	47	46	48	45	47	49	50
R039	A	8247 Firwood Ln	Greendale	75	78	38	39	44	47	45	48	45	46	48	49
R040	A	8263 Firwood Ln	Greendale	73	76	36	38	43	46	44	46	43	44	46	47
R041	A	6313 Parkview Rd	Greendale	77	80	40	41	47	49	48	50	47	48	52	52
R042	A	6309 Parkview Rd	Greendale	78	81	40	41	47	49	48	50	47	48	52	52
R043	A	6312 Parkview Rd	Greendale	77	80	39	40	46	48	47	49	46	47	50	51
R044	A	6319 Parkview Rd	Greendale	76	80	40	41	47	49	48	50	46	47	50	51
R045	A	6323 Parkview Rd	Greendale	76	79	39	40	47	49	48	50	45	46	48	50
R046	A	6267 Overlook Ct	Greendale	72	75	36	37	44	46	44	46	40	42	44	45
R047	A	6210 Overlook Ct	Greendale	71	74	36	37	43	45	44	46	40	41	44	45
R048	A	6280 Overlook Ct	Greendale	72	75	36	38	44	46	45	47	41	42	44	46
R049	A	7718 Overlook Dr	Greendale	73	76	37	38	44	46	45	47	41	43	45	46
R050	A	6320 Parkview Rd	Greendale	76	79	39	40	46	48	47	49	45	46	48	50

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R052	B	6620 Hill Ridge Dr	Greendale	74	78	39	41	46	49	47	49	41	43	46	46
R053	B	6630 Hill Ridge Dr	Greendale	74	78	39	41	46	49	47	49	41	43	46	46
R054	B	7220 Horizon Dr	Greendale	73	77	40	41	44	47	46	48	40	42	45	45
R055	B	7283 Huckleberry Ct	Greendale	74	77	40	41	47	49	48	50	41	42	45	46
R056	B	7291 Huckleberry Ct	Greendale	74	77	40	41	47	49	48	50	41	42	46	46
R057	B	7274 Huckleberry Ct	Greendale	74	77	39	41	46	49	47	49	41	42	45	46
R058	B	7242 Huckleberry Ct	Greendale	73	77	39	41	46	48	47	49	40	41	45	45
R059	B	7210 Huckleberry Ct	Greendale	73	76	39	40	46	48	46	49	40	41	44	45
R060	B	7080 Horizon Dr	Greendale	72	75	38	39	44	48	45	48	39	40	42	43
R061	B	6900 Horizon Dr	Greendale	70	73	36	38	41	43	42	44	37	38	40	41
R062	B	6840 Horizon Dr	Greendale	70	73	36	38	40	42	41	43	37	39	40	41
R063	B	6571 Hill Ridge Dr	Greendale	75	79	39	42	48	50	49	51	42	44	49	49
R064	B	6591 Hill Ridge Dr	Greendale	75	79	40	41	47	50	48	50	42	44	47	48
R065	B	6645 Hill Ridge Dr	Greendale	75	78	40	41	47	50	48	50	42	43	47	47
R066	B	7476 Hill Valley Ct	Greendale	77	80	41	42	49	51	50	52	44	46	50	51
R067	B	7501 Hill Valley Ct	Greendale	77	81	42	43	50	52	51	53	44	46	51	51
R068	B	6681 Hill Ridge Dr	Greendale	75	78	41	42	48	51	49	51	42	43	47	48
R069	B	6715 Hill Ridge Dr	Greendale	75	79	42	43	45	48	46	49	42	44	47	48
R070	B	6725 Hill Ridge Dr	Greendale	76	79	42	43	44	47	46	49	42	44	47	48
R071	B	7376 Highview Dr	Greendale	76	80	43	44	44	48	47	49	43	44	48	49
R072	B	6714 Hilldale Ct	Greendale	76	79	42	43	46	50	48	51	43	44	48	48
R073	B	6701 Hilldale Ct	Greendale	76	79	42	43	49	51	50	52	43	44	48	49
R074	B	6709 Hilldale Ct	Greendale	76	79	42	43	50	52	50	53	43	44	49	49
R075	B	6744 Hill Park Ct	Greendale	78	81	44	45	52	54	53	55	44	46	51	51
R076	B	6706 Hill Park Ct	Greendale	76	80	42	44	50	53	51	53	43	45	50	50
R077	B	6696 Hill Park Ct	Greendale	76	80	42	43	50	52	51	53	43	45	49	50
R078	B	7571 Highview Dr	Greendale	79	82	45	46	50	52	51	53	45	47	51	52
R079	B	7511 Highview Dr	Greendale	78	81	44	46	47	49	49	51	44	46	51	51

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R080	B	7361 Highview Dr	Greendale	76	79	43	44	43	46	46	48	43	44	48	48
R081	B	6740 Hill Ridge Dr	Greendale	75	79	42	43	42	45	45	47	42	43	47	47
R082	B	6710 Hill Ridge Dr	Greendale	74	78	41	42	43	47	45	48	42	43	46	47
R083	B	7231 Horizon Dr	Greendale	74	77	40	41	42	46	44	47	40	42	45	45
R084	B	7086 Hollow Ln	Greendale	72	76	39	40	42	44	43	45	39	41	43	44
R085	B	7151 Horizon Dr	Greendale	72	76	39	40	44	48	45	48	39	41	43	44
R086	B	7053 Heathmeadow Ct	Greendale	72	75	38	40	45	48	46	49	39	40	43	44
R087	B	6962 Heathmeadow Ct	Greendale	71	74	37	38	40	42	42	44	38	39	41	42
R088	B	7032 Heathmeadow Ct	Greendale	71	75	38	39	44	46	45	47	38	40	42	43
R089	B	7050 Heathmeadow Ct	Greendale	71	75	38	39	46	48	46	48	38	40	42	43
R090	B	7027 Horizon Dr	Greendale	71	75	37	39	45	47	46	48	38	39	42	43
R091	A	8272 Flagstone Ct	Greendale	73	76	36	38	44	46	44	47	42	43	46	46
R092	A	6329 Parkview Rd	Greendale	75	78	38	40	47	49	47	49	44	45	48	49
R093	A	6333 Parkview Rd	Greendale	74	77	38	39	46	48	46	48	43	44	47	48
R094	A	6215 Overlook Ct	Greendale	71	75	36	37	44	46	44	46	40	42	44	45
R095	A	7716 Overlook Dr	Greendale	72	76	36	38	44	46	45	47	41	43	46	46
R096	A	6332 Parkview Rd	Greendale	74	77	37	39	45	47	46	48	42	44	47	47
R097	A	6330 Parkview Rd	Greendale	74	77	38	39	46	48	46	48	43	44	47	48
R098	A	6324 Parkview Rd	Greendale	75	78	39	40	47	49	47	49	44	45	48	49
R099	A	6322 Parkview Rd	Greendale	75	79	39	40	46	48	47	49	44	46	49	49
R101	B	6560 Hill Ridge Dr	Greendale	76	79	40	42	48	50	48	51	43	45	48	50
R102	B	6580 Hill Ridge Dr	Greendale	76	79	40	41	47	49	48	50	42	44	47	48
R103	B	6650 Hill Ridge Dr	Greendale	74	78	40	41	47	50	48	51	41	43	46	47
R104	B	6660 Hill Ridge Dr	Greendale	74	78	40	41	47	50	48	50	41	43	46	47
R105	B	6670 Hill Ridge Dr	Greendale	74	78	40	42	47	50	48	50	41	43	46	47
R106	B	6690 Hill Ridge Dr	Greendale	75	78	41	42	48	50	49	51	42	43	47	47
R107	B	6694 Hill Ridge Dr	Greendale	75	78	41	42	48	50	49	51	42	43	47	47
R108	B	7260 Horizon Dr	Greendale	74	77	40	41	46	49	47	50	41	42	46	46

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R109	B	7200 Horizon Dr	Greendale	73	77	39	41	44	47	45	48	40	41	44	45
R110	B	7275 Huckleberry Ct	Greendale	73	77	40	41	46	49	47	50	40	42	45	46
R111	B	7181 Hyacinth Ct	Greendale	73	76	39	40	45	48	46	48	40	41	44	45
R112	B	7217 Hyacinth Ct	Greendale	73	77	39	40	45	48	46	49	40	42	44	45
R113	B	7271 Hyacinth Ct	Greendale	74	77	39	41	46	50	47	50	41	42	45	46
R114	B	7292 Hyacinth Ct	Greendale	74	77	39	40	46	49	47	50	41	42	45	46
R115	B	7182 Hyacinth Ct	Greendale	73	76	38	40	47	48	47	49	40	41	43	44
R116	B	7498 Hill Valley Ct	Greendale	77	80	41	43	49	51	50	52	45	47	51	52
R117	B	7521 Hill Valley Ct	Greendale	77	81	42	43	50	52	50	53	44	46	51	51
R118	B	7441 Hill Valley Ct	Greendale	76	80	41	42	49	51	50	52	43	45	49	49
R119	B	7425 Hill Valley Ct	Greendale	76	79	41	42	49	51	49	51	43	44	49	49
R120	B	7365 Hill Valley Ct	Greendale	75	78	41	42	48	50	49	51	42	43	47	48
R121	B	6695 Hill Ridge Dr	Greendale	75	79	41	43	49	51	50	52	42	43	48	48
R122	B	6741 Hill Ridge Dr	Greendale	76	79	42	43	43	47	46	49	43	44	47	48
R123	B	6723 Hilldale Ct	Greendale	77	80	43	44	51	53	51	54	43	45	50	50
R124	B	6735 Hilldale Ct	Greendale	77	80	43	44	49	51	50	52	43	45	50	50
R125	B	6734 Hill Park Ct	Greendale	77	81	43	44	52	54	52	54	44	46	51	51
R126	B	6716 Hill Park Ct	Greendale	77	80	43	44	51	53	52	54	44	45	50	51
R127	B	6688 Hill Park Ct	Greendale	76	79	41	43	49	51	50	52	43	44	49	49
R128	B	6693 Hill Park Ct	Greendale	76	80	42	43	50	53	50	53	43	45	50	50
R129	B	6697 Hill Park Ct	Greendale	77	80	42	43	50	53	51	54	43	45	50	50
R130	B	6737 Hill Park Ct	Greendale	78	82	44	45	53	55	53	55	44	46	52	52
R131	B	7541 Highview Dr	Greendale	78	82	45	46	49	51	50	52	45	46	51	52
R132	B	7255 Horizon Dr	Greendale	74	77	40	42	43	47	45	48	41	42	45	46
R133	B	7221 Horizon Dr	Greendale	73	77	40	41	42	46	44	47	40	42	44	45
R134	B	7111 Hollow Ln	Greendale	73	76	39	41	41	44	43	46	40	41	44	44
R135	B	7062 Hollow Ln	Greendale	72	76	39	40	41	43	43	45	39	41	43	44
R136	B	7112 Hollow Ln	Greendale	72	76	39	40	41	45	43	46	40	41	43	44

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R137	B	7185 Horizon Dr	Greendale	72	76	39	40	42	46	44	47	40	41	44	44
R138	B	7125 Horizon Dr	Greendale	72	76	38	40	45	47	45	48	39	40	43	44
R139	B	7077 Heathmeadow Ct	Greendale	72	75	38	39	44	48	45	49	39	40	43	44
R140	B	6611 Hollyhock Ct	Greendale	72	75	38	40	43	45	45	47	39	40	43	44
R141	B	6965 Heathmeadow Ct	Greendale	71	74	37	39	40	42	42	44	38	39	41	42
R142	B	6996 Heathmeadow Ct	Greendale	71	74	37	39	42	44	43	45	38	39	41	42
R143	A	6301 Parkview Rd	Greendale	77	81	40	41	46	49	47	49	47	49	51	52
R144	A	8258 Fremont Ct	Greendale	74	77	37	39	44	47	45	47	43	45	47	48
R145	A	6325 Parkview Rd	Greendale	75	79	39	40	47	49	48	50	44	46	49	49
R146	B	6967 Horizon Dr	Greendale	70	74	37	38	43	45	44	46	38	39	41	42
R147	A	6327 Parkview Rd	Greendale	75	78	39	40	47	49	47	49	44	45	49	49
R148	A	6331 Parkview Rd	Greendale	74	78	38	39	46	48	47	49	43	44	46	48
R149	A	6337 Parkview Rd	Greendale	73	76	37	38	45	47	46	48	42	43	44	47
R150	A	6252 Overlook Ct	Greendale	72	75	36	37	44	46	45	46	40	42	45	45
R151	A	7719 Overlook Dr	Greendale	72	76	37	38	44	46	45	47	41	43	43	46
R152	A	6334 Parkview Rd	Greendale	73	76	37	39	45	47	46	48	42	43	46	47
R153	B	6540 Hill Ridge Dr	Greendale	77	80	40	42	48	50	49	51	45	46	49	51
R154	B	6550 Hill Ridge Dr	Greendale	76	79	40	42	48	50	49	51	44	46	49	50
R155	B	6600 Hill Ridge Dr	Greendale	75	78	40	41	47	49	47	50	41	43	46	47
R156	B	6640 Hill Ridge Dr	Greendale	74	78	40	41	47	49	47	50	41	43	46	46
R157	B	6680 Hill Ridge Dr	Greendale	74	78	40	42	48	50	48	51	42	43	46	47
R158	B	7240 Horizon Dr	Greendale	74	77	40	41	45	48	46	49	41	42	45	46
R159	B	7150 Horizon Dr	Greendale	73	76	39	40	46	48	46	49	40	41	44	45
R160	B	7288 Huckleberry Ct	Greendale	74	77	40	41	47	49	47	50	41	42	45	46
R161	B	7251 Hyacinth Ct	Greendale	73	77	39	40	46	48	47	49	40	42	45	45
R162	B	7206 Hyacinth Ct	Greendale	73	76	38	40	46	47	47	48	40	41	44	45
R163	B	7130 Horizon Dr	Greendale	73	76	38	39	45	47	45	48	39	41	43	44
R164	B	7110 Horizon Dr	Greendale	72	75	38	39	44	48	45	49	39	40	43	44

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R165	B	7060 Horizon Dr	Greendale	72	75	37	39	44	47	45	48	38	40	42	43
R166	B	7040 Horizon Dr	Greendale	71	75	37	39	45	47	46	48	38	40	42	43
R167	B	7000 Horizon Dr	Greendale	71	74	37	38	45	47	45	47	38	39	41	42
R168	B	6960 Horizon Dr	Greendale	70	74	37	38	44	46	45	47	37	39	41	42
R169	B	6551 Hill Ridge Dr	Greendale	76	80	41	42	48	51	49	51	43	45	50	50
R170	B	7410 Hill Valley Ct	Greendale	75	79	40	42	48	50	49	51	42	44	48	48
R171	B	7460 Hill Valley Ct	Greendale	76	80	41	42	49	51	49	52	43	45	49	50
R172	B	7485 Hill Valley Ct	Greendale	77	80	42	43	50	52	50	52	44	45	50	50
R173	B	6691 Hill Ridge Dr	Greendale	75	79	41	42	49	51	49	52	42	43	48	48
R174	B	6699 Hill Ridge Dr	Greendale	75	79	41	43	48	50	49	51	42	44	47	48
R175	B	6703 Hill Ridge Dr	Greendale	75	79	42	43	46	48	47	49	42	44	47	48
R176	B	7364 Highview Dr	Greendale	76	79	42	44	43	47	46	48	43	44	48	48
R177	B	6746 Hilldale Ct	Greendale	77	80	43	44	45	49	47	50	43	45	49	49
R178	B	6753 Hilldale Ct	Greendale	77	81	43	45	47	50	49	51	43	45	50	50
R179	B	6728 Hill Park Ct	Greendale	77	81	43	44	51	53	52	54	44	45	51	51
R180	B	6692 Hill Park Ct	Greendale	76	79	42	43	50	52	50	52	43	44	49	49
R181	B	6685 Hillpark Ct	Greendale	76	79	41	43	49	52	50	53	42	44	49	49
R182	B	6689 Hill Park Ct	Greendale	76	80	42	43	49	52	50	52	43	44	49	50
R183	B	6727 Hill Park Ct	Greendale	78	81	43	44	52	55	52	55	44	46	52	52
R184	B	6747 Hill Park Ct	Greendale	79	82	44	46	54	56	54	56	44	46	52	52
R185	B	7481 Highview Dr	Greendale	77	81	44	45	46	48	48	50	44	45	50	50
R186	B	7421 Highview Dr	Greendale	77	80	43	45	44	47	47	49	43	45	49	49
R187	B	7360 Old Loomis Rd	Greendale	76	79	43	45	42	46	46	48	43	44	48	48
R188	B	6700 Hill Ridge Dr	Greendale	75	78	41	42	44	48	46	49	42	43	46	47
R189	B	7279 Horizon Dr	Greendale	74	78	41	42	44	46	45	48	41	43	46	46
R190	B	7071 Hollow Ln	Greendale	72	76	39	41	40	43	43	45	40	41	43	44
R191	B	7163 Horizon Dr	Greendale	72	76	39	40	43	46	44	47	39	41	43	44
R192	B	7133 Horizon Dr	Greendale	72	76	38	40	45	47	46	48	39	40	43	44

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R193	B	6601 Hollyhock Ct	Greendale	72	75	38	40	45	47	45	47	39	40	43	44
R194	B	6641 Hollyhock Ct	Greendale	72	75	38	40	41	43	43	45	39	41	42	43
R195	B	6634 Hollyhock Ct	Greendale	72	75	38	40	40	42	42	44	39	40	42	43
R196	B	6628 Hollyhock Ct	Greendale	71	75	38	39	41	43	43	44	39	40	42	43
R197	B	7005 Heathmeadow Ct	Greendale	71	75	38	39	41	43	43	45	38	39	42	43
R198	B	7009 Horizon Dr	Greendale	71	74	37	39	45	47	46	48	38	39	42	43
R199	B	6939 Horizon Dr	Greendale	70	74	37	38	42	44	43	45	37	39	41	42
R200	B	6827 Horizon Dr	Greendale	70	74	37	38	39	41	41	43	37	38	41	42
R201	B	7412 W Old Loomis Rd	Franklin	77	80	44	46	45	46	47	49	44	45	49	49
R202	B	7432 W Old Loomis Rd	Franklin	77	80	45	47	44	47	47	50	44	46	50	50
R203	B	6776 S 76th St	Franklin	78	82	45	46	48	50	50	52	45	47	51	52
R205	A	6296 Parkview Rd	Greendale	76	80	39	40	45	48	46	48	46	47	50	50
R206	A	6300 Parkview Rd	Greendale	77	80	39	40	46	48	46	49	46	48	50	51
R207	A	8255 Firwood Ln	Greendale	74	77	37	39	44	46	45	47	43	45	47	48
R208	A	8259 Firwood Ln	Greendale	74	77	37	38	44	46	44	47	43	45	46	47
R209	A	8246 Firwood Ln	Greendale	75	78	38	39	44	47	45	48	44	46	48	48
R210	A	8268 Flagstone Ct	Greendale	73	76	36	37	44	46	44	46	42	43	46	46
R211	A	8191 Fairmont Ln	Greendale	72	75	36	37	44	46	44	46	41	42	45	45
R212	A	6305 Parkview Rd	Greendale	78	81	40	41	46	49	47	49	47	49	52	52
R213	A	8256 Fremont Ct	Greendale	74	78	37	39	44	47	45	47	44	45	47	48
R214	A	8238 Firwood Ln	Greendale	76	79	38	40	45	48	46	48	45	47	49	50
R215	A	6321 Parkview Rd	Greendale	76	79	39	41	47	49	48	50	45	46	50	50
R216	A	6335 Parkview Rd	Greendale	73	77	37	39	45	47	46	48	42	44	46	47
R217	A	7616 Parkview Rd	Greendale	72	76	36	38	44	46	45	47	41	42	46	46
R218	A	7714 Overlook Dr	Greendale	72	75	36	38	44	46	45	47	41	42	45	46
R219	A	7720 Overlook Dr	Greendale	73	76	37	38	45	47	45	47	42	43	46	47
R220	A	6328 Parkview Rd	Greendale	74	78	38	39	46	48	47	49	43	45	48	48
R221	A	6326 Parkview Rd	Greendale	75	78	38	40	46	48	47	49	43	45	48	49

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R222	B	6590 Hill Ridge Dr	Greendale	75	78	40	41	47	49	48	50	42	44	47	47
R223	B	6610 Hill Ridge Dr	Greendale	74	78	39	41	46	49	47	49	42	43	46	47
R224	B	7280 Horizon Dr	Greendale	74	78	40	42	47	50	48	50	41	43	46	47
R225	B	7180 Horizon Dr	Greendale	73	76	39	41	45	47	46	48	40	41	44	45
R226	B	7209 Huckleberry Ct	Greendale	73	76	39	41	46	48	47	49	40	41	44	45
R227	B	7243 Huckleberry Ct	Greendale	73	77	39	41	46	49	47	49	40	42	45	45
R228	B	7146 Horizon Dr	Greendale	73	76	39	40	45	48	46	49	40	41	44	45
R229	B	7264 Hyacinth Ct	Greendale	74	77	39	40	46	49	46	50	41	42	45	45
R230	B	7236 Hyacinth Ct	Greendale	73	76	39	40	45	48	46	48	40	41	44	45
R231	B	7020 Horizon Dr	Greendale	71	74	37	39	45	47	46	48	38	39	42	43
R232	B	6980 Horizon Dr	Greendale	71	74	37	38	44	47	45	47	38	39	41	42
R233	B	6940 Horizon Dr	Greendale	70	74	37	38	44	46	45	46	37	39	41	42
R234	B	6920 Horizon Dr	Greendale	70	73	37	38	42	44	43	45	37	39	40	42
R235	B	6820 Horizon Dr	Greendale	70	73	36	38	39	41	41	43	37	38	40	41
R236	B	6541 Hill Ridge Dr	Greendale	77	80	41	42	49	51	49	51	43	46	50	51
R237	B	6561 Hill Ridge Dr	Greendale	76	80	39	42	48	51	49	51	43	45	49	49
R238	B	6581 Hill Ridge Dr	Greendale	75	79	40	42	48	50	48	51	42	44	48	48
R239	B	6625 Hill Ridge Dr	Greendale	75	78	40	41	47	49	48	50	42	43	47	47
R240	B	7430 Hill Valley Ct	Greendale	76	79	41	42	48	51	49	51	43	44	48	49
R241	B	7448 Hill Valley Ct	Greendale	76	79	41	42	48	51	49	51	43	44	49	49
R242	B	7461 Hill Valley Ct	Greendale	77	80	41	43	49	52	50	52	44	45	50	50
R243	B	7401 Hill Valley Ct	Greendale	76	79	41	42	48	51	49	51	42	44	48	49
R244	B	7381 Hill Valley Ct	Greendale	75	79	41	42	48	50	49	51	42	43	48	48
R245	B	6726 Hilldale Ct	Greendale	77	80	42	44	46	50	48	51	43	44	48	49
R246	B	6713 Hilldale Ct	Greendale	76	80	42	44	50	53	51	53	43	45	49	50
R247	B	7480 Highview Dr	Greendale	78	81	44	45	49	51	50	52	44	45	50	50
R248	B	6748 Hill Park Ct	Greendale	78	81	44	45	51	53	51	53	44	46	51	51
R249	B	6711 Hill Park Ct	Greendale	77	80	42	44	51	54	51	54	44	45	51	51

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R250	B	6731 Hill Park Ct	Greendale	78	81	44	45	52	56	53	56	44	46	52	52
R251	B	6743 Hill Park Ct	Greendale	78	82	44	45	53	55	54	56	44	46	52	52
R252	B	7451 Highview Dr	Greendale	77	80	44	45	45	48	48	49	44	45	50	50
R253	B	7391 Highview Dr	Greendale	76	80	43	44	44	46	46	48	43	44	49	49
R254	B	6750 Hill Ridge Dr	Greendale	75	79	42	44	41	45	45	47	42	44	47	47
R255	B	6730 Hill Ridge Dr	Greendale	75	78	42	43	42	46	45	47	42	43	46	47
R256	B	7213 Horizon Dr	Greendale	73	76	40	41	42	45	44	47	40	41	44	45
R257	B	7143 Horizon Dr	Greendale	72	76	38	40	45	49	46	49	39	41	43	44
R258	B	7061 Heathmeadow Ct	Greendale	72	75	38	39	45	48	45	49	39	40	43	44
R259	B	6621 Hollyhock Ct	Greendale	72	75	38	40	42	44	44	46	39	40	43	44
R260	B	6631 Hollyhock Ct	Greendale	72	75	39	40	42	44	43	45	39	40	43	44
R261	B	6616 Hollyhock Ct	Greendale	71	75	38	39	41	43	43	45	39	40	42	43
R262	B	6602 Hollyhock Ct	Greendale	71	75	38	39	42	44	44	45	38	40	42	43
R263	B	6985 Heathmeadow Ct	Greendale	71	75	38	39	40	42	42	44	38	39	42	43
R264	B	6944 Heathmeadow Ct	Greendale	71	74	37	39	39	42	41	43	38	39	41	42
R265	B	7014 Heathmeadow Ct	Greendale	71	74	37	39	43	45	44	46	38	40	42	43
R266	B	7051 Horizon Dr	Greendale	71	75	38	39	44	48	45	48	38	40	42	43
R267	B	6991 Horizon Dr	Greendale	71	74	37	39	44	46	45	47	38	39	41	42
R268	B	6897 Horizon Dr	Greendale	70	74	37	38	41	43	42	44	37	39	41	42
R269	B	6853 Horizon Dr	Greendale	70	74	37	38	40	42	41	43	37	39	41	42
R270	C	S 68th St	Franklin	73	77	41	42	37	41	42	44	40	42	43	44
R271	C	7140 W Rawson Ave	Franklin	71	75	39	41	36	38	41	43	34	36	40	41
R272	E	9059 W Hawthorne Ln	Franklin	73	77	40	42	43	45	45	47	39	40	42	43
R273	C	7106 W Rawson Ave	Franklin	71	75	39	41	36	38	41	43	36	37	41	42
R274	C	7142 W Rawson Ave	Franklin	72	76	38	42	37	39	41	44	35	38	40	41
R275	E	9011 W Meadow Ln	Franklin	72	76	40	41	43	45	44	47	39	40	41	42
R276	E	9059 W Meadow Ln	Franklin	72	76	39	40	42	45	44	46	38	40	41	42
R277	E	8735 W Hawthorne Ct	Franklin	75	79	43	45	44	47	47	49	43	44	44	45

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R278	E	8710 W Hawthorne Ln	Franklin	77	80	45	46	45	47	48	50	44	46	46	46
R279	E	8925 W Meadow Ln	Franklin	73	77	41	42	43	46	45	47	40	41	42	43
R280	E	8735 W Meadow Ln	Franklin	75	79	44	45	45	48	47	49	43	44	44	45
R281	E	8610 W Hawthorne Ln	Franklin	78	82	49	51	48	51	52	54	47	48	45	45
R282	E	8645 W Hawthorne Ln	Franklin	76	80	45	47	46	48	49	51	44	45	44	45
R283	E	8605 W Hawthorne Ln	Franklin	77	80	46	48	44	46	49	50	45	46	44	45
R284	E	8545 W Hawthorne Ln	Franklin	77	80	46	48	43	45	48	50	45	46	44	44
R285	E	8940 W Hawthorne Ln	Franklin	75	78	43	44	45	47	47	49	42	43	43	44
R286	E	9100 W Hawthorne Ln	Franklin	73	76	40	41	42	45	44	46	39	40	41	42
R287	E	9101 W Hawthorne Ln	Franklin	72	76	39	41	42	45	44	46	38	40	41	42
R288	E	8842 W Rawson Ave	Franklin	73	77	41	43	40	42	44	46	40	41	41	42
R289	E	8510 W Hawthorne Ln	Franklin	76	80	43	44	40	42	45	46	44	46	44	44
R290	B	7188 Old Loomis Rd	Greendale	74	77	40	42	42	44	44	46	41	42	45	45
R291	B	7100 Old Loomis Rd	Greendale	73	76	40	41	41	44	44	46	40	41	44	45
R292	E	9011 W Hawthorne Ln	Franklin	74	77	42	43	43	45	46	47	40	42	43	44
R293	E	9029 W Hawthorne Ln	Franklin	73	77	41	42	43	45	45	47	40	41	42	43
R294	E	9030 W Meadow Ln	Franklin	73	77	42	42	43	45	45	47	39	41	42	43
R295	E	8810 W Meadow Ln	Franklin	75	78	43	44	44	47	47	49	42	43	43	44
R296	E	8716 W Meadow Ln	Franklin	76	79	44	45	45	47	47	49	43	44	44	45
R297	E	8730 W Hawthorne Ct	Franklin	77	80	44	46	46	48	48	50	44	45	46	46
R298	E	8845 W Meadow Ln	Franklin	74	78	41	43	44	46	46	48	41	42	43	44
R299	E	8715 W Meadow Ln	Franklin	76	80	45	46	46	48	48	50	44	45	45	46
R300	E	8570 W Hawthorne Ln	Franklin	78	81	48	50	45	47	50	52	46	47	44	44
R301	E	8550 W Hawthorne Ln	Franklin	77	81	47	50	44	46	49	51	46	47	44	45
R302	E	8625 W Hawthorne Ln	Franklin	77	80	46	48	46	49	49	51	45	46	44	45
R303	E	8525 W Hawthorne Ln	Franklin	76	80	45	47	40	43	47	49	44	45	44	44
R304	E	8980 W Hawthorne Ln	Franklin	75	78	42	44	44	47	46	49	42	43	43	44
R305	E	8732 W Rawson Ave	Franklin	74	78	42	44	41	43	45	46	41	42	42	43

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R306	E	9010 W Meadow Ln	Franklin	73	77	42	43	43	46	46	47	40	41	42	43
R307	E	6928 S 90th St	Franklin	74	78	42	44	44	46	46	48	41	42	43	44
R308	E	8750 W Hawthorne Ct	Franklin	76	79	43	45	45	48	47	50	43	44	45	45
R309	E	8650 W Hawthorne Ln	Franklin	77	81	46	47	46	48	49	50	45	46	46	47
R310	E	8755 W Meadow Ln	Franklin	75	78	42	44	45	47	47	49	42	43	43	44
R311	E	8640 W Hawthorne Ln	Franklin	77	81	47	48	46	48	49	51	46	47	46	47
R312	E	8530 W Hawthorne Ln	Franklin	77	80	46	49	41	43	48	50	45	46	44	45
R313	E	7028 S 92nd St	Franklin	71	75	38	40	42	44	43	46	37	39	40	41
R314	E	7050 S 92nd St	Franklin	71	75	38	39	41	44	43	45	37	39	40	41
R317	D	8731 W Rawson Ave	Franklin	73	77	42	43	37	40	43	45	40	42	42	43
R318	D	7222 S Woelfel Rd	Franklin	69	73	37	38	33	35	38	40	35	37	39	40
R319	D	7210 S Woelfel Rd	Franklin	69	73	37	39	33	36	39	40	36	37	39	40
R320	C	7308 S 77th St	Franklin	71	75	41	43	36	38	42	44	35	37	38	39
R321	C	7308 S 77th St	Franklin	71	74	41	42	34	37	42	43	35	37	38	39
R322	C	7308 S 77th St	Franklin	70	74	40	42	34	36	41	43	35	37	38	39
R323	C	7308 S 77th St	Franklin	70	74	40	41	33	36	41	42	35	37	38	39
R324	C	7308 S 77th St	Franklin	70	73	39	40	33	36	40	42	35	37	38	39
R325	C	7713 W Terrace Dr	Franklin	71	75	41	43	35	37	42	44	36	37	38	39
R326	C	7713 W Terrace Dr	Franklin	71	75	42	43	35	38	43	44	36	37	38	39
R327	C	7713 W Terrace Dr	Franklin	70	74	40	41	34	36	41	42	36	38	39	39
R328	C	7713 W Terrace Dr	Franklin	71	74	41	42	34	36	42	43	37	38	39	39
R329	C	7713 W Terrace Dr	Franklin	71	74	41	42	34	37	42	43	36	38	39	39
R330	C	7713 W Terrace Dr	Franklin	71	74	41	42	34	36	42	43	39	40	39	39
R331	C	7713 W Terrace Dr	Franklin	71	75	41	42	35	37	42	43	37	39	39	39
R332	C	7713 W Terrace Dr	Franklin	71	75	42	43	35	37	43	44	39	40	39	39
R333	C	7713 W Terrace Dr	Franklin	71	74	42	44	34	36	43	44	38	40	39	40
R334	C	7713 W Terrace Dr	Franklin	72	75	43	45	35	37	44	45	39	40	39	40
R335	C	7713 W Terrace Dr	Franklin	71	75	43	45	35	38	44	45	39	40	39	40

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R336	C	7713 W Terrace Dr	Franklin	71	75	43	44	34	37	43	45	39	40	39	40
R337	C	7713 W Terrace Dr	Franklin	70	74	40	41	33	36	41	42	36	38	38	39
R338	C	7713 W Terrace Dr	Franklin	70	73	40	41	33	35	41	42	38	39	38	39
R339	C	7713 W Terrace Dr	Franklin	70	74	40	41	33	36	41	42	38	39	38	39
R340	C	7713 W Terrace Dr	Franklin	70	74	41	43	33	36	42	43	38	39	38	39
R341	C	7713 W Terrace Dr	Franklin	70	73	41	42	33	35	42	43	38	39	38	39
R342	C	7713 W Terrace Dr	Franklin	70	74	41	43	33	36	42	44	38	39	39	39
R343	C	7713 W Terrace Dr	Franklin	70	73	41	43	33	35	42	43	38	39	38	39
R344	C	7713 W Terrace Dr	Franklin	70	74	42	43	33	36	42	44	38	40	38	39
R345	C	7713 W Terrace Dr	Franklin	70	74	42	43	33	36	42	44	38	39	38	40
R346	C	7341 S 76th St	Franklin	71	75	41	42	34	37	42	43	36	37	39	41
R347	C	7365 S 76th St	Franklin	70	74	40	41	34	37	41	43	34	37	36	40
R348	C	7388 Carter Cir	Franklin	70	74	40	42	34	36	41	43	35	37	38	39
R349	C	7468 Carter Cir	Franklin	70	74	39	41	34	36	41	42	34	38	37	39
R350	C	7618 W Terrace Dr	Franklin	71	75	42	44	36	38	43	45	36	39	37	38
R351	C	7618 W Terrace Dr	Franklin	71	75	42	43	37	39	43	44	36	37	39	40
R352	C	7714 W Terrace Dr	Franklin	72	75	42	43	36	38	43	45	36	37	38	38
R353	C	7714 W Terrace Dr	Franklin	72	76	43	44	36	38	43	45	36	38	38	39
R354	C	7101 S Beachwood Ct	Franklin	70	74	39	41	35	37	41	42	36	38	40	40
R355	D	7102 S Woelfel Rd	Franklin	72	76	40	42	37	40	42	44	38	40	41	42
R356	D	7170 S Woelfel Rd	Franklin	70	74	38	39	34	36	39	41	36	38	39	40
R357	C	7389 Carter Cir	Franklin	71	74	41	43	34	37	42	44	37	38	39	39
R358	B	7200 Old Loomis Rd	Greendale	75	78	41	42	43	45	45	47	41	43	45	46
R359	B	7144 Old Loomis Rd	Greendale	73	77	40	41	41	44	43	46	41	42	44	45
R360	E	7008 S 92nd St	Franklin	71	75	38	40	42	44	43	46	38	39	40	41
R361	E	8630 W Hawthorne Ln	Franklin	78	81	48	50	47	49	51	53	46	47	45	46
R362	E	9010 W Hawthorne Ln	Franklin	74	78	41	43	44	46	46	48	41	42	43	44
R363	E	9020 W Hawthorne Ln	Franklin	74	77	41	42	43	46	45	47	40	41	42	43

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R364	E	6974 S 92nd St	Franklin	72	76	39	41	42	44	44	46	38	39	41	42
R366	D	8601 W Rawson Ave	Franklin	74	78	43	44	38	40	44	46	42	43	43	43
R367	D	8631 W Rawson Ave	Franklin	74	77	43	44	37	40	44	45	41	42	42	43
R368	D	8701 W Rawson Ave	Franklin	74	77	42	44	37	40	44	45	41	42	42	43
R369	D	7160 S Woelfel Rd	Franklin	70	74	38	40	34	37	40	41	37	38	40	41
R371	C	7516 Carter Cir	Franklin	70	74	40	41	34	37	41	42	35	38	37	38
R372	C	S 68th St	Franklin	73	76	40	41	38	40	42	43	40	41	43	43
R373	A	8260 Fremont Ct	Greendale	74	77	37	39	44	47	45	47	43	44	47	47
R374	A	8262 Fremont Ct	Greendale	74	77	37	38	44	46	45	47	42	44	46	47
R375	B	6721 Hill Park Ct	Greendale	77	81	43	44	51	54	52	55	44	45	52	52
R376	C	7128 W Rawson Ave	Franklin	71	75	39	41	36	38	41	43	35	38	40	41
R377	B	7520 W Old Loomis Rd	Franklin	78	82	46	48	45	48	49	51	45	47	51	51
R378	D	8998 W Stone Hedge Dr	Franklin	71	75	39	41	35	37	41	42	38	39	40	41
R379	D	7125 S Cambridge Dr	Franklin	73	76	41	42	36	39	42	44	40	41	41	42
R380	D	7106 S Cambridge Dr	Franklin	73	77	42	43	36	39	43	44	40	41	42	43
R381	D	7118 S Cambridge Dr	Franklin	73	77	42	43	37	39	43	45	40	42	42	43
R382	D	7176 S Cambridge Dr	Franklin	72	75	41	42	34	37	41	43	38	40	40	42
R383	D	7273 S Cambridge Dr	Franklin	69	73	38	39	32	35	39	40	36	37	39	40
R384	D	7231 S Cambridge Dr	Franklin	70	74	38	39	33	36	39	41	37	38	39	40
R385	D	7251 S Stone Hedge Dr	Franklin	71	75	40	41	33	35	41	42	38	39	40	41
R386	D	7269 S Stone Hedge Dr	Franklin	71	74	40	41	32	35	41	42	38	39	40	41
R387	D	7337 S Stone Hedge Dr	Franklin	70	74	40	42	32	35	40	42	37	39	39	40
R388	D	8760 W Callaway Ct	Franklin	70	74	40	42	32	34	41	43	37	38	38	39
R389	D	8879 W Callaway Ct	Franklin	70	74	38	40	31	34	39	41	37	38	39	40
R390	D	7444 S Stone Hedge Dr	Franklin	69	73	38	39	31	34	38	40	35	37	37	38
R391	D	7358 S Stone Hedge Dr	Franklin	70	74	39	40	32	35	40	41	37	38	38	39
R392	D	7120 S Woelfel Rd	Franklin	72	75	40	41	36	39	41	43	38	39	40	41
R393	D	7140 S Woelfel Rd	Franklin	71	75	39	40	35	38	41	42	37	39	40	41

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R394	C	7713 W Terrace Dr	Franklin	71	75	42	43	35	38	43	44	37	38	38	39
R395	C	7552 Carter Cir	Franklin	70	74	41	42	34	37	42	43	35	37	38	39
R396	C	7141 W Rawson Ave	Franklin	70	74	39	40	35	37	41	42	36	37	40	41
R397	C	7161 W Rawson Ave	Franklin	71	74	39	41	35	37	41	42	36	37	40	41
R398	C	7161 W Rawson Ave	Franklin	71	74	40	41	35	38	41	43	36	37	40	41
R399	D	7141 S Cambridge Dr	Franklin	72	76	41	42	36	38	42	43	39	40	41	42
R400	D	7234 S Cambridge Dr	Franklin	70	74	39	40	33	35	40	41	37	39	40	41
R401	D	7268 S Cambridge Dr	Franklin	70	74	38	40	32	35	39	41	37	38	39	40
R402	D	7380 S Cambridge Dr	Franklin	69	72	37	39	30	33	38	40	36	37	38	39
R403	D	7217 S Stone Hedge Dr	Franklin	71	74	39	40	32	35	40	42	37	39	40	41
R404	D	8826 W Callaway Ct	Franklin	70	74	39	40	32	34	40	41	37	39	39	40
R405	D	8854 W Callaway Ct	Franklin	70	74	39	40	32	34	40	41	37	38	39	40
R406	D	8785 W Callaway Ct	Franklin	69	73	38	40	31	34	39	41	36	37	38	40
R407	D	7401 S Stone Hedge Dr	Franklin	69	73	39	40	31	34	40	41	36	38	38	39
R408	D	7380 S Stone Hedge Dr	Franklin	70	74	39	40	32	34	39	41	36	38	38	39
R409	D	7340 S Stone Hedge Dr	Franklin	70	74	40	41	32	35	40	42	37	39	38	39
R410	D	7178 S Karrington Dr	Franklin	72	76	41	43	34	36	42	44	39	41	40	41
R411	D	7145 S Karrington Dr	Franklin	73	77	43	44	35	38	43	45	40	42	41	42
R412	D	7189 S Karrington Dr	Franklin	72	76	42	43	34	37	42	44	39	41	41	42
R413	C	7532 Carter Cir	Franklin	70	74	40	41	34	37	41	43	35	36	37	38
R414	D	8982 W Stone Hedge Dr	Franklin	71	75	40	41	34	37	41	42	38	39	40	41
R415	D	7158 S Cambridge Dr	Franklin	72	76	41	42	35	37	42	43	39	41	41	42
R416	D	7342 S Cambridge Dr	Franklin	69	73	38	39	31	33	38	40	36	37	39	40
R417	D	7374 S Cambridge Dr	Franklin	69	73	37	39	31	33	38	40	36	37	38	39
R418	D	7315 S Stone Hedge Dr	Franklin	71	74	40	42	32	35	41	42	37	39	39	40
R419	D	8708 W Calloway Ct	Franklin	70	74	39	41	32	34	40	42	37	38	38	39
R420	D	7419 S Stone Hedge Dr	Franklin	69	73	38	39	31	34	39	40	36	37	38	39
R421	D	7412 S Stone Hedge Dr	Franklin	70	73	38	40	31	34	39	41	36	38	38	39

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
R422	D	7282 S Stone Hedge Dr	Franklin	71	75	41	42	33	36	41	43	38	40	39	40
R423	D	7200 S Karrington Dr	Franklin	72	76	41	42	34	36	42	43	39	40	40	41
R424	D	7167 S Karrington Dr	Franklin	73	76	42	43	34	37	43	44	40	41	41	42
R425	D	7228 S Stone Hedge Dr	Franklin	71	75	40	42	33	36	41	43	38	40	40	41
R426	C	7401 Carter Cir	Franklin	71	74	41	43	34	36	42	44	37	39	39	40
R427	C	S 68th St	Franklin	74	78	42	44	39	43	44	46	40	43	45	46
R428	C	S 68th St	Franklin	73	76	40	41	38	39	42	43	40	41	43	44
R429	C	S 68th St	Franklin	72	75	39	41	38	40	41	43	39	41	42	43
R430	C	S 68th St	Franklin	74	77	42	43	38	42	43	45	41	42	44	45
R431	C	S 68th St	Franklin	74	77	41	43	39	41	44	45	41	42	44	45
R432	D	7163 S Cambridge Dr	Franklin	72	75	37	41	35	38	39	43	35	40	40	42
R433	D	7130 S Cambridge Dr	Franklin	73	77	42	43	35	38	43	44	40	41	41	43
R434	D	7194 S Cambridge Dr	Franklin	71	75	40	41	34	36	41	42	38	39	40	41
R435	D	7360 S Cambridge Dr	Franklin	69	73	37	39	31	33	38	40	36	37	38	40
R436	D	7311 S Cambridge Dr	Franklin	69	72	37	38	31	34	38	39	35	37	38	39
R437	D	7295 S Cambridge Dr	Franklin	69	73	37	38	32	34	38	40	36	37	38	40
R438	D	7259 S Cambridge Dr	Franklin	70	74	38	39	33	35	39	41	36	38	39	40
R439	D	7219 S Cambridge Dr	Franklin	70	74	39	40	34	36	40	41	37	38	40	41
R440	D	7233 S Stone Hedge Dr	Franklin	71	74	40	41	32	35	40	42	38	39	40	41
R441	D	8796 W Callaway Ct	Franklin	70	74	39	40	32	34	40	41	37	38	39	40
R442	D	8843 W Callaway Ct	Franklin	70	73	38	39	31	34	39	40	36	38	39	40
R443	D	8811 W Callaway Ct	Franklin	69	73	38	39	31	34	39	40	36	38	39	40
R444	D	8747 W Callaway Ct	Franklin	69	73	39	40	31	33	39	41	36	37	38	39
R445	D	7426 S Stone Hedge Dr	Franklin	69	73	38	39	31	34	39	40	36	37	37	38
R446	D	7324 S Stone Hedge Dr	Franklin	71	74	41	42	33	35	41	43	37	39	39	40
R447	D	7306 S Stone Hedge Dr	Franklin	71	75	42	43	33	35	42	44	38	39	39	40
R448	D	7260 S Stone Hedge Dr	Franklin	71	75	41	42	33	36	42	43	38	40	40	41
R449	D	7211 S Karrington Dr	Franklin	72	75	41	42	34	36	42	43	39	40	40	42

NAME	NEIGHBOR-HOOD	ADDRESS	MUNICIP-ALITY	FIREWORKS		BASEBALL		CONCERT		CONCERT+ BASEBALL		SNOWMAKING		HILLS HAVE EYES	
				1.5 m	4 m	1.5 m	4 m	1.5 m	4 m	1.5 m	4m	1.5 m	4 m	1.5 m	4 m
Neighborhood (See Report Figure 2)				**Worst-Case Modeled Exposure Levels by Neighborhood**											
Neighborhood A			Greendale	78	81	40	41	47	49	48	50	47	49	52	52
Neighborhood B			Greendale	79	82	46	48	54	56	54	56	45	47	52	52
Neighborhood C			Franklin	74	78	43	45	39	43	44	46	41	43	45	46
Neighborhood D			Franklin	74	78	43	44	38	40	44	46	42	43	43	43
Neighborhood E			Franklin	78	82	49	51	48	51	52	54	47	48	46	47

APPENDIX J. REVIEW OF RELEVANT ORDINANCES AND RECOMMENDATIONS

May 2, 2023

To: RSG

From: Attorney Dennis M. Grzezinski

Review of relevant ordinances and recommendations regarding Franklin ordinance/enforcement

Brief summary of the relevant monitoring results

RSG's sound monitoring study has documented various activities at the ROC which are clearly capable, as a result of their volume and nature, to annoy, irritate, and disrupt the quiet enjoyment, and disturb the sleep, of residents in Franklin and Greendale neighborhoods adjacent to the ROC -- during both daytime and nighttime hours Some of the activities have produced noise that is clearly audible as far as two miles away The monitoring was restricted by the operator's lack of cooperation with RSG

RSG's Tables summarize documented exceedances of the limits in the current Franklin and Greendale noise ordinances by the **average** sound levels produced by the following activities at the ROC· **Fireworks** have produced noise exceeding both communities' ordinance limits in all relevant neighborhoods. **Umbrella bar concerts** exceed the Franklin limits in Neighborhood B and the Greendale limits in Neighborhoods B and E ANSI standards to protect against harm from low-frequency noises are exceeded by the **Fireworks** in all relevant neighborhoods and by the **Concerts** in Neighborhood E If the average sound levels of these activities exceed these limits and standards, the louder portions of these events or activities would exceed them by even more In addition, while other activities conducted at the ROC may not have on average exceeded the limits, the louder portions of them are likely to have exceeded the limits

In discussing noise, the Development Agreement for the ROC refers to "compliance" and to "violations," but contains no definitions or specified limits on noise It does state that a violation is required to be corrected and remediated within 30 minutes

The Noise and Light Addendum, Exhibit C to the Agreement, states:

> As further mitigation, the operator will install a dedicated sound system to ensure that the sound at the Umbrella Bar is directional controlled to minimize the spillover effect beyond the property boundary

Neighbors have complained that speakers at Franklin Field have directed sound out of the ROC property and towards surrounding residential areas, and photographs confirm this It is not clear what steps the City or the County have taken to ensure that this provision of the Development Agreement has been complied with The City of Franklin's practice with regard to noise from the ROC has been to refer to the general Franklin noise ordinance for determining noise limits, although as noted below, there are additional ordinance provisions that are relevant

The current Franklin noise ordinance, at Section 183-41, prohibits noises between 70 to 79 dBA as measured at the real property boundary (or 50 feet from the noise source) Variances can be issued to permit single events that may create noise from 80 to 89 dB The ordinance does not require

noises louder than the defined 70 dBA limit to be continuous or to persist for any particular length of time in order to constitute a violation However, **until recently, the practice of the City has been to treat noise in excess of the limits in the ordinance as a violation only if the noise level continuously exceeds those limits for 30 minutes or more, and apparently only when it exceeded 79 dBA** Thus, a musical concert could consist of a series of songs that are consistently loader than the limits, and the concert could go on for an hour or two, and not be treated as a violation, if there was even a short break between one song and the next, or a relatively quiet period within a song Only a continuous exceedance of the noise level limit for 30 minutes or more was treated as a violation **There is and was no basis in the language in the Development Agreement or in the ordinance for this practice.** It had to a large extent left noise producing activities at the ROC virtually unregulated and resulted in a significant number of complaints to City and to County officials. Franklin staff currently responsible for noise enforcement informed us that this practice is no longer in use, and that any exceedance of the noise limits is now considered as a violation, without needing to persist for any particular length of time In addition, it is important that City personnel recognize that the ordinance declares 70 dBA, not 79 dBA as defining when noise is excessive and prohibited

However, the East and West noise monitors at ROC were inoperative during the RSG sound study, and apparently have been so for a long time, perhaps approaching a year. As a result of the lack of cooperation from the operator, there is no information as to why this has been so More recently, the East and West monitors were apparently once again made operational but were not downloading their results to be accessed by City staff It is incumbent upon the operator to maintain all three required monitors in proper operation including downloading, as well as to keep them properly calibrated, and upon the City of Franklin and/or Milwaukee County to take steps to assure that this is consistently accomplished

In addition, section 178-1 of the Franklin ordinances also prohibits public nuisances, defined as acts or conditions that "substantially annoy, injure or endanger the comfort, health, repose or safety of the public It does not appear that this ordinance has been applied by the City to evaluate noise produced at the ROC, although excessive noise is recognized in Wisconsin as a potential cause of a public nuisance

The Greendale noise ordinance is also relevant, not because it directly regulates noise coming from ROC -- but because **it bears on the issue of whether relatively uncontrolled noise from** ROC **constitutes a nuisance to residents of nearby Greendale neighborhoods.** It is clear from Wisconsin court cases that noisy activities, even those that comply with local noise ordinances, may nevertheless constitute public or private nuisances and result in injunctions and liability for damages See *State v H Samuels Co , Inc ,* 211 N W 2d 417, 60 Wis 2d 631 (Wis 1973), *Barhian v Lindner Bros Trucking Co , Inc ,* 106 Wis 2d 291, 316 N W 2d 371 (Wis 1982), and *Town of Trempealeau v Klein,* 365 Wis 2d 195, 870 N W 2d 247 (Wis App 2015)

The Greendale ordinance is summarized in Table 1 of RSG's Report It provides limits on noises that vary depending on the nature of the receiving district, the nature of the noise (whether continuous, impulsive, intermittent, or perpetual), and whether daytime or nighttime. Each of those characteristics correspond well to the extent to which noise tends to annoy or interfere with public comfort and repose. And providing limits on the level of allowed noise that vary depending on those characteristics is both sensible and a fairly common approach.

As RSG's report notes, humans find unwanted noise in the form of speech or music to be particularly distracting and irritating. As a result, it is not unusual to further restrict noise that contains music or speech by reducing the dB limits (by 5 dB, for example) Similarly, low frequency sounds, such as base notes, travel farther, can more readily penetrate into buildings, and can be more irritating or annoying than higher frequency sounds

The City of Milwaukee's noise ordinance, at Section 80-64 1, establishes noise level limits that vary depending on the type of district and for daytime and nighttime The methods and procedures for documenting noise levels, set forth in Section 80-65, are quite complex, but an alternative method for documenting excessive sounds from devices and speakers is of the "plainly audible" type, measured by whether the noise/music can be heard more than 50 feet from the offending property. Section 80-65.4.b-3. This plainly audible type of determining a noise violation has the advantage of being easily determined— by the affected resident who is disturbed or annoyed, by a police officer or other municipal employee — using only their ears, without the need for special training and the use of complicated measuring devices. The relevant portion of Section 80-65 4 reads as follows: "b Boisterous and Unreasonably Loud Noise. The following are examples, without limitation due to enumeration, of human and mechanically-created noises which are impractical to measure and which may be deemed nuisances in violation of this subsection . . . b-3 Distance of greater than 50 feet. The operation of any radio, television, musical instrument, compact disc or tape player, phonograph or other machine or device in a manner that tends to disturb the peace, quiet and comfort of the neighboring occupants at a distance of greater than 50 feet from the site, building, structure or vehicle where the machine or device is located "

Recommendations for improved regulation

While prohibiting activities that result in noise levels between 70 and 79 dBA at the property line, the current Franklin ordinance does not specify how to measure the sound level: as an average over some period of time (L_{eq}), as a maximum level (L_{max}), as a Daytime/Nighttime average (DNL), or using some other method. (The Greendale noise limitations, as mentioned above, respond well to achieving the usual municipal goal of preventing activities that are likely to result in a public nuisance.) If the Franklin ordinance prohibition on activities that produce noise levels at or above 70 dBA is measured using the L_{max} measurement, rather than the average noise level over a longer period, the results would be reasonably consistent with the Greendale ordinance average levels. This approach to enforcement is also consistent with the apparent intent derived from the specific language of the Franklin ordinance, **which does not allow activities that result in noise levels exceeding 70 dBA** (except for individually permitted special events)

1. Accordingly, it is proper and consistent with the language of the ordinance to treat activities that result in noise levels over 70 dBA L_{max} as violations.

2. The City or Franklin should consider adding to its noise ordinance a 5 dB "penalty" for amplified sounds consisting largely of speech or music, which is more noticeable, irritating, and annoying to human beings, and is more disruptive to residents' quiet enjoyment of life in their neighborhoods. This would lower the maximum noise limitation to 65 dBA L_{max} for such activities, and significantly reduce the likelihood that activities at the ROC would result in a public nuisance.

3.. A 5 dBA penalty could also be considered for nighttime activities, perhaps from 10 PM to 8 AM (like that in Greendale's ordinance)

4. The City of Franklin could consider adopting an alternative "clearly audible" enforcement standard (like that in Section 80-65 4 b-3 of Milwaukee's Code)

Enforcement of existing requirements and suggested improvements

Compliance by the operator with the provision of the Noise and Light Addendum requiring installation of a directed sound system at the Umbrella Bar should be required. Having speakers permanently configured to direct sound into the immediate audience area, and not towards nearby residential neighborhoods, should reduce complaints and also allow reduced noise volumes —saving energy and costs to the operator In the absence of a permanently directed system, appropriate monitoring equipment, and potentially sound modeling as well, will be needed to enable the sound there to be assessed and controlled to keep offsite volumes within allowed limits

Relocating and/or reconfiguring speakers at the ball stadium, to direct amplified sounds down and towards the audience rather than outward toward neighboring residents, would also be likely to improve attendees' enjoyment while reducing the operator's energy costs and reducing neighborhood complaints This should be encouraged and could be required of the operator as a condition if a permit is sought to use the stadium for a special event in the future

The operator should be required to maintain the 3 monitoring systems in full operating condition, as well as calibrating and recalibrating them in accordance with their manufacturers' standards, and the operator should be required to submit timely proof of doing so

Monitoring and enforcement of the requirements of the noise ordinance requires clear, transparent assignment of responsibility to the appropriate City personnel along with necessary monitoring devices, sufficient training or other resources needed to provide for accountability to the operator, to the City, and to residents of nearby neighborhoods Having the monitoring data available online could also provide greater transparency to the public

Permitting of special events, such as fireworks and The Hill Has Eyes, involves additional considerations. A general approach of requiring the operator to take reasonable steps to reduce the impact of extra-loud activities should be followed, in order to reduce the likelihood of excessive sound leaving the property and causing a public nuisance. Thus, the number of days (and especially nights) that neighbors are subjected to such events should be limited, and such events need to be limited in how late they can be open, in order to provide neighbors undisturbed sleep— perhaps generally ending by 10 PM Extremely disruptive activities, such as helicopter flights, might not be permitted at all, and some activities could be required to be indoors, inside tents, or behind or within noise barriers