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Acoustics and Technology Consulting

ENVIRONMENTAL NOISE ASSESSMENT AND FEASIBILITY STUDY

Longhorn Ballroom

Dallas, TX

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Presented By:
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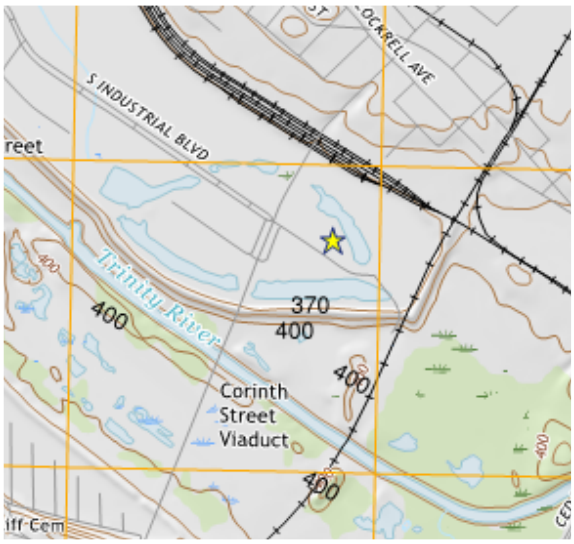
Introduction

The Longhorn Ballroom (Previously Bob Willis' Ranch House) has served as a premier performance venue for musical guests since the 1950's. It has become a Dallas destination for music aficionados with the varied and diverse history of musicians that have graced its stage. Additionally, the Longhorn Ballroom Backyard is located immediately southeast of the Longhorn Ballroom building and has been used for outdoor performances and festivals. The unique building layouts, architecture, and exterior paintings provides an environment that is arguably unrivaled in the City of Dallas. This uniqueness allows patrons to mingle from inside performances to outdoor performance areas in a setting that is quintessentially Dallas.

Existing Surrounding Environment

The Longhorn Ballroom site is surrounded by several significantly loud noise sources and businesses. A railroad switch yard and concrete batch plant bounds the north side of the property. Additionally, along the southeast side of the property runs the DART rail. At this location, the commuter train is elevated and proceeds at full speed. Noise levels near the train are within the 80 dBA+ range based on previous historical and site measurements.



The bounding property on the west side of the Longhorn Backyard is designated as light industrial and is the site for an existing scrap metal recycling business. Additional light industrial businesses within the immediate vicinity to the Backyard include multiple concrete manufacturing plants and warehouses. Finally, while not in the direct line of sight to the backyard there are multiple businesses along Corinth which include liquor stores, tire repair shops, and auto repair facilities. Considering these adjacencies, the use of the Backyard for outdoor performances seems to be a viable option.

As stated previously, the location of the Longhorn Ballroom Backyard is favorable considering the surrounding light industrial and warehouse use and depressed topographical conditions. Current distances to the nearest residences are 2,600+ feet opposite of the direction of proposed loudspeaker coverage. In the direction of the loudspeaker coverage, the nearest residences are 4,000 feet. Neither direction allows a direct line of sight to the proposed stage and both have acoustical shadowing from the Trinity River Berm and other buildings.

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Codes and Noise Ordinances

Current City of Dallas noise ordinance Sec. 51A-6.102 requires varying noise levels at bounding property lines based on land use. For example, the daytime allowable noise limit for adjacent residential land designated WR is 56 dBA. Conversely, the bounding daytime allowable noise level for mixed use properties is 63 dBA and 65 dBA for Light Industrial areas. The City of Dallas does not have allowances for special entertainment districts as seen in other municipalities. In some instances, these entertainment districts have allowances of 75 – 85 dBA between the hours of 10:00 – 2:00 am depending on location and use. While some special allowances should ideally be considered for the City of Dallas, they do not currently exist.

While there are no nearby residences today, care should be considered for future residential mixed used properties which may encroach on the Longhorn Ballroom Backyard. If the areas that are currently designated light industrial or warehouse remain as such, the City of Dallas noise level may be achievable. However, if the Longhorn Ballroom complex establishes the area as a desirable destination and residential development approaches the boundary, the allowable noise level limits may be difficult to achieve.

Other Municipal Noise Ordinances

To help establish reasonable noise levels in designated entertainment districts, some municipalities have separated allowable entertainment district noise levels from historical noise limits. This allows these areas to operate at levels expected by the patrons while maintaining the culture established by the venues. The following are excerpts from each example city and ordinance.

Austin:
9-2-4 - RESTRICTION ON DECIBEL LEVEL.

A person may not operate sound equipment at a business that produces sound:

> *(1) in excess of 85 decibels between 10:00 a.m. and 2:00 a.m., as measured at the property line of the business;*

Washington D.C. (Constitutional Bill):

To amend the Construction Codes Approval and Amendments Act of 1986 to regulate sound attenuation standards for new residential construction in activity areas or entertainment areas; to amend the Office of and Commission on Nightlife and Culture Establishment Act of 2018 to create a grant program for soundproofing entertainment venues; to amend Chapter 8 of Title 47 of the District of Columbia Official Code to create a property tax deduction for soundproofing buildings; and to require the Mayor to publish a report on strategies to accommodate outdoor performances.

(A) Residential units meet or exceed a composite Outdoor/Indoor Transmission Class of not less than 32

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(B) Residential units achieve an indoor sound level reduction for frequencies between 80 and 160 hertz of not less than 30 dBA

The combination of allowable adjacent noise levels as noted in the Austin ordinance and the Washington D.C. bill which addresses minimum construction standards would be ideal in a modern ordinance. The Washington D.C. constitutional bill is by far the most advanced and forethought plan to date which addresses new and existing constructions for residential buildings near an entertainment district. The bill requires minimum construction standards for residential construction so that business owners are not penalized for creating a culture in the entertainment which attracts new residential construction in the area.

ENVIRONMENTAL NOISE STUDY

To document the existing conditions, we conducted an environmental noise study for the Longhorn Ballroom site. Measurements were conducted on September 7-8, 2020 to collect data for the traffic and environmental conditions. Continuous 23-hour measurements were conducted at three locations—near the pond to the east, along Riverfront Boulevard, and within the middle of the proposed Backyard as noted on the following diagram. Measurements within the last hour of the 24-hour period were abandoned due to the threat of rain.

Site measurements were conducted continuously during the 23-hour measurement period in the mentioned locations to calculate overall values. Snapshot measurements were also conducted to determine typical noise levels and spectral content for comparison to the continuous unattended measurements. Periodic snapshot measurements were collected using a Type I NTI XL2 integrating sound level meter and were recorded in third octave band frequencies. The continuous measurements were conducted using Type II Soft db Piccolo and Piccolo II integrating sound level meters. The Piccolo meters were programmed to capture noise levels in 1-minute intervals, and the data was post-processed to determine the hourly percentile values where required. [1]

[1] The equivalent noise level is the steady state equivalent of a noise that varies during the measurement period.

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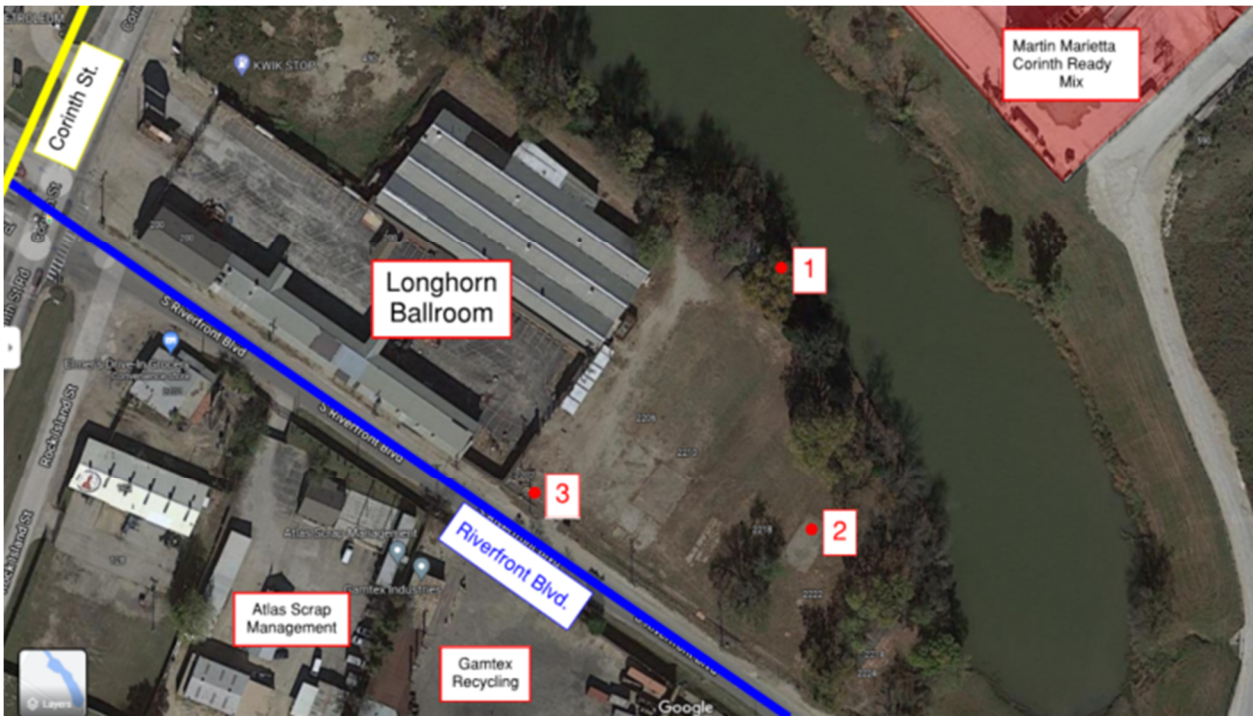

Satellite image indicating project site, measurement locations and notable noise sources.

Site Conditions and Observations

The date of the site visit was selected with favorable weather conditions in mind. Our team set up meters per the description above and took several spectrum measurements over the course of the 24-hour period. Measurement locations were placed near the dominate noise sources and within the center of the Longhorn Ballroom Backyard.

The site consists of a significant amount of vegetation, including trees and long grass. A gravel parking lot is immediately outside of the existing building. Traffic on Corinth Street was fairly consistent while our team was on site. Objectively, we noticed that the road noise from Riverfront Boulevard was significantly louder than the Corinth Street road noise due to cement truck and scrapyard activities on Riverfront Boulevard. Noise from the concrete batch plant, railyard, and Dart Rail was also clearly audible. Additionally, a train horn was clearly audible from the Longhorn Ballroom site although the exact location could not be confirmed.

Environmental Noise Model

An environmental noise model was created using the iNoise software and calibrated with the measurements taken during the site visit. The typical maximum noise levels are shown in the figures below.

Map 1 illustrates average noise levels due to concrete batch plant and scrapyard activities. Noise events such as alarms from the concrete batch plant, motors, dropped aggregate, cement

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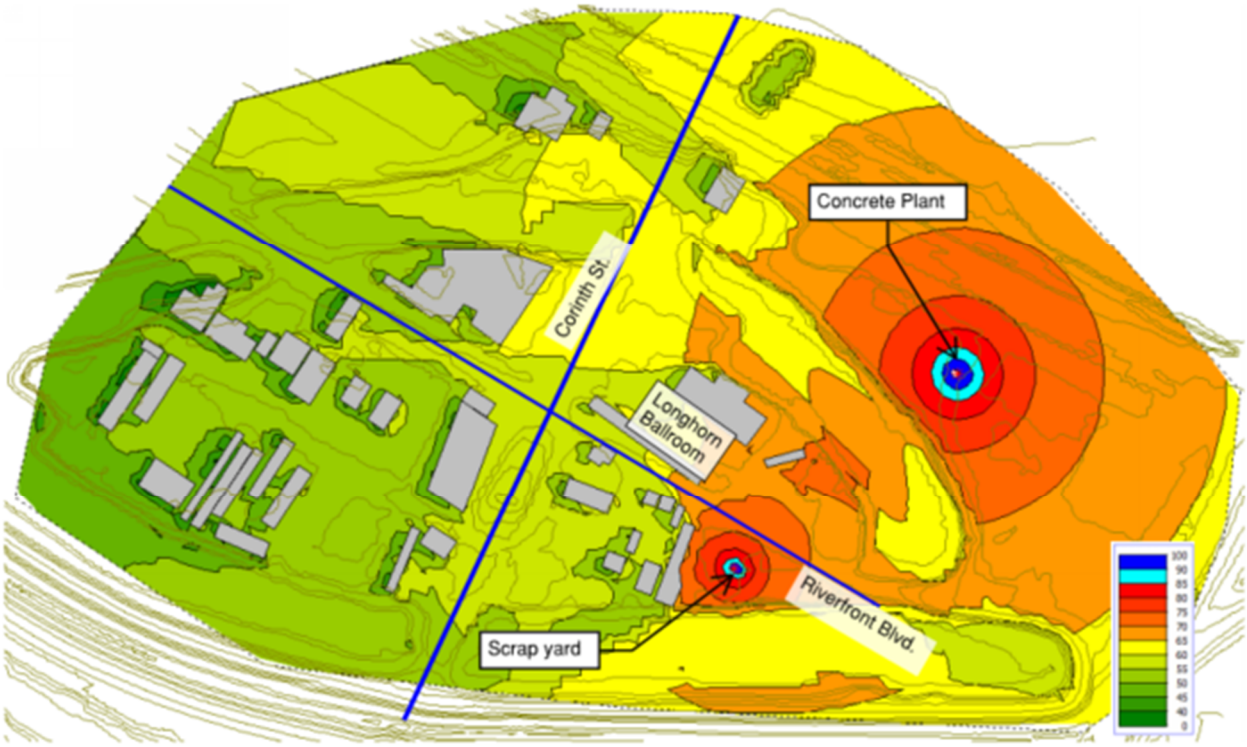
truck traffic, and dropped scrap metal occur frequently during business hours. The greatest noise source during measurements proved to be cement truck traffic which exits concrete batch plant along Riverfront Boulevard. Map 2 highlights the typical maximum noise levels for the concrete batch plant and scrapyard.



Map 1 - Typical average noise levels due to existing site activities

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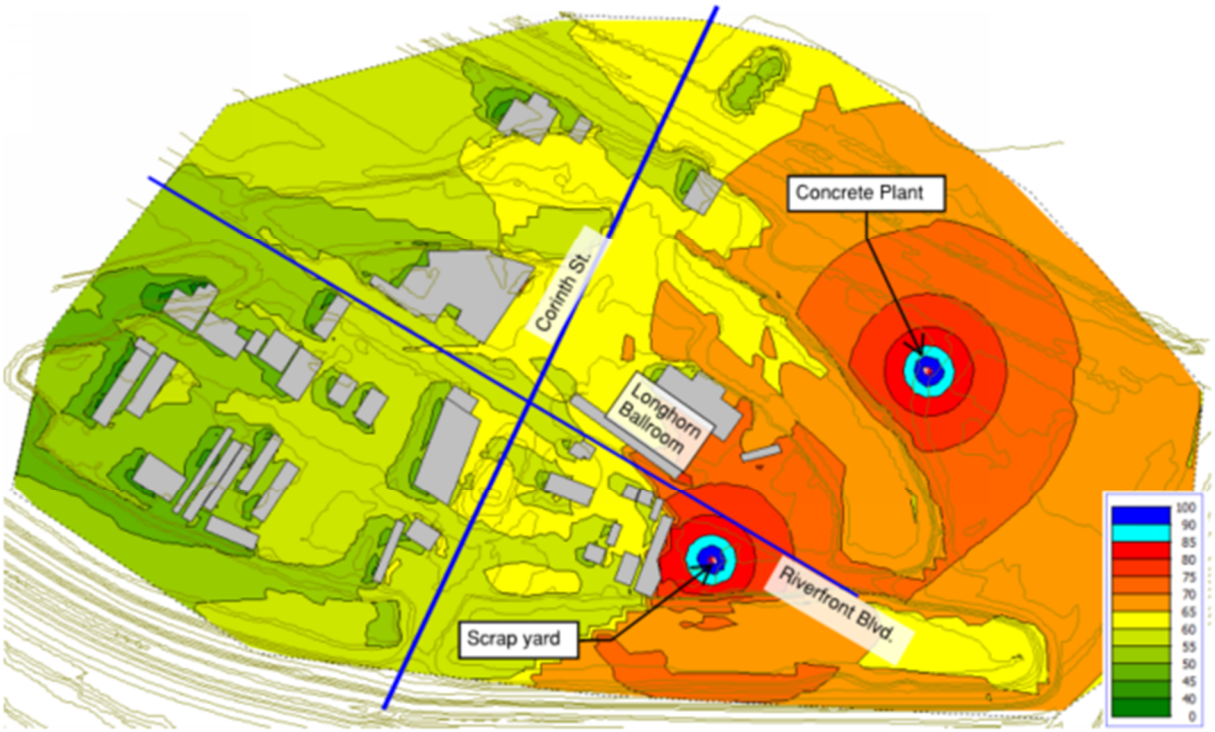

Map 2 - Typical maximum noise levels due to existing site activities

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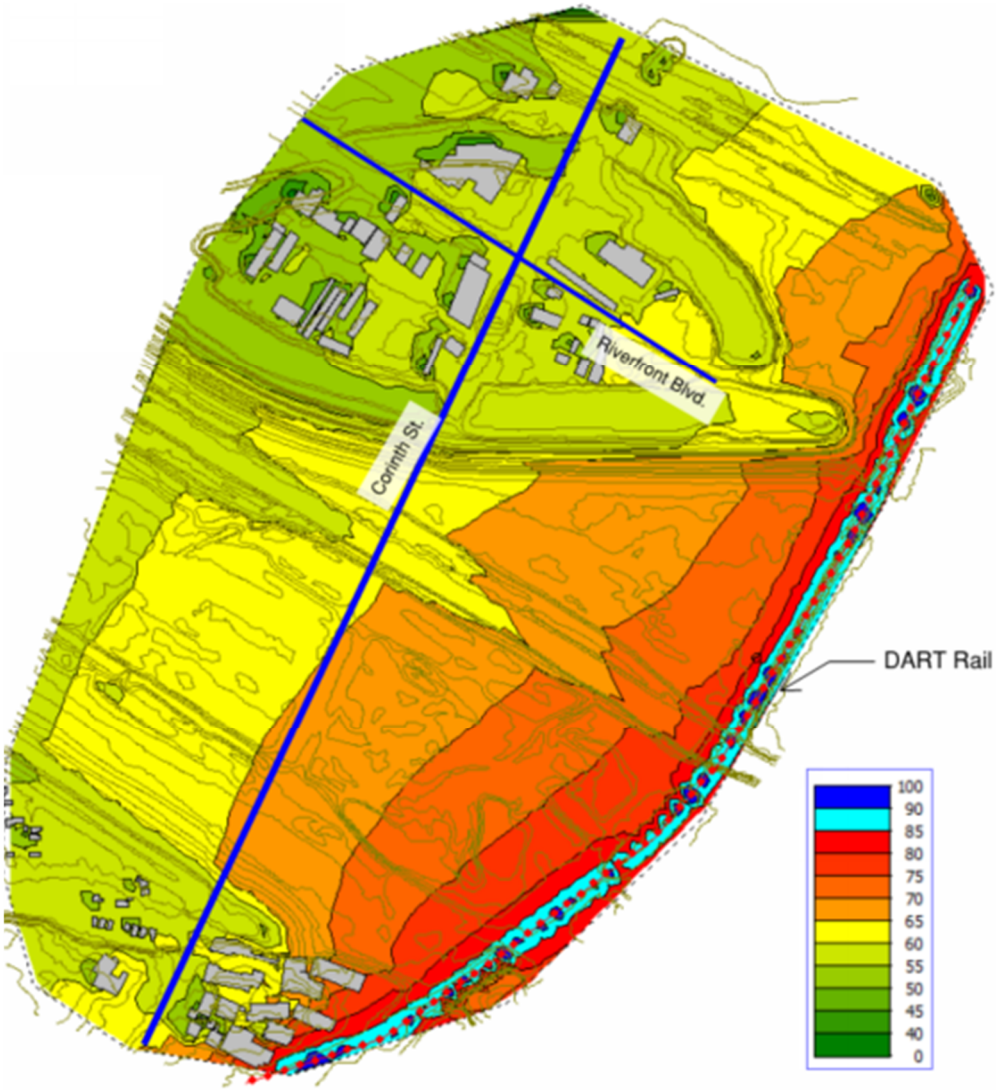

Map 3 - DART rail maximum noise event level

Map 3 illustrates the noise impact of a train passing by the site, calibrated using Lmax levels during the observed train event. These levels exceed 85 dBA at some buildings close to the rail, and 65 dBA in the Longhorn Ballroom Backyard.

Detailed measurement results are shown in the charts below. For each measurement location, the chart includes both the maximum noise level along with the equivalent noise level for the one minute measurement period. In many instances, particularly in location 3, noise levels regularly exceed 80 dBA.

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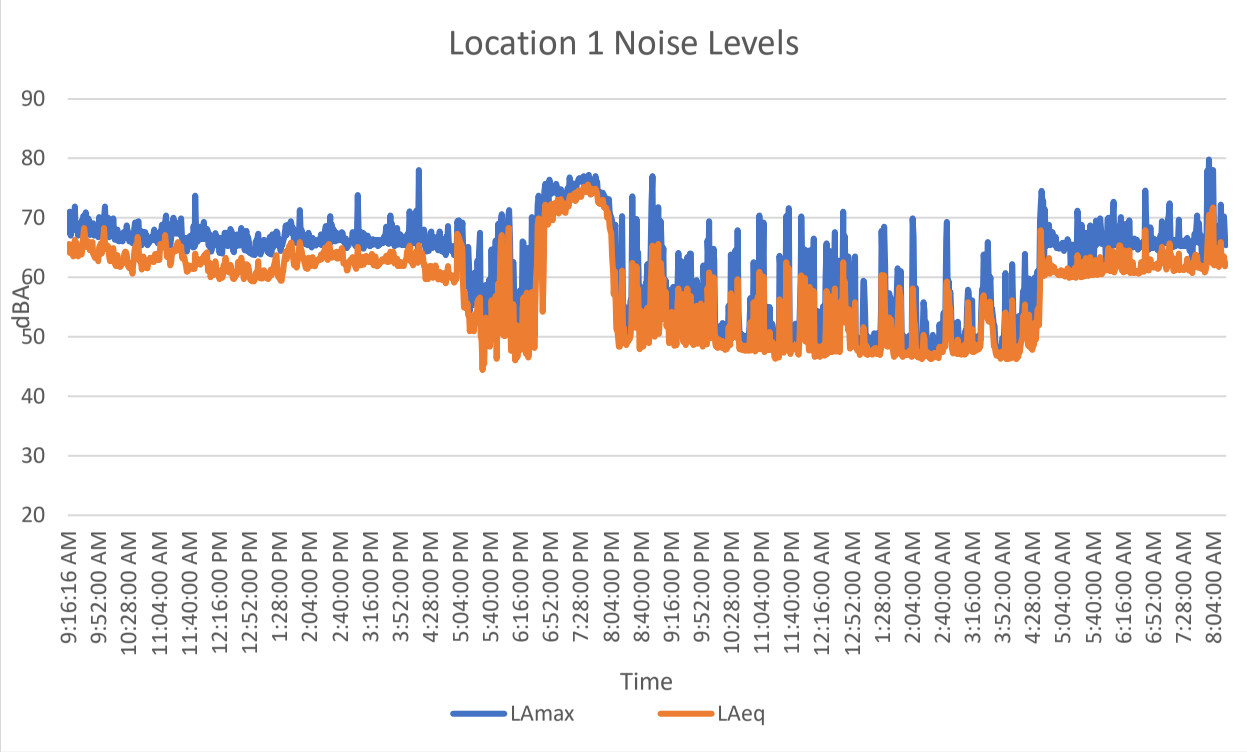

Chart 1

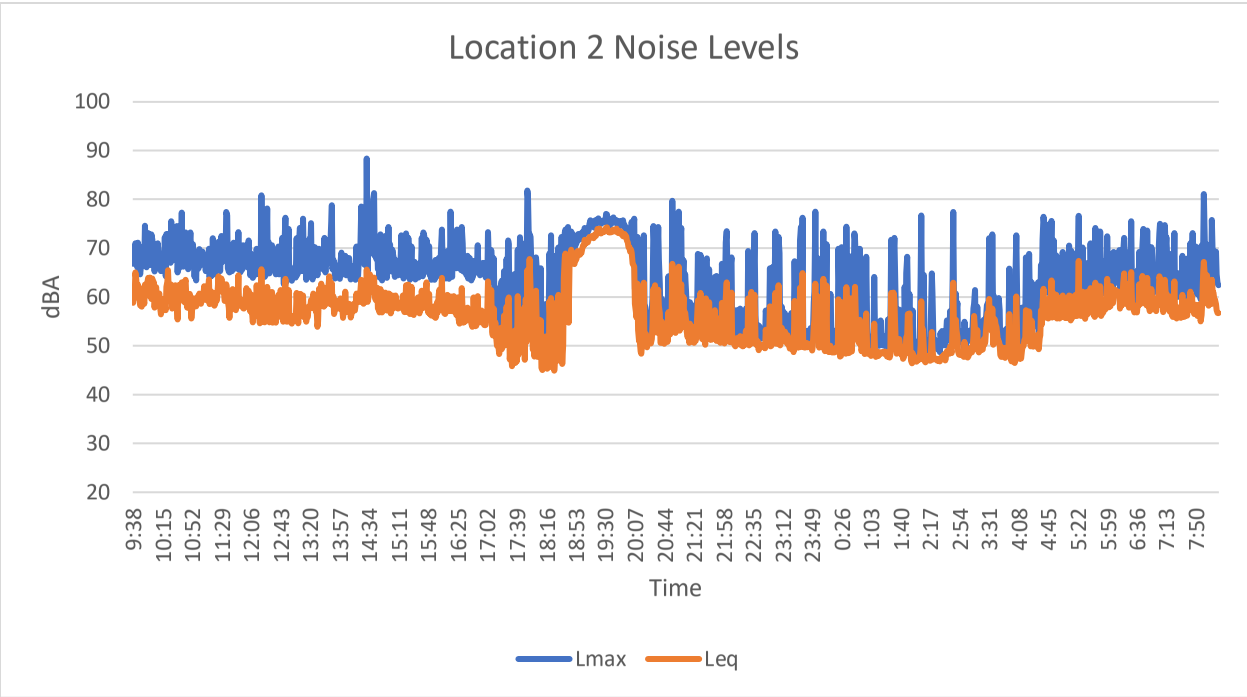

Chart 2

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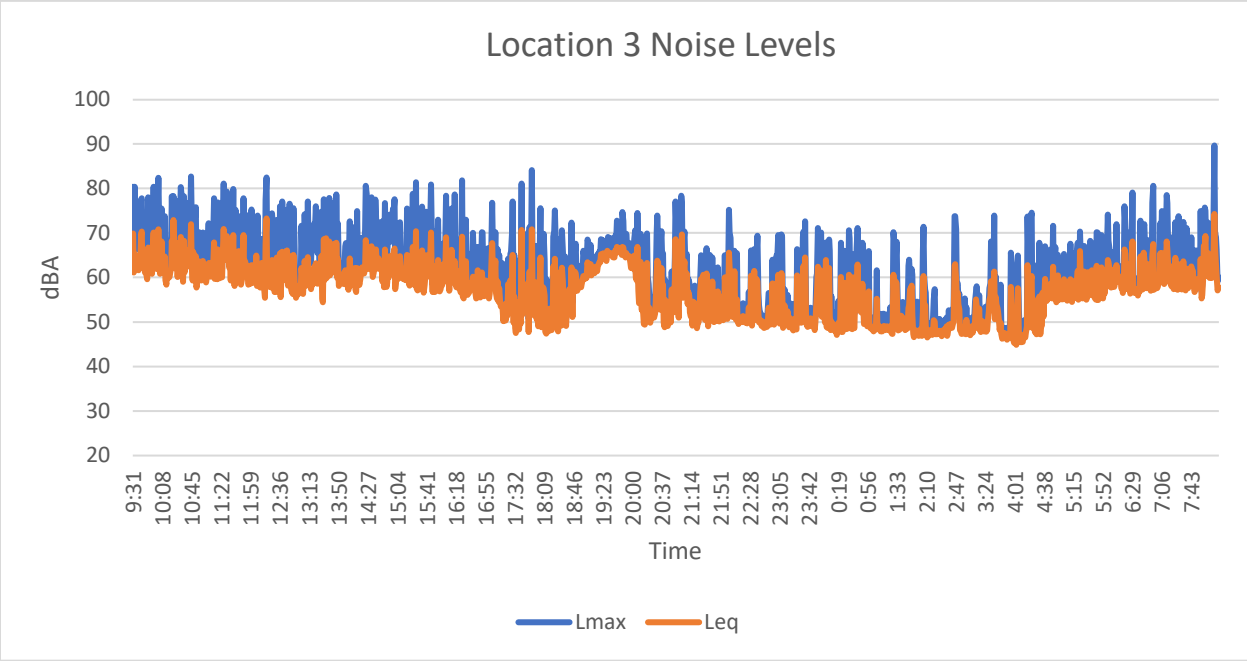

Chart 3

Concert Noise Level Assessment

To illustrate anticipated noise levels during an outdoor Longhorn Backyard concert event, we developed a computer model for confirmation. The model uses the iNoise software as noted above. This approach assumes generic line array loudspeaker directivity and is not specific to any one loudspeaker manufacturer. The loudspeaker arrays are assumed to be mounted at a height of 28 feet. The Longhorn Backyard site is also modeled with a 15 foot solid fence surrounding the Backyard as currently proposed.

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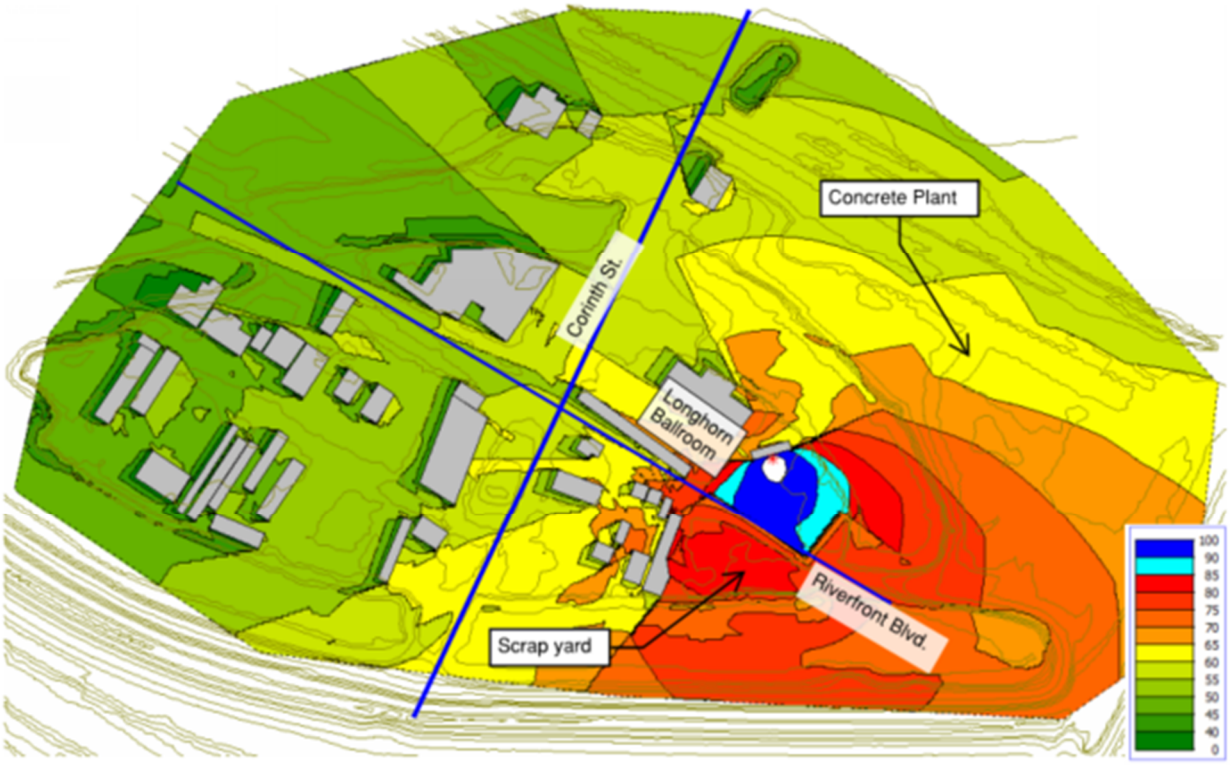

Map 4 - Anticipated concert sound levels

The resultant map notes that anticipated sound levels along Corinth Street are similar to noise levels events from the concrete batch plant and the scrapyard. Additional detailed maps can be developed to exactly match the loudspeaker performance of a specific line array with coordination of the manufacturer and developing site plans.

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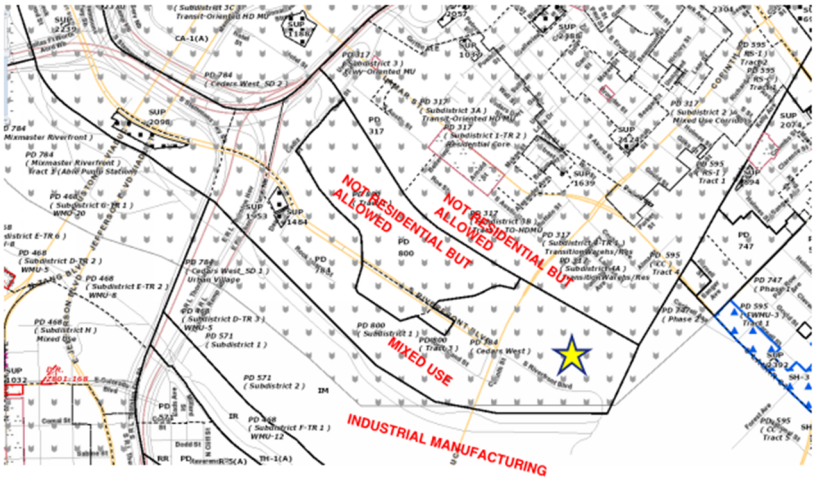
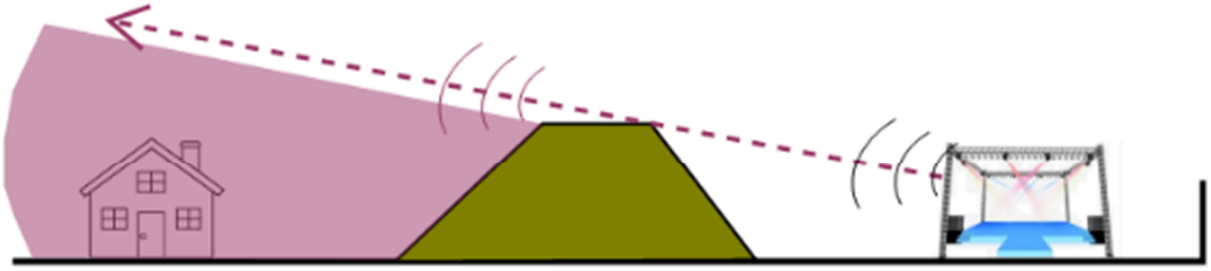
Outdoor Performance Area

Just south of the main Longhorn Ballroom building is the Longhorn Ballroom Backyard. It is a proposed two acre clearing currently surrounded by rail, light industrial businesses, and the Trinity River. The site is currently designated as PD 784 and PD 317 and 800 surround the property. PD 800 is a mixed-use district with some potential higher density residential developments. Whereas, PD 784 SEC. 51P-784.202. DOWNTOWN FORM DISTRICT REGULATION subsection A clause 2 states "This district is considered to be a nonresidential zoning district."



The Longhorn Ballroom complex is situated in a geographical depression which significantly benefits the reduction of noise from outdoor performances. The Trinity River levy surrounds the property and immediately adjacent sites on the south and west sides. The levy forms an approximately 30ft tall acoustical raised earthen berm from the residential districts on the opposite side of the river. The berm provides an acoustics shadow zone for properties



Acoustic Shadow Zone

located opposite of the performance area. This phenomenon is shown in the illustration below. Additionally, the terrain slopes upward east of the Longhorn Ballroom property completing the depression. The resultant noise reduction can range from 5 dB (Clearly noticeable) to upwards of 10+ dB (Half as Loud) depending on the distances between the listener, berm, and noise source.

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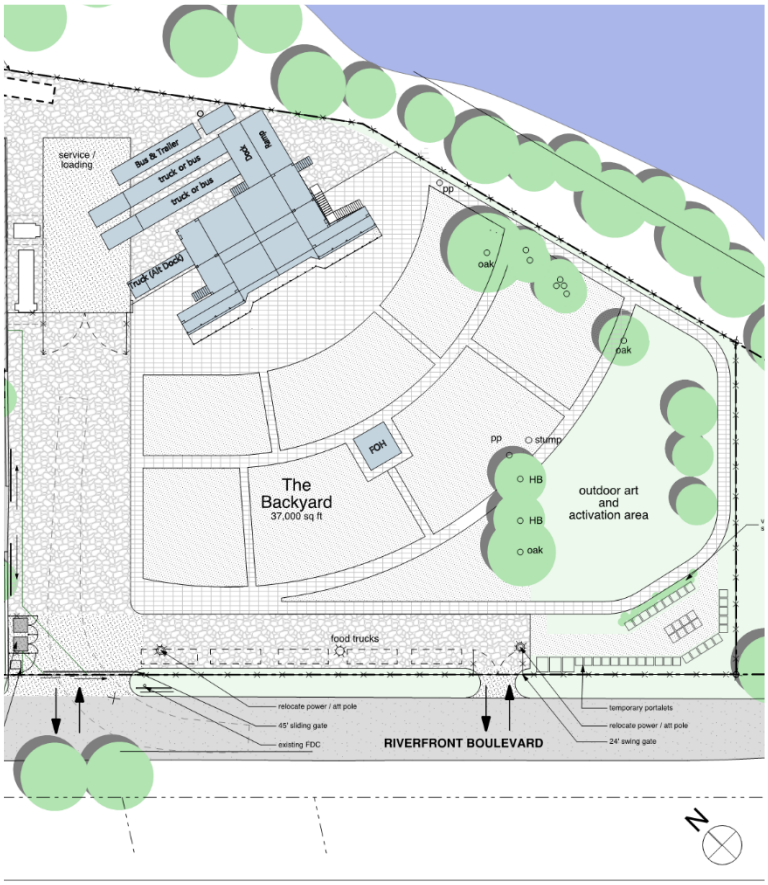
In addition to the terrain configuration and as noted above, the use of a highly directional line array sound system should be used for performances to further reduce noise levels at a distance. Unlike traditional 2- or 3-way loudspeakers which are controlled using the physical shape of a horn or cone driver, the line array speaker system uses the interaction between multiple loudspeaker boxes to give precise control vertically. These systems use electronic manipulation and delay to produce these results with vertical coverage tolerances within 7 degrees. While it may seem counterintuitive that multiple loudspeakers in a line array configuration can produce quieter results at a distance, this is exactly the case. With some limitations, the taller the line array speaker the more vertical control at lower frequencies is realized. In this configuration, we would recommend that the stage face south towards Riverfront Boulevard to limit the impact on the surrounding communities. The combination of the reduction due to the berm and vertical control of a line array loudspeaker design will meet the property line noise level requirement of the residential areas across the Trinity River.



Day to day use and coverage of the Backyard area can be achieved with distributed loudspeaker configuration which allows the musical source to be closer to the listener. In this configuration the overall loudness at each speaker can be reduced to provide the ambiance needed for daily use.

Conclusions

Sound levels along Corinth Street are expected to be within the 60-65 dBA. We do not expect that these would be daily noise levels but instead reserved for large concert events only. Day-to-day sound levels would be at least 10-15 dBA lower considering the smaller crowd size and use of the venue. In our opinion, the proposed location and stage orientation of the Longhorn Ballroom Backyard concert area is a viable option for outdoor performance use. The topographical features and current distances to existing residential areas are well within reason for a successful performance venue. We continue to recommend that the design of the stage

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loudspeaker system utilize a vertically digitally steerable line array to minimize impacts to existing and potential residential uses. This would allow the sound during concerts to be tailored to the occupied seating areas and thereby reducing noise impacts when the Backyard is not full for a special event. In addition, we would also recommend the use of an evenly distributed audio system to be installed throughout the backyard areas so that the main stage line array would not need to be used in daily business operations.

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