Rock Sports Complex Sound Study

Presentation to Milwaukee County
Committee on Audit

September 13, 2023

Presented by: Dana Lodico

RSG

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EXAMPLE OF LONG-TERM UNATTENDED SOUND MONITORING SETUP

The Project Team

RSG
the science of insight

Bowlby & Associates, Inc.

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Environmental Law and Civil Litigation

BethFoy
& ASSOCIATES

Introduction
Purpose of the Sound Study

- Document sound levels generated by ROC activities
- Compare the ROC event levels with background sound levels and noise limits
- Make recommendations
- Develop sound thresholds

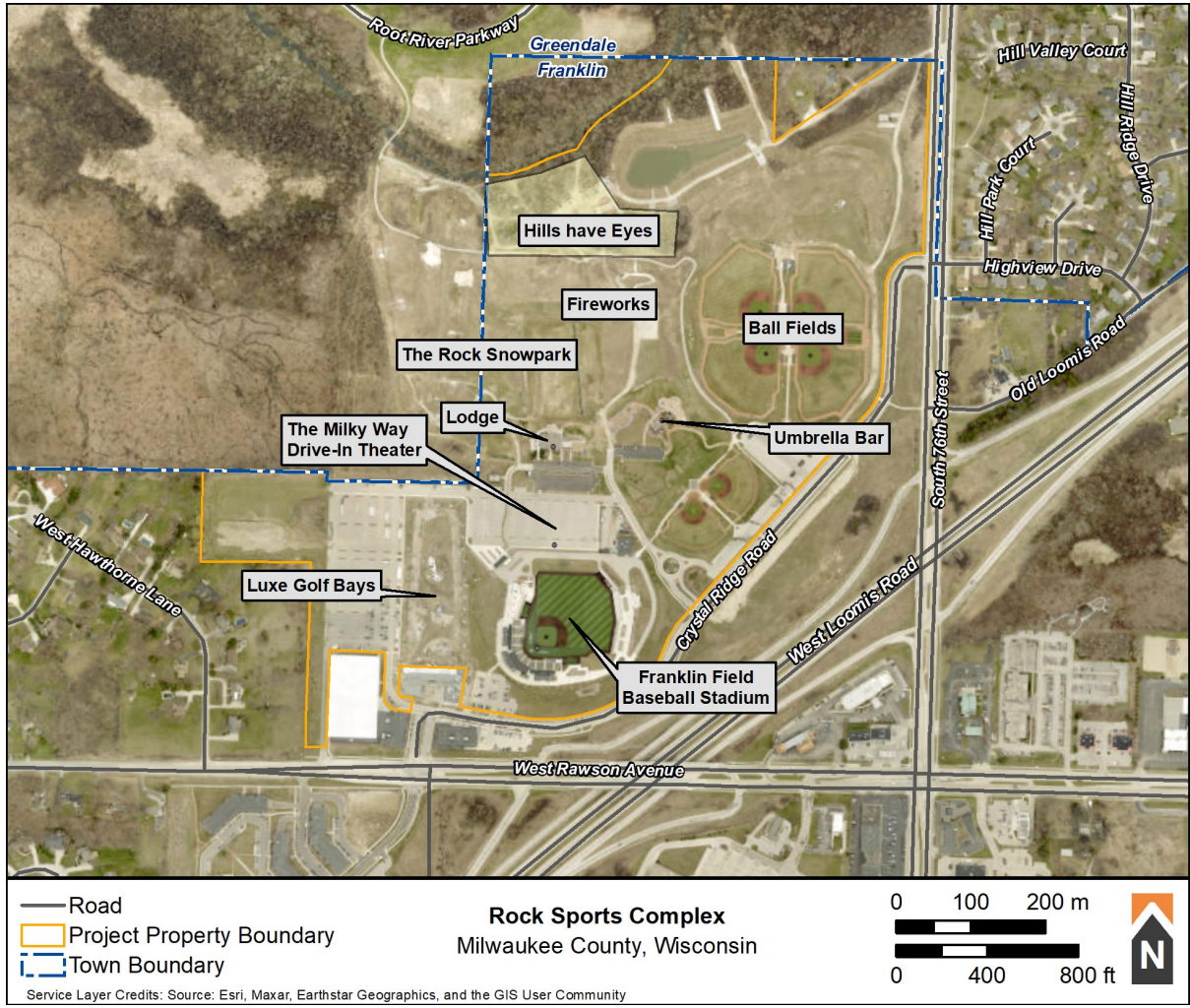
**The ROC did not cooperate with RSG or County staff requests for collaboration on the Sound Study and did not grant permission for RSG to make sound measurements on ROC property. Budget from items that could not be completed due to lack of ROC cooperation was reallocated to a review of the ROC compliance monitor data and locations, low frequency sound analysis, and review of event data with respect to background levels and time-of-day / day-of-week. (See Rock Sports Complex – Sound Study Workplan, dated October 24, 2022)*

Study Overview
Sound-Generating Activities

The ROC included the following sound-generating activities:

- Milwaukee Milkmen baseball games at Franklin Field
- Live amplified music at the Umbrella Bar
- Fireworks (Helicopter Candy Drop)
- The Hills Have Eyes Halloween event
- Snowmaking at the Rock Snowpark
- Luxe Golf facility opened in August 2022

Drive-in movies at the Milky Way Drive-In Theater, indoor corporate events at the Lodge, and recreational baseball at the ball fields did not substantially contribute to the sound environment in the residential areas.



Study Overview
Measurement Procedures

- Long-term continuous unattended sound monitoring
  - To assess diurnal sound levels occurring during periods with and without ROC events
  - 6-months of monitoring at 3 locations
  - 1-second sound level data, audio, and meteorological data
- Attended sound monitoring during 6 events
  - To quantify sound levels generated by individual activities
- Equipment
  - ANSI/IEC Class 1 sound level meters
  - Digital recordings
  - Meteorological data (wind, temperature, humidity)
- Data processing

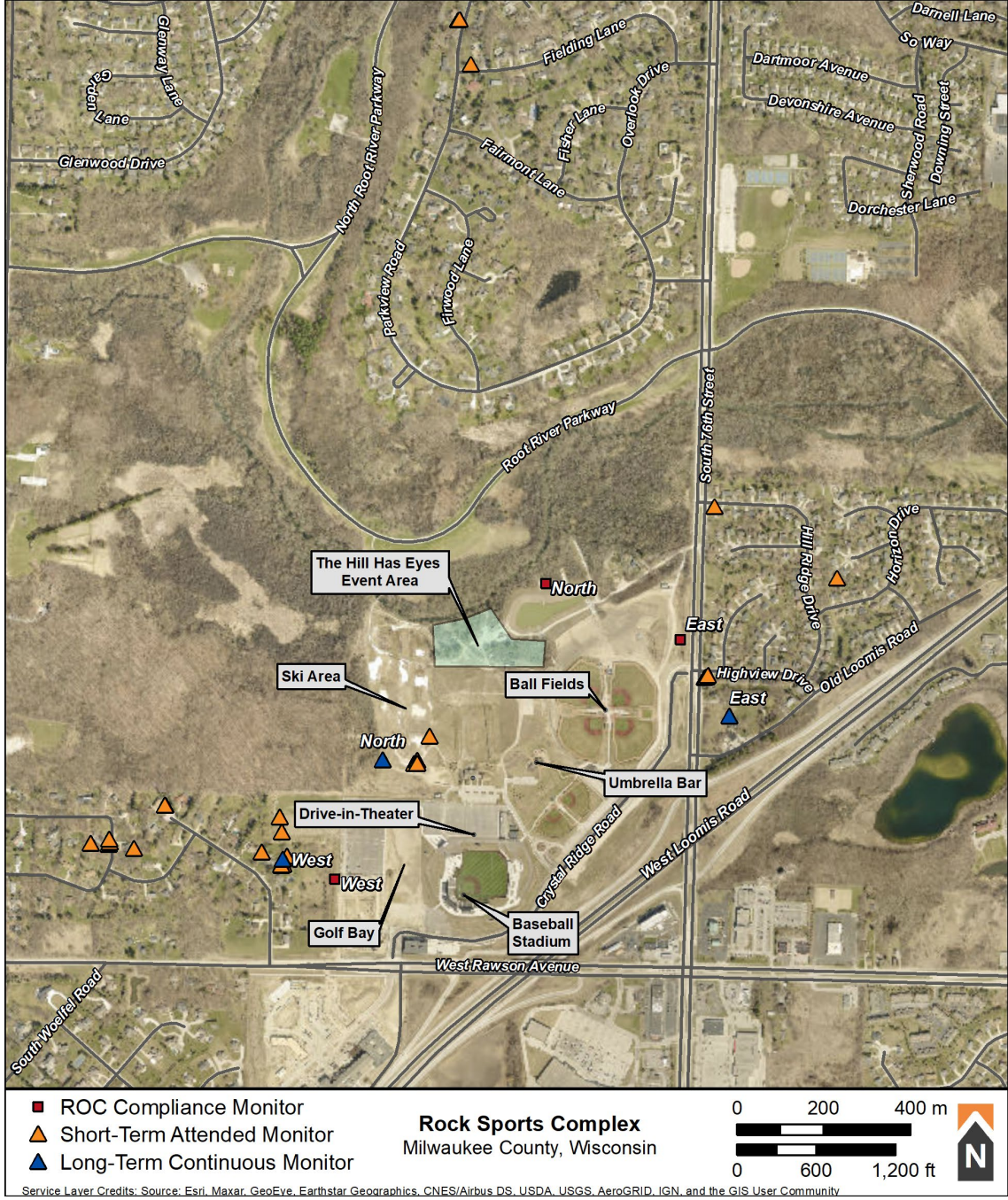

WEST MONITOR LOCATION

Study Overview
Measurement Locations

RSG Monitoring Locations

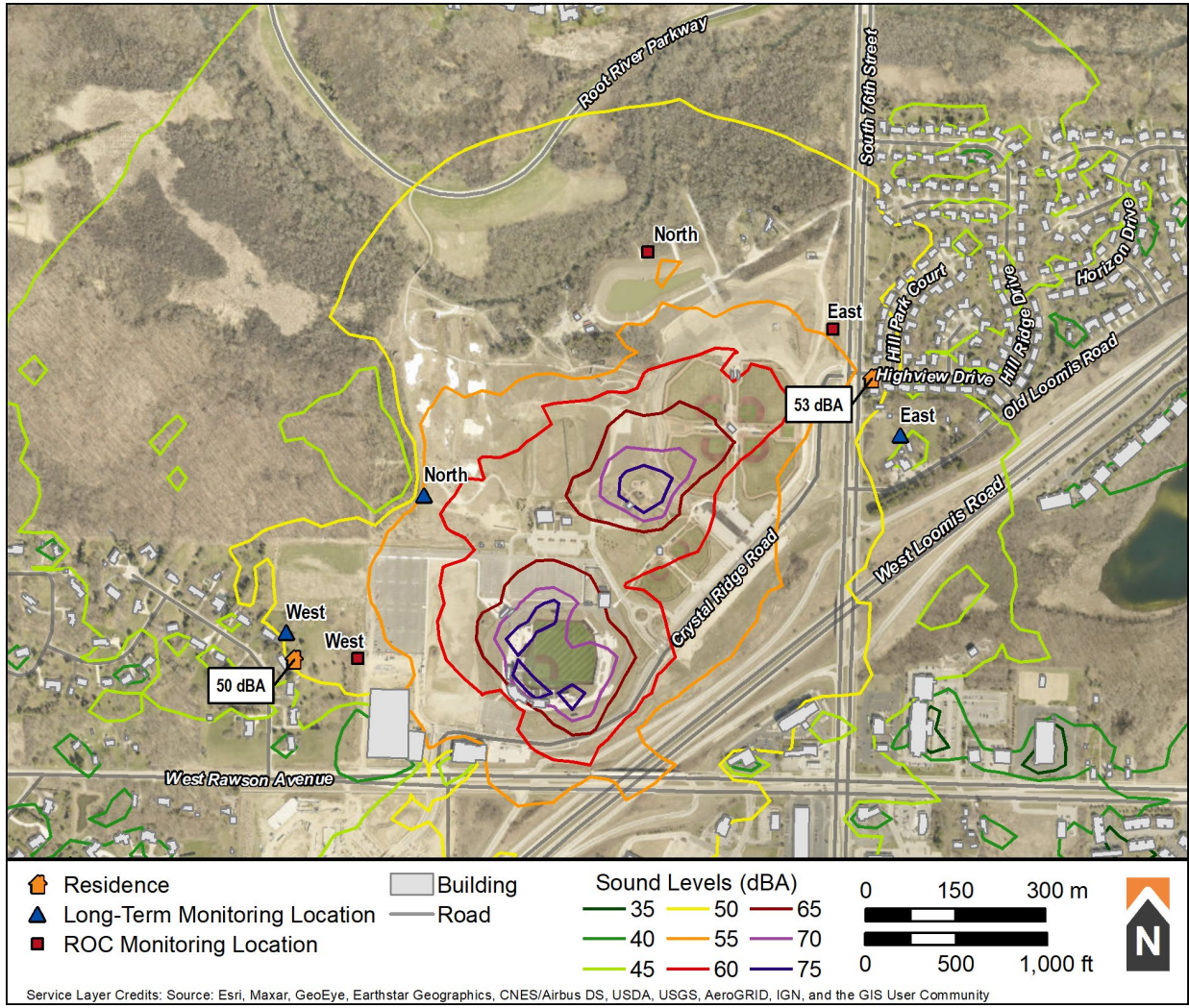
- North Monitor – to capture direct noise from Franklin Field and Umbrella Bar and validate sound modeling
- East Monitor – representative of H Section Neighborhood
- West Monitor – representative of Hawthorn Neighborhood
- Attended monitoring at additional locations (3-7 select locations during each event)
- 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.

Study also included assessment of existing ROC Compliance Monitor locations and data appropriateness



Study Overview
Sound Propagation Modeling

- 3-dimensional acoustic model (CadnaA software)
- Seven scenarios:
    1. Existing daytime background traffic noise
    2. Milwaukee Milkmen baseball game at Franklin Field
    3. Live music from a band at the Umbrella Bar
    4. Baseball game concurrent with a live band
    5. Fireworks
    6. The Hills Have Eyes event
    7. Snowmaking
- Validated using North Monitor data
- Visually depicts propagation of ROC event sound in surrounding areas surrounding the site
- Sound levels for each residence (ground & upper floors)
- Used to adjust the long-term monitoring data for use in identifying noise limit exceedances



Study Overview
Other Study Components

- Public Outreach
  - Public meeting on August 29, 2022
  - Review of Public Comments from meeting
  - Discussions with community members
- Review of existing sound limits and standards
- ROC compliance monitoring evaluation
- Sound exceedance evaluation
- Recommendations

Milwaukee County
SOUND STUDY
Public Meeting

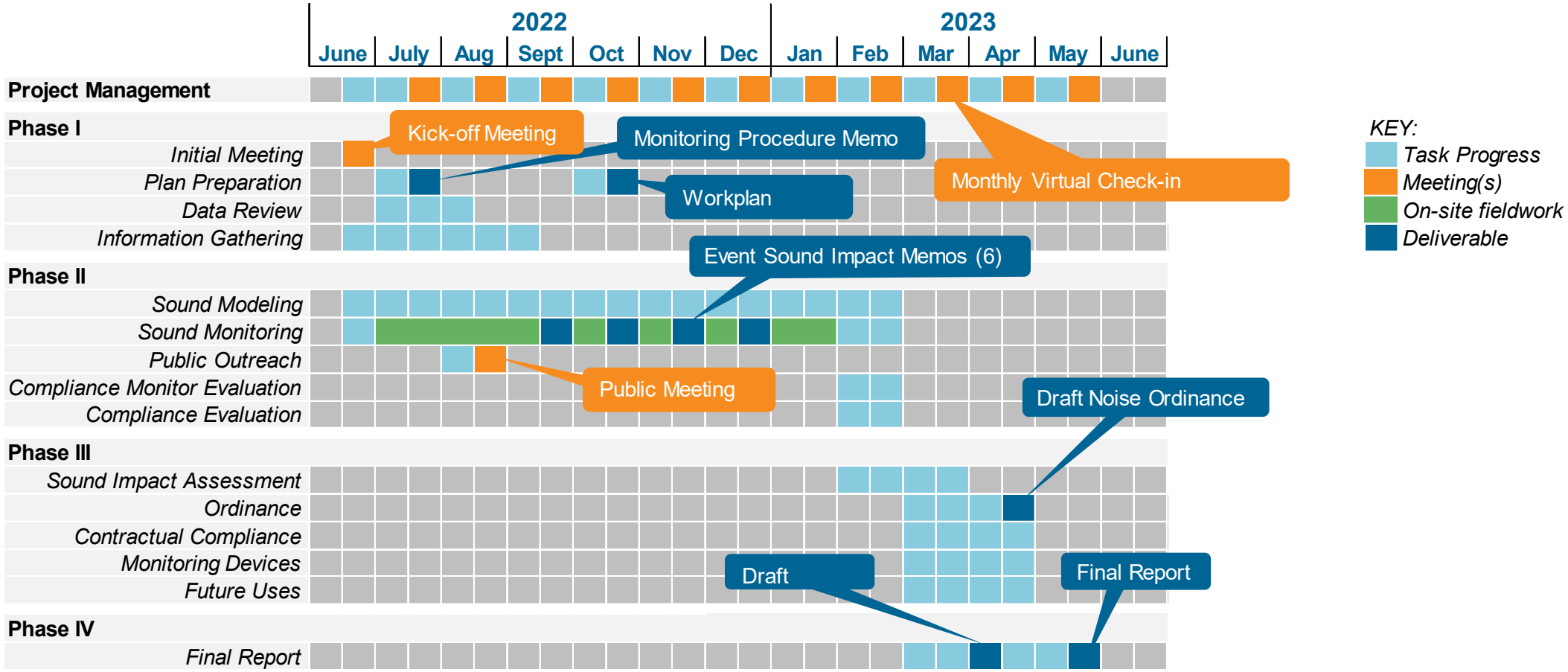
Thanks for joining us!

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

MILWAUKEE COUNTY

Study Overview

Project Timeline



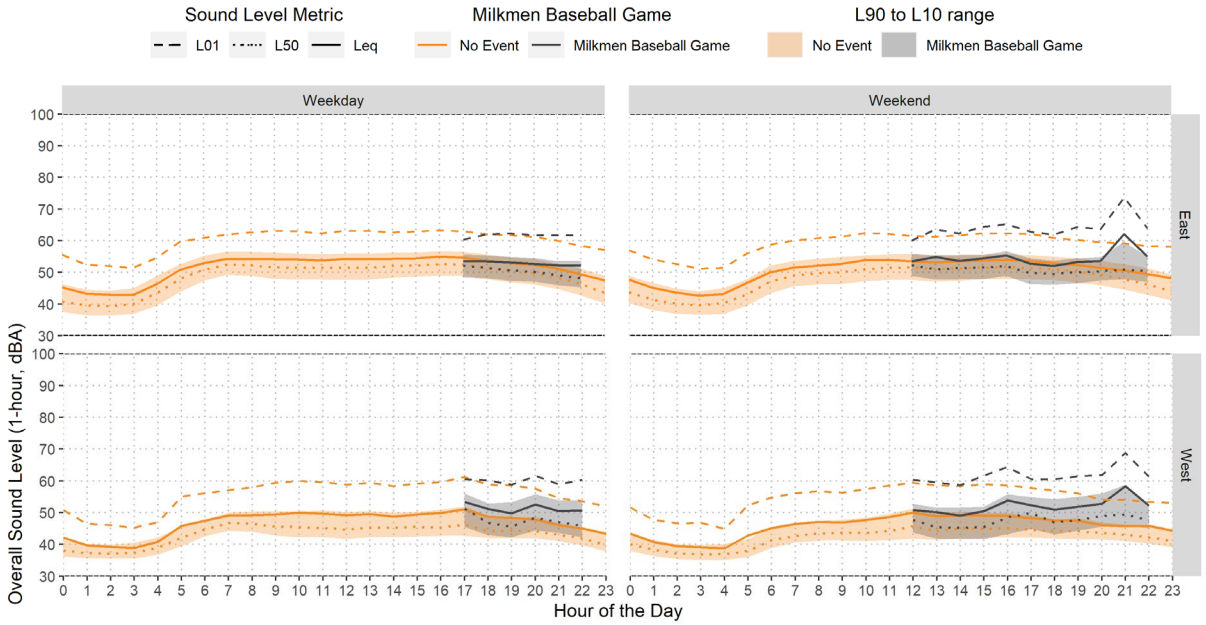
Results

Milwaukee Milkmen Games

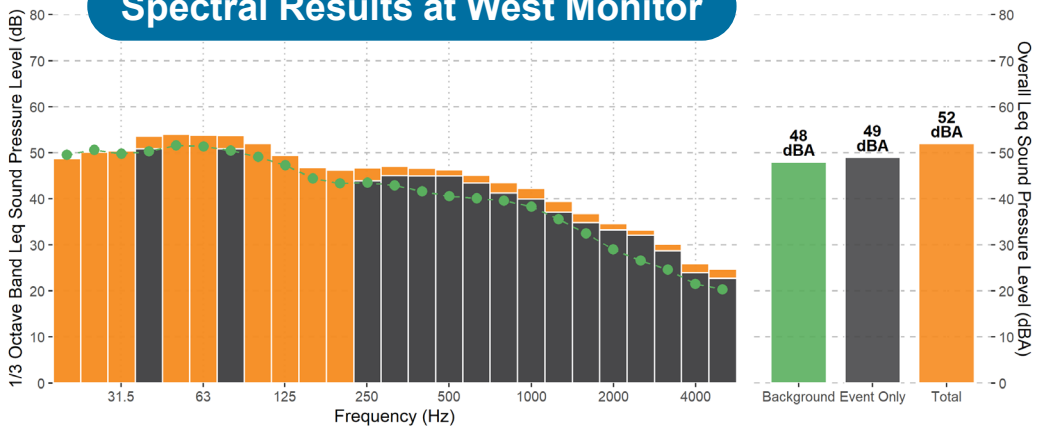
- Sound Sources:
  - Announcements over PA
  - Music over PA
  - Mooing
  - Cheering (lower in level)
- Sound levels typically similar in level to background sound
- Sounds distinctly noticeable in Hawthorn Neighborhood

(Weekend levels include Umbrella Bar concerts)

Overall Results



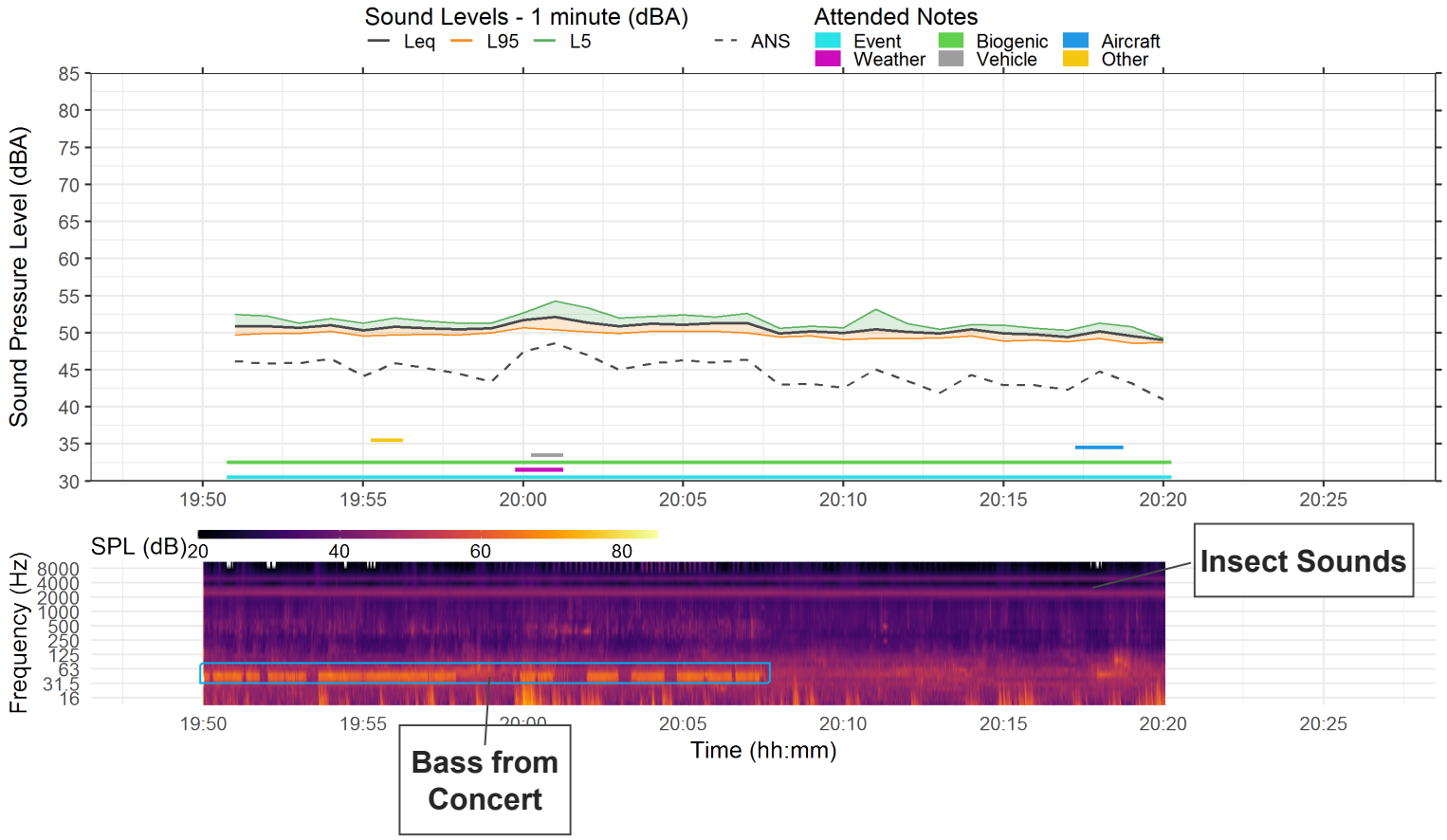
Spectral Results at West Monitor



Results

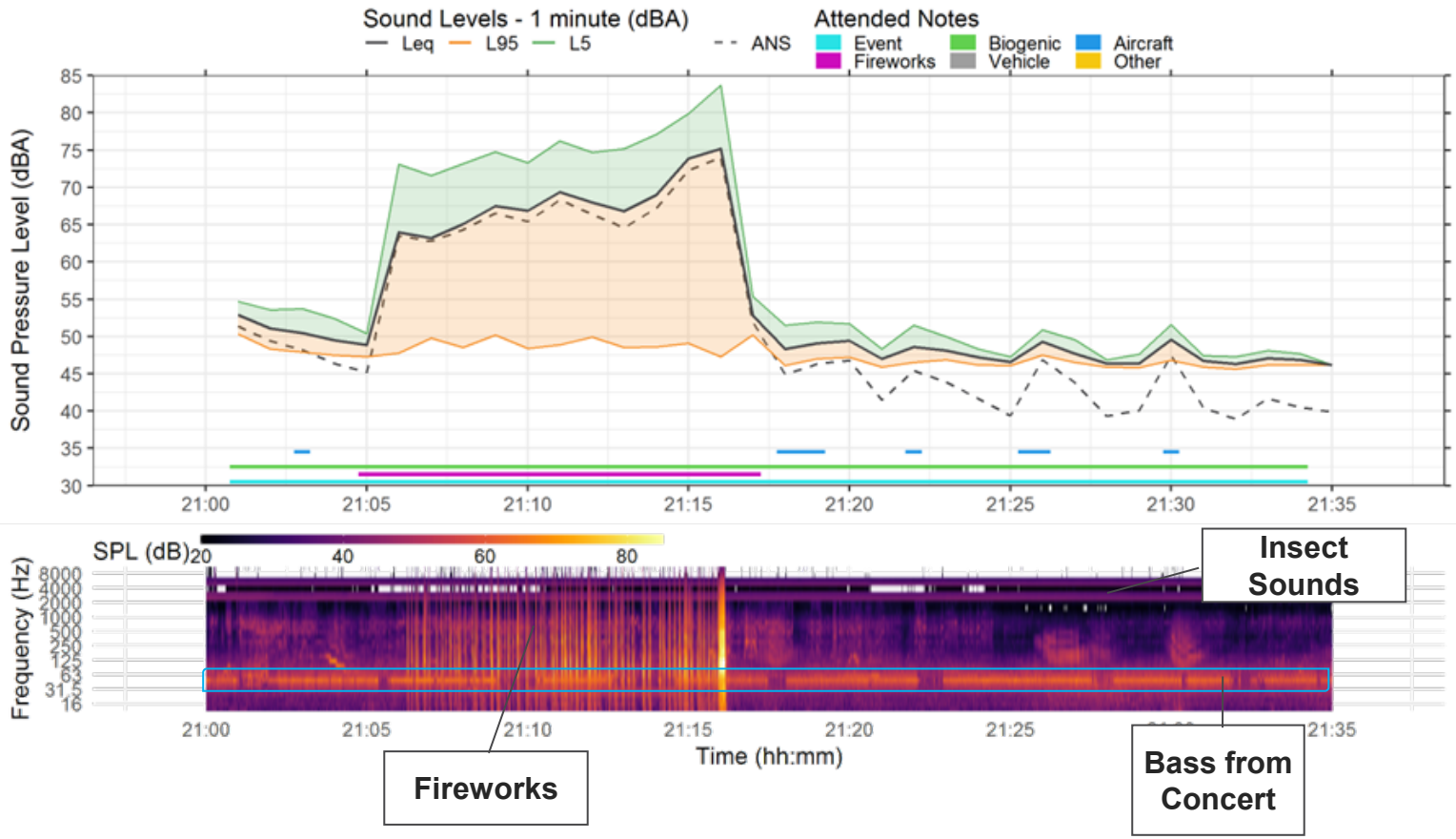
Live Music at Umbrella Bar

- Low frequency sound distinctly audible in Hawthorn and H Section neighborhoods
- Speech and music audible when background is low



Results
Fireworks

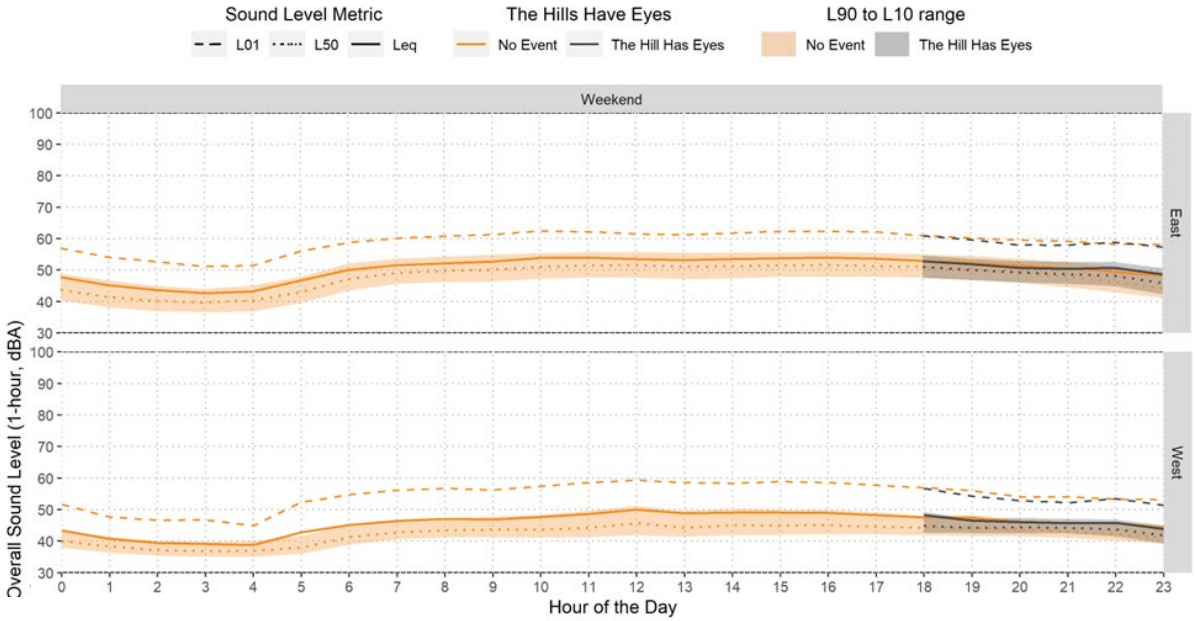
- Sounds dominate the sound environment
- 30 to 35 dB above comparable periods without events



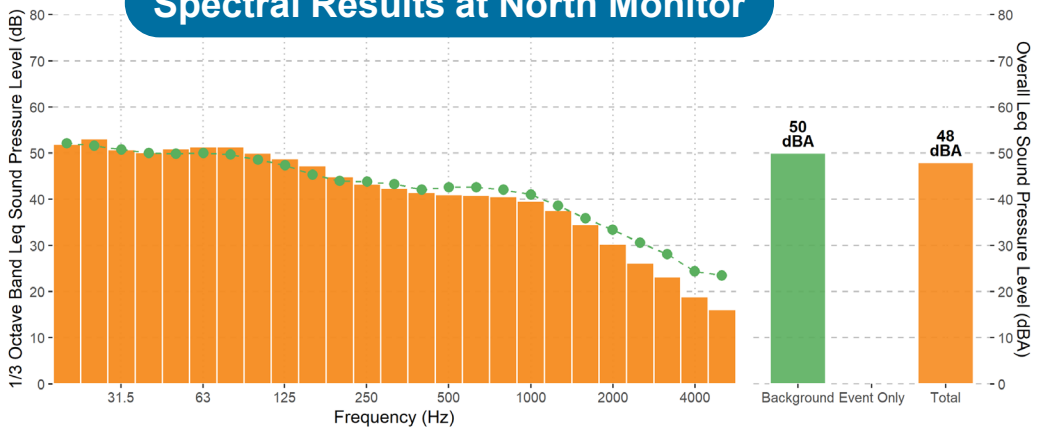
Results
Hills Have Eyes

- Sound levels below background
- Primary sound sources included chainsaw, PA system, music, special events sounds
- Low frequency music audible in H Section Neighborhood
- Clearly audible as far as 1-mile to the north

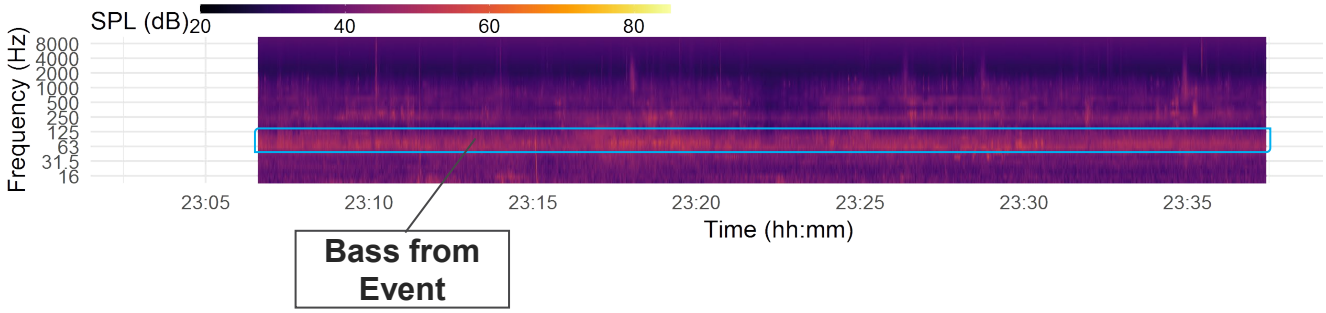
Overall Results



Spectral Results at North Monitor

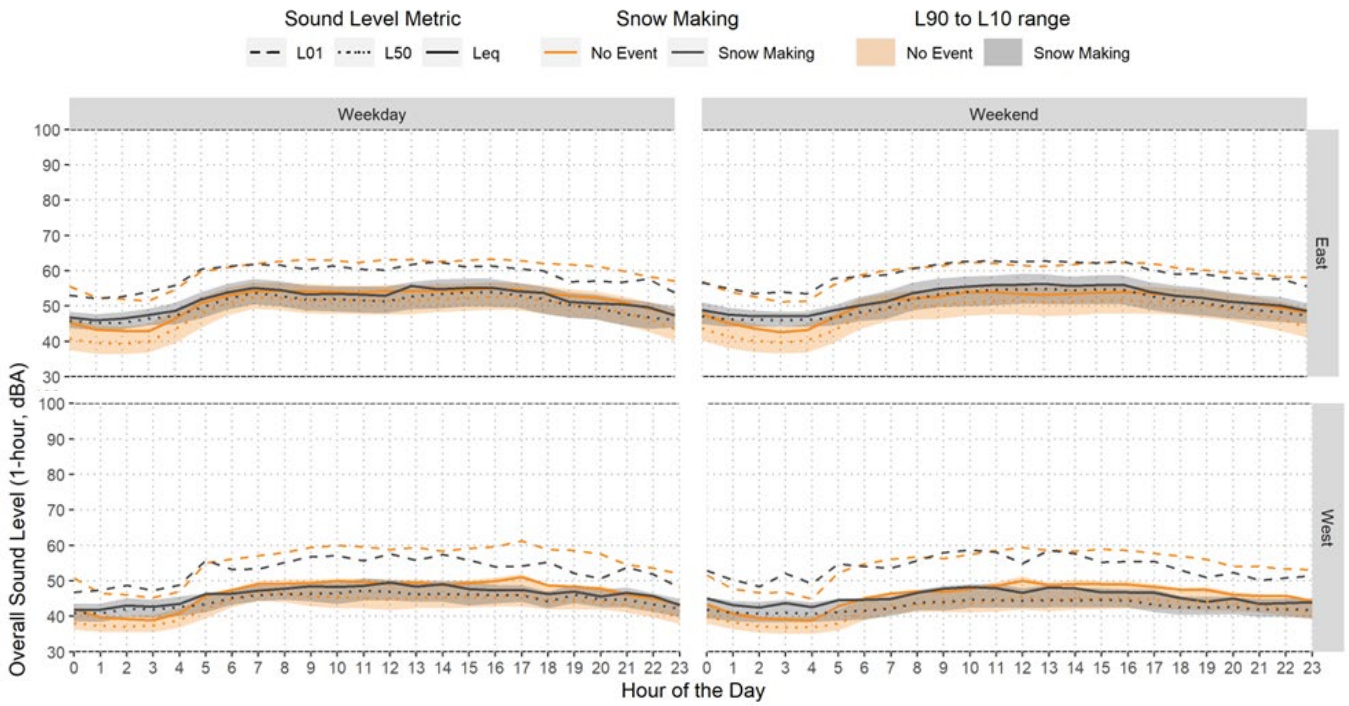


Spectrogram > 1 mile to north



Results
Snowmaking

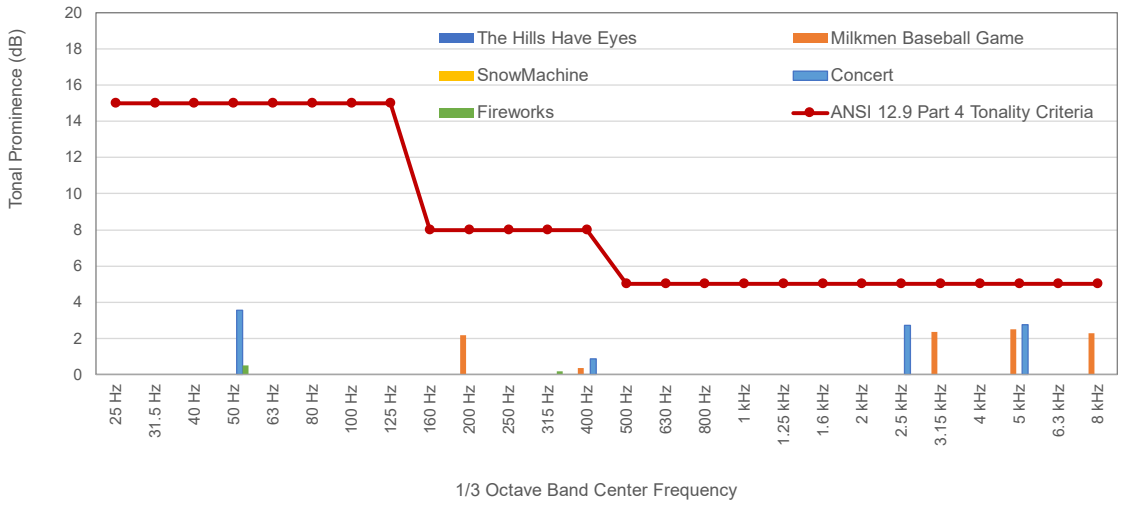
- Distinguishable during early morning & late-night hours



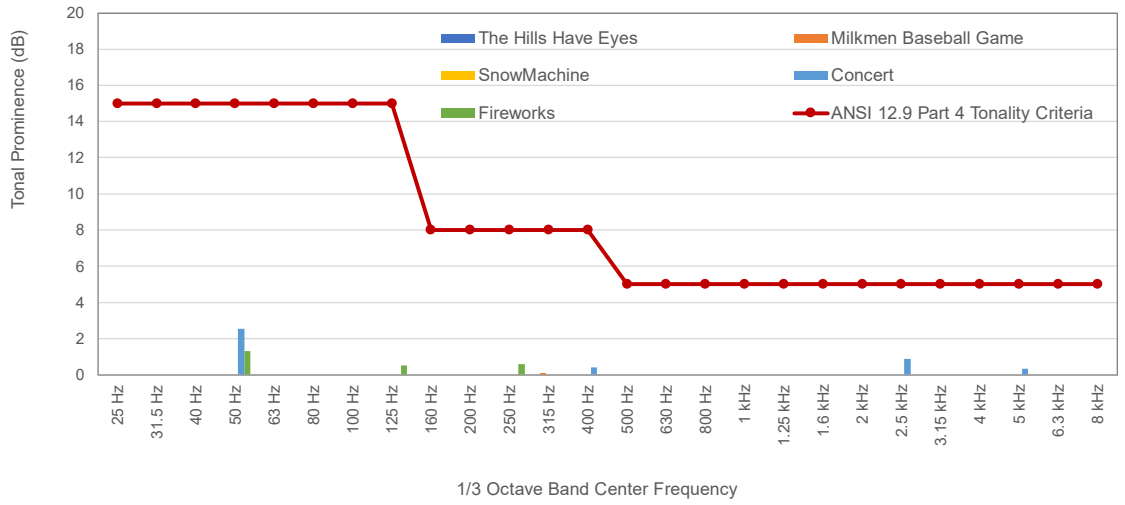
Results
Tonality

- Assessed using American National Standards Institute (ANSI) standard
- No tonal prominence identified at East or West Monitors

East Monitor

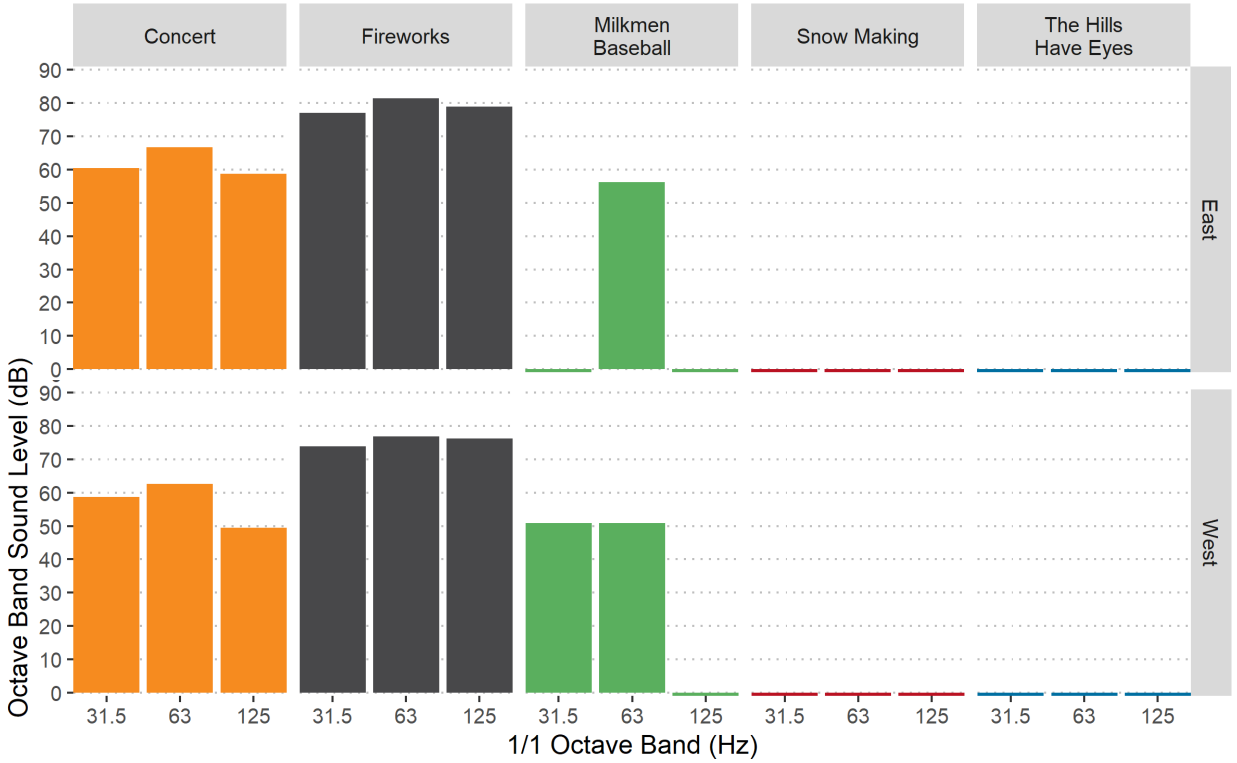


West Monitor



Results
Low Frequency

- ANSI suggests a residential noise limit of 65 dB at 16 and 31.5 Hz, and 70 dB at 63 Hz to reduce annoyance.
- Similar standards were found in NPC's review of 500 US ordinances.*



* Blomberg, Leslie D., The state of low frequency noise regulation in the United States.

Sound Limit Exceedances for Average Events

City of Franklin Limits

Limit: 70 dBA Ls_{max}

- Fireworks: All surrounding neighborhoods and boundaries
- Concerts: Section H Neighborhood

Village of Greendale Limits

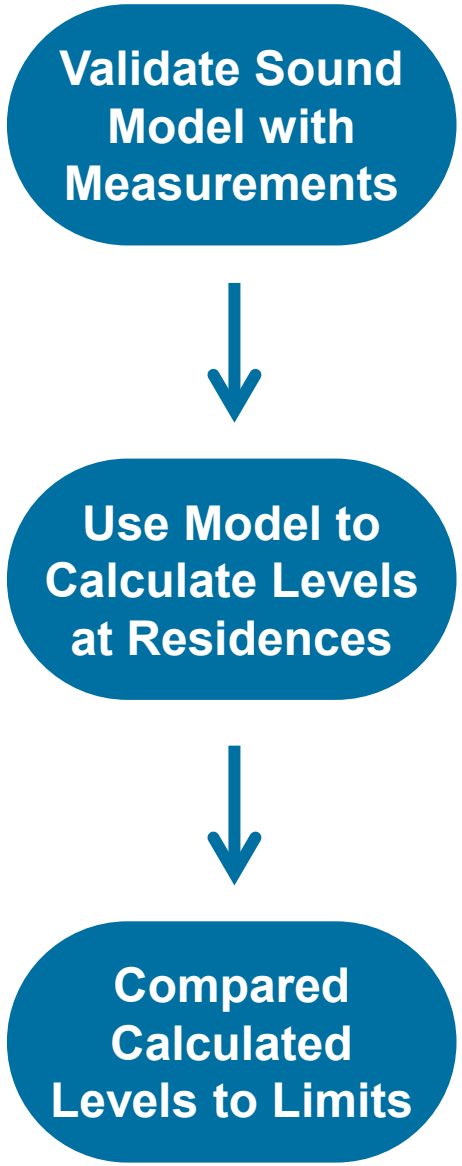
Limit: Varies based on sound source type

- Fireworks: All surrounding neighborhoods and boundaries
- Concerts: Hawthorn and Section H Neighborhoods

Low Frequency Limits from ANSI

Limit: 65 dB @ 31.5 Hz and 70 dB @ 63 Hz

- Fireworks: All surrounding neighborhoods and boundaries
- Concerts: Hawthorn Neighborhood



Recommendations
City of Franklin Noise Ordinance

City Code: “No person shall operate … anything which … causes a sound at a level between 70 dBA and 79 dBA as measured at the … property boundary”

Code also prohibits public nuisances, defined as acts or conditions that "substantially annoy, injure or endanger the comfort, health, repose or safety of the public.”

Clarification Areas

- Metric and Averaging Time
- Differentiation between Daytime and Nighttime Periods

Considerations

- Relevance
- Sound source characteristics
- Ease of enforcement

Recommendations
City of Franklin Noise Ordinance

Clarifications to Existing Regulations

- Enforce limit when sound levels exceed **70 dBA Ls_{max}** at property boundary
- Audio recordings for full duration
- Provide updated limits for longer duration events sounds

Recommended permissible sound levels for residential land use

	Daytime	Nighttime
Perpetual / Continuous, 5-minute L_{eq}	50 dBA	45 dBA
Intermittent, 1-minute L_{eq}	60 dBA	55 dBA
Impulsive, Ls_{max} or L_{01}	70 dBA	60 dBA

Violations of these limits can be identified using existing City enforcement processes and data from ROC Compliance Monitors

Recommendations
City of Franklin Noise Ordinance

Sounds with speech or music content can result in higher levels of annoyance

Recommendations for Improved Regulation

- Speech, music, and chainsaw penalty of 5 dB

Recommended permissible sound levels for residential land use for improved regulation

	Events without speech or music (Fireworks, snowmaking, golf)		Events with speech and/or music (Baseball games, concerts, Hills Have Eyes)	
	Daytime	Nighttime	Daytime	Nighttime
Perpetual / Continuous, 5-minute L_{eq}	50 dBA	45 dBA	45 dBA	40 dBA
Intermittent, 1-minute L_{eq}	60 dBA	55 dBA	55 dBA	50 dBA
Impulsive, Ls_{max} or L_{01}	70 dBA	60 dBA	65 dBA	55 dBA

Recommendations

Facility Design Improvements

- Franklin Field
  - Focus speakers away from residences & reduce volume
  - Evaluate sound system design for optimization / directional speaker system / volume limits
  - Optimization may provide some energy savings for ROC
- Umbrella Bar
  - Install dedicated sound system (per Dev. Agreement)
  - Include sound check process
  - Band shed
- Fireworks / Helicopter
  - Limit number of events
  - Provide advance notice of events to nearby residences
  - Explicitly state if events are exempt from sound limits
- Hills Have Eyes
  - Temporary sound blankets / barriers
  - Eliminate disturbing sounds (chainsaw)
  - Focus PA system away from communities

Without permission to access ROC property, a detailed review of the existing sound sources, systems, and facilities could not be conducted. These recommendations are based on field observations of this facility and knowledge of other similar facilities.

RSG

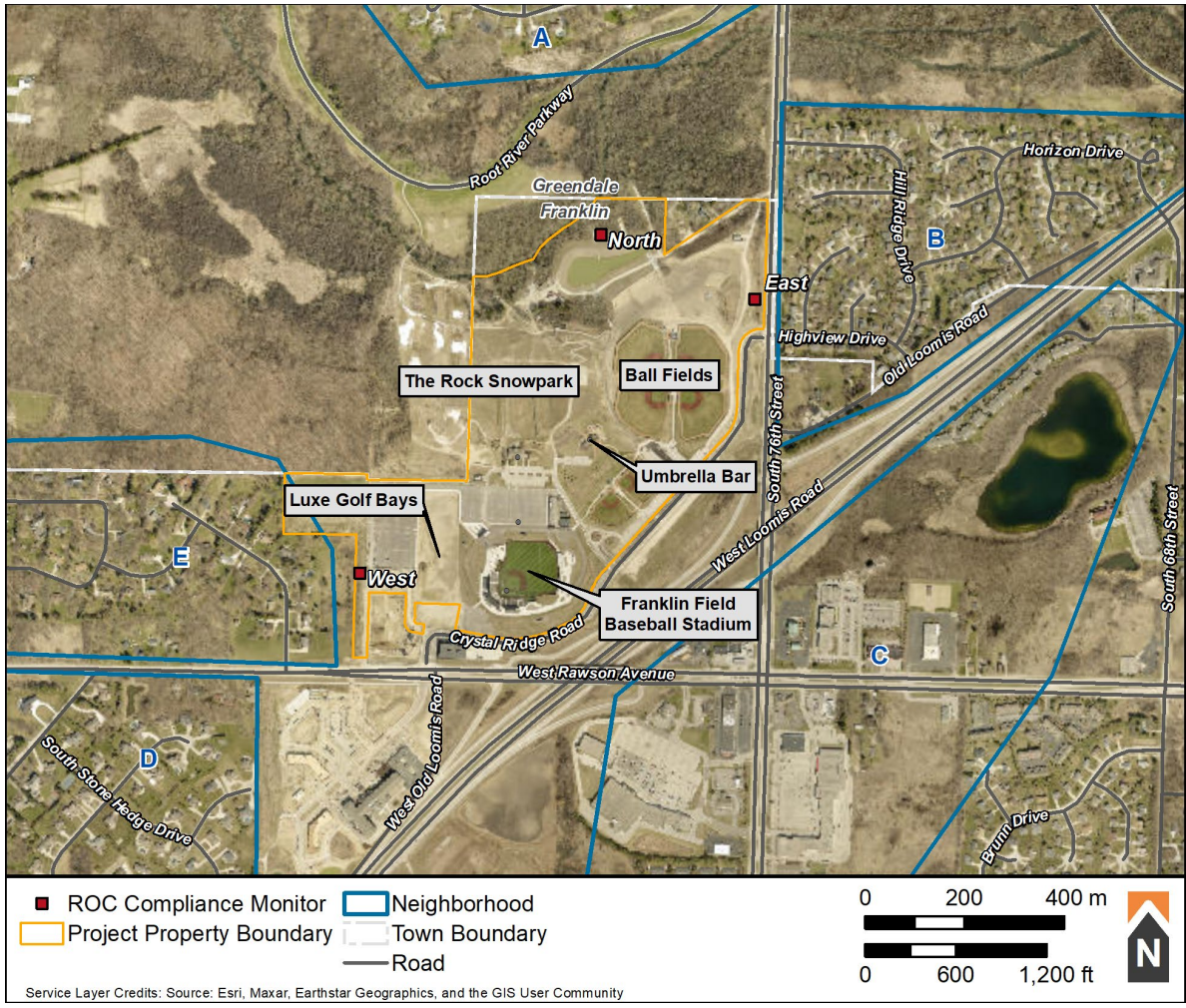
Recommendations

ROC Compliance Monitoring

- ROC East and West Monitors appropriate to represent Hawthorn and H Section neighborhoods
- ROC North Monitor is representative of northern property boundary
- Monitoring equipment is sufficient, but not maintained
- Burden is on citizens to enforce the noise standard

Recommendations

- Ensure that all monitors are operational, maintained, and field / lab calibrated (last calibration is June 20, 2019)
- Review micro-siting of ROC Monitors
- Consider relocated ROC North Monitor to act as a reference location for Umbrella Bar sound check
- Update sound thresholds
- Request monthly reporting from ROC on all sound exceedances, regardless of whether a complaint is filed



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