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SOUNDSCAPE STUDY REPORT

for

CITY OF FORT LAUDERDALE FLORIDA

By

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EXECUTIVE SUMMARY

Siebein Acoustic in partnership with the University of Florida (Soundscape Team) conducted a soundscape study in response to RFP # 12655-225 for the City of Ft. Lauderdale. The study was conducted with oversight and collaboration with the Noise Control Advisory Committee and City of Fort Lauderdale staff over a period of approximately 11 months. The Soundscape Team analyzed noise, ambient sounds and amplified music in 3 Entertainment Overlay Districts and 4 Regional Activity Centers that included commercial and residential areas with close proximities. Field measurements and soundwalks were conducted at multiple locations in February (16^{th} – 20^{th}) and again in April (21-25) of 2023. Sound level measurements included long-term (days) logging of sound for 4-5 days at multiple locations throughout the study area in addition to localized short-term (30-60 seconds) measurements taken at representative locations during the day, evening, night, and early morning hours. Hundreds of measurements were taken over the course of 10 days during the two field measurement periods.

The soundscape team met monthly with the Noise Control Advisory Committee to initially identify locations for measurements, discuss the character and content of sonic concerns, the objectives of the committee, review the method of measurement and to engage citizens and stakeholders in participating in the sound walks. Data were presented to the committee in summary reports from each of the field measurement visits and as data were analyzed and prepared for graphic illustration. Meeting discussions were productive in honing in on areas of focus such as amplified music, bass sounds from amplified music, and the negative sonic impact of loud vehicles on residential occupancies. The narrative, illustrations, recommendation strategies, and conclusions put forward in this report, were developed through presenting data to the Noise Control Advisory Committee, responding to their feedback, adjusting the scope of work and priorities to reach conclusions and to provide a range of options for the Noise Control Advisory Committee to consider, ratify, and recommend for adoption to the City Commission.

The findings suggest a tiered set of strategies that have been organized into immediate, near-term, and long-term approaches toward an enhanced Fort Lauderdale soundscape. In addition, the recommendations fall in three categories: administrative controls, engineering controls, and specific sound controls. Within these guiding organizational structures, there are recommendations that can be implemented within the scope of the existing Code of Ordinances, recommendations that will require revisions to that code, and recommendations for planning and permitting that represent a near-term approach toward long-term improvements in the Fort Lauderdale Soundscape. Immediate actions include possible use of improved sound level meters, training for noise control staff, the use of C-weighting in addition to A-weighting for measuring sounds with low frequencies such as amplified music. The adoption of a flexible measurement protocol for enforcement staff, expanding the use of the “Plainly Audible” metric, and possible trial periods of lower sound level limits to provide a basis for future changes to the municipal code. It is also recommended to consider raising the sound level limit threshold (currently 50 dBA) in residential areas to the nominal ambient levels measured at 55 dBA to 60dBA in areas of the city where this was measured. Even with higher ambient levels in urbanized areas, recommendations to limit loud vehicles are necessary to minimize noisy events that can disturb focus and health in residential and commercial areas. Near and long-term recommendations include efforts to improve health and well-being by reducing sound from loud sources, improving the noise insulation capacity of new construction that might be keyed to market value or user expectations, and to establish sound levels that provide for health and wellness throughout the city. To achieve these goals, Fort Lauderdale leaders should consider a system of sound study requirements for new entertainment venues and residences near entertainment districts similar to those required for transportation expansions.

City Of Fort Lauderdale Noise Ordinance Potential Action Items

Analysis of the measurement data included in the report, discussions with the Noise Control Advisory Committee and others related to the project have resulted in a list of potential action items for the City to consider implementing to fine tune the Noise Ordinance. Adjustments to measurement procedures and metrics are recommended to improve enforcement procedures and to help control amplified music sounds propagating to residential and mixed-use properties.

KEEP ENTERTAINMENT DISTRICT OVERLAY SOUND LEVEL LIMITS in Section 17-7-c.

1. Maintain the current sound level limits in the Ordinance. The overall sound level limits in the current Noise Ordinance are generally reasonable and are supported by statistical analysis of the measurement data collected in this study.

ADD C-WEIGHTED RESIDENTIAL SOUND LEVEL LIMIT TO TABLE 1 SECTION 17-6

2. Consider using a C-weighted, LCFmax, metric in addition to the A-weighted metric in all zoning categories. The dBC sound level would be 10 dB higher than the current dBA sound level.
    a. Consideration could be given to reducing the dBC to dBA difference to 5 dB after 11:00 p.m. or 12:00 a.m. after a 6 month or 12 month trial period of including the C-weighted metric for all measurements.
    b. Consider raising the night time sound level limit to 55 dBA and 60 dBC in areas of the City where the “Quiet ambient” and “General ambient” sound levels measured in this study are > 55 dBA/55 dBC. This includes buildings that are immediately adjacent to The Wharf, Riverwalk, and built up areas of the City.
    c. Consider raising the night time sound level limit to 55 dBA and 60 dBC in areas immediately adjacent to A1A and Seabreeze in the Beaches.
    d. The current 50 dBA sound level limit should remain in place in other areas of the City with lower densities and less vehicular traffic.
3. Consider extending the use of the “Plainly Audible” criterion for all sounds in all zoning categories. This would apply at residential properties farther than 500 feet from Entertainment Districts.

SOUND LEVELS IN AMPLIFIED MUSIC VENUES in Section 17.7.c and 17.7.d

4. Develop methods to enforce the current sound level limits in Entertainment Districts.
    a. Consider voluntary interior sound level monitoring of sound levels in entertainment venues to demonstrate compliance with the appropriate sound level limits.
    b. This could include self-monitoring of sounds inside clubs using a system like 10EZ; making approximate corrections for the ambient sound level contributions of multiple clubs by subtracting 10 dB from the measured sound levels as a potential interim solution before a more technically sophisticated solution can be implemented, using ANSI or ASTM procedures for correcting for the influence of background sounds and multiple contributors to the measured sounds, using an acoustic camera, multiple capsule microphone, or other sound measuring devices capable of determining the direction and level of individual sound sources or other technically feasible method.

5. Consider adding maximum interior sound levels inside clubs and entertainment venues to protect human and hearing health of occupants and staff. This may start at XX dBA and XX dBC and be gradually reduced over time.

COMPLIANCE TO SOURCE, RECEIVER AND PLAINLY AUDIBLE REQUIREMENTS in Section 17-7-c.

6. Add required compliance for sounds propagating from Entertainment Districts at residential receiving properties using the current dBA and dBC residential sound level limits in the Noise Ordinance. This would require special measurement procedures to implement.
7. Add required compliance for sounds propagating from Entertainment Districts to residential receiving properties using the current Plainly Audible criterion. This would require special measurement procedures to implement.

ENFORCEMENT OF SOUND LEVEL LIMITS WITHOUT NEED FOR COMPLAINANT in Section 17-3.

8. Consider monitoring of sounds propagating from entertainment venues by Code Enforcement staff on a proactive basis without the need to receive a complaint from a resident.

POTENTIAL NEED FOR SOUND LEVEL LIMIT AT SOURCE FOR VENUES NOT IN SPECIAL ENTERTAINMENT DISTRICT in Section 17.7-d.

9. A sound level limit may need to be set for clubs, bars and restaurants that are not in the Entertainment Districts to determine compliance. Alternately, compliance measurements could be taken at or near the locations of potentially noise exposed residences on City rights-of-way.

TECHNICAL REQUIREMENTS FOR METERS IN SECTION 17.4

10. Employ ANSI and ASTM standards for equipment used to verify compliance, measurement methods, metrics, etc.
11. Consider use of Type 1 sound level meters for greater measurement certainty.

TRAINING OF NOISE CONTROL OFFICERS IN SECTION 17.3

12. Require training in ordinance requirements, measurement procedures, accounting for multiple sound sources and other technical acoustical knowledge for enforcement staff on a periodic basis.

EXPAND SECTION 17-9 TO INCLUDE NOISE STUDIES FOR NEW ENTERAINMENT VENUES AND NEW RESIDENTIAL DEVELPOMENTS

13. Consider adjusting current zoning regulations to require a noise study for site plan approval for new and renovated projects with entertainment venues, amplified music, residential, office and mixed use projects so that the general planning of the projects and the Outside to Inside Noise Level Reduction (NLR) of the buildings would result in meeting Noise Ordinance requirements once they are built.
14. Consider adjusting current zoning regulations to include vertical zoning of mixed-use buildings with requirements for sound and vibration isolation of mixed uses analyzed in a noise study for the project.

AUTOMATIC LOUD VEHICLE DETECTION in Section 17-7-9.

15. Consider a pilot installation of vehicle noise detection systems to help address vehicle noise to determine if the technology is feasible to achieve the City's goals.

TRIAL PERIOD

16. Any modifications to the Noise Ordinance should be enacted for a trial period of 6 months without penalty and an additional 6 months where warnings are given to help establishments move into compliance where needed.

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INTRODUCTION

The City of Fort Lauderdale has evolved into a robust urban community with 24-hours each day of commercial activity, dense mixed-use activity centers, growing amounts of infill downtown housing, burgeoning destination retail, an active urbane nightlife, historic buildings, commuter rail transit, a street grid that is automobile and pedestrian friendly, and is home to the notable Riverwalk with an exceptional marine and pedestrian culture. This dynamic mix of uses, urban density, and high levels of activity with a benevolent climate that supports outdoor living leads to a complex soundscape with many desirable qualities. The City is looking to enhance compatibility among the different uses and stakeholders with different time schedules as the city continues to grow and become more complex.

Siebein Associates, Inc., in collaboration with the University of Florida School of Architecture, was engaged to conduct a study of the soundscape at multiple locations in the downtown area, designated activity centers, and locations that have been identified in collaboration with the City of Ft. Lauderdale Noise Control Advisory Committee. The study included 'sound walks' with Committee members and citizens in the designated areas, acoustical measurements of the soundscape, photographs, and maps of the areas under investigation. Short-term and long-term measurements of the soundscapes were conducted to assist in understanding the complexities of the soundscapes and how sounds change from early morning, throughout the day into the afternoon, and into the late evening. The acoustical data, field observations, and discussions with City staff, Committee members, and the general public, have been considered, and organized toward a comprehensive assessment of the areas of study in the City of Fort Lauderdale. This information is intended to support the work of the Noise Control Advisory Committee in making well-informed decisions on the priorities and balance for managing an active urban center with regard to shaping the soundscape. This report also provides recommendations for consideration to help improve compatibility among the various sound sources, entertainment venues, public spaces, residents and other stakeholders in the City of Fort Lauderdale. Fort Lauderdale's downtown, is unique in that there is both the 'main street' of Los Olas Boulevard and the second 'main street' of the New River and Riverwalk. Both are linked to transportation networks and host highly desirable pedestrian activities including dining, shopping, recreation, and nightlife. According to the Fort Lauderdale Downtown Development Authority (DDA), more than 50 developments are in the pipeline, some already underway, bringing more than 8,500 new residential units and 725,800 square feet of new restaurant and retail space (New York Post, February 2023). Fort Lauderdale is emerging as a unique model for growing a dense, demographically diverse, coastal urban lifestyle. As new residents come to Fort Lauderdale for the attractive mix of people, recreation, and entertainment they contribute to an active soundscape that includes all of the sounds found in complex urban environments including active socialization, gathering, special events of many types, cars, trains, boats, mechanical equipment, construction and amplified music. These sounds are balanced with the desire of residents to have normal repose inside their homes in the presence of activities in the urban core.

The current noise ordinance, Chapter 17 – Noise Control, of the City of Fort Lauderdale Code of Ordinances, designates A-weighted (dBA) sound level limits for daytime and nighttime hours with both A-weighted and C-weighted (dBC) maximum sound levels for use when measuring amplified sound. There is sometimes confusion about which sound levels and times of day are to be applied to different areas of the City. The measurement locations are also defined in the ordinance. The sound level limits and measurement procedures for foreseeable boundary situations are also defined in the ordinance. However, there are some indications of reported situations where sounds may be measured within the current sound level limits at points of enforcement, but are found as potentially disturbing at receiving locations in some instances. A major focus of this work, as overseen by the Noise Control Advisory Committee, is to offer

alternatives for consideration that can potentially be prioritized and implemented by the Committee toward enhancing sonic compatibility among the different uses as the city continues to grow.

The Soundscape Team including Siebein Associates, Inc., staff, and University of Florida faculty and students surveyed multiple locations, selected in consultation with the Noise Control Advisory Committee. Each site was visited multiple times during 2 weekends in the daytime, evening, late evening, and early morning hours. Each site was visited multiple times in February and again in April of 2023. Sound walks were conducted at each location. A soundwalk is a unique way of experiencing and measuring the acoustical aspects of urban environments. Consultants with sound measuring equipment walk through an environment documenting the sound levels, frequency content, sources of sound and other technical aspects of the soundscape while also discussing acoustical issues of concern with project stakeholders and observing the sonic and urban context. The sound walks in Fort Lauderdale included walks through the selected study areas with stakeholders to discuss issues of concern, their impression of possible strategies that could be implemented to enhance sonic compatibility among different uses, and to document the sonic context with sound level measurements, video recordings, and photographs at a variety of moments within the designated neighborhood locations. Two sets of unattended long-term acoustical measurements were also made. The first set was made at locations near entertainment venues where there had been acoustical concerns expressed in the past. The second set was made at locations near residential receivers where issue had been raised in the past.

METHOD

1. Sound walks were conducted with the soundscape team and residents, entertainment venue operators, City staff, and members of the Noise Control Advisory Committee through the neighborhoods in the designated study areas to document the range of conditions that are experienced daily. These soundwalks were made at different times of the day to qualify the different sonic conditions that occur throughout the day, evening, late night, and early morning on a typical weekend. Stakeholder concerns were noted and videos and photographs of the neighborhood conditions along with various spot sound level measurements were taken to qualify the types and levels of ambient and transient sounds in the neighborhoods.

2. Short-term sound level measurements were made of individual specific acoustic events to the extent that the sounds could be isolated and identified from the other sounds present at the time. This was done in the day, evening, late evening, and early morning hours at multiple sites within the designated study areas.

3. Long-term acoustical measurements were taken near identified sound sources and receiver locations. These measurements are taken continuously for 5 to 7 days at each of 12 locations. The data were used to calculate long-term average sound levels, document ambient sound levels, and identify sonic events that occurred during the measurement periods.

4. The data were analyzed, grouped, and presented to document existing conditions and to understand the quantitative sound levels of different sound sources, receivers and locations in the City.

5. Three dimensional computer models were built of selected sound transmission paths to understand the relative sound levels experienced at grade and above grade at selected locations for different sound sources and receivers.

6. The current Noise Ordinance was reviewed relative to the measured data and documented concerns expressed by stakeholders.

7. Building infrastructure was observed at selected locations to understand how the building elements may contribute to sound propagation and to determine the potential for planning, zoning, and code adjustments to contribute to future enhanced sonic compatibility in new and renovated construction.

8. The data were synthesized and recommendations provided to address each issue for consideration by the Committee and City.

SOUND LEVEL MEASUREMENT AND DECIBELS

Sound is defined as a pressure disturbance in the air caused by a vibrating body that is capable of being heard or detected by the human ear. The average sound pressure level or equivalent continuous sound level (LAeq) of a time-varying sound is defined as the level of an equivalent steady sound at a specific location for the same measurement duration that has the same A-weighted sound energy as the time-varying sound. The maximum A-weighted sound level or LAmax is the greatest sound level measured on a sound level meter using fast time averaging during a designated time duration and an A-weighted filter.

An A-weighted sound level (dBA) is one to which an A-weighting filter has been applied. The A-weighting filter approximates the sensitivity of the human ear being less responsive to low frequency sounds. A-weighting deducts significant amounts of sound energy from the low frequencies preferencing the high-mid frequencies that the ear is most sensitive to. The mid-high frequencies are actually increased by (1.3 dB at the 2,500Hz frequency band) in the A-weighting process. Conversely, lower frequency or bass sounds are decreased by substantial amounts (-26 dB in the 63Hz Frequency band, -16 dB in the 125 Hz octave band, - 7 dB in the 250 Hz octave band among others). C-weighted sound levels filter out much less low frequency sound (-1 dB in the 63Hz frequency octave band) than A-weighted sound levels while both A and C weightings are more similar in the high frequencies. A 'flat' or unweighted measurement is referred to as Z-weighted. In this Z-weighted case, no weighting is applied to the measured sound levels in different frequency bands. There are no deductions or additions of any level in different frequency bands with the Z-or flat-weighting.

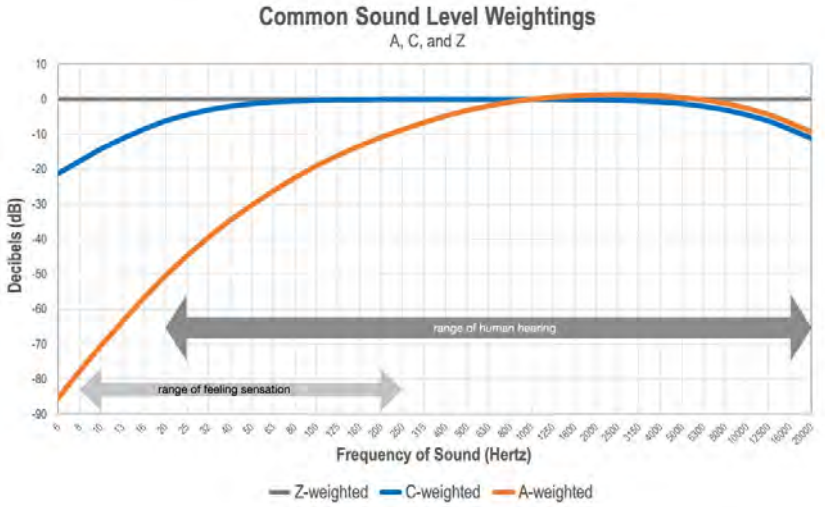


Figure 1. Sound level weightings showing corresponding reductions in the 1/3 octave frequency bands for each weighting factor. Note that A-weighting adds approximately 0.5 to 1.3 dB to each 1/3 octave band sound level in the 1,250 Hz to 5,000 Hz 1/3 octave bands and deducts substantial amounts of lower frequency or bass energy from the overall sound level.

Sounds are typically measured in decibels. A decibel is 10 times the logarithm to the base 10 of the pressure disturbance in the air compared to the pressure at the threshold of human hearing. Decibels cannot be simply added by summation because they are logarithmic ratios. For example, 2 sounds of 50 decibels each added together result in a sound of 53 dB, not 100 dB as simple addition would achieve. A summary of the way that sounds with different sound levels are added together is shown in Table 1.

Table 1. Examples of the addition of sound levels (dBA).

Sound level 1	Sound level 2	Combined sound level	Explanation
50 dBA	50 dBA	53 dBA	When two sounds of equal level are combined, the result is a 3 dB increase in sound level
50 dBA	52 dBA	54 dBA	When one sound is combined with another sound that is 2-3 dB louder than first sound, the combined sound level is 2 dB louder than the louder sound
50 dBA	55 dBA	56 dBA	When one sound is combined with another sound that is 4-7 dB louder than the first sound, the combined sound level is 1 dB louder than the louder sound
50 dBA	60 dBA	60 dBA	When one sound is 10 dB louder than another, the combined sound level is approximately equal to the louder sound level

The differences in sound levels are not perceived by people linearly either. One sound must be 10 dB louder than another sound for it to be heard as approximately twice as loud as the first sound. A sound that is 0 to 1 dB louder than another sound is heard as approximately the same loudness as the first sound. A sound that is 2 to 3 dB louder than another sound is heard as barely louder than the first sound. A sound that is 5 to 6 dB louder than another sound is heard as noticeably louder, but not twice as loud as the first sound. A summary of the perception of the relative loudness of two sounds is shown in Table 2. An acoustic thermometer showing the sound levels associated with different sounds is shown in figure 1. The sound levels are measured in A-weighted decibels or dBA. An A-weighted decibel is one that has been adjusted so it corresponds to the relative loudness of middle level sounds as they are heard by human listeners. The low frequency or bass sounds are reduced by the A-weighting process and the higher pitch sounds that human ears are more sensitive to are increased slightly by the A-weighting process.

Table 2. Perception of the relative loudness of 2 sounds.

Difference in sound level between two sounds	The louder sound is perceived as ____ the quieter sound
0 to 1 dB	Not noticeably louder than
2-3 dB	Barely noticeably louder than
5-6 dB	Noticeably louder than, but not twice as loud as
10-12 dB	Approximately twice as loud as
15 dB	Approximately three times as loud as
20 dB	Approximately four times as loud as

In general terms, sound levels of 30 to 40 dBA are usually perceived by people as being relatively quiet. Normal conversation measured at approximately 3 feet from the person speaking is 60 to 65 dBA. Cars

passing on a street or a residential air-conditioning unit are approximately 65 to 75 dBA. Loud night clubs and amplified music at concerts are often played at levels of 100 to 110 dBA.

Sounds can also be feelable. In particular, sounds below 250Hz can be felt through the mechanoreceptors that sense vibration and pressure as part of our sense of touch. High levels of low frequency sound, extending to frequencies as low as 5Hz, can be felt in the chest, legs, arms, and head – even though the sounds cannot be heard. Low frequency sounds from mechanical equipment or amplified music both within a building and outside a building can impart vibrations within building structural and enclosure systems that can be re-radiated as airborne sound, typically in the low frequencies, to the occupants inside the spaces. This reradiated sound can result in people feeling and hearing sound inside a space that may not be measurable, audible or feelable outside the space.

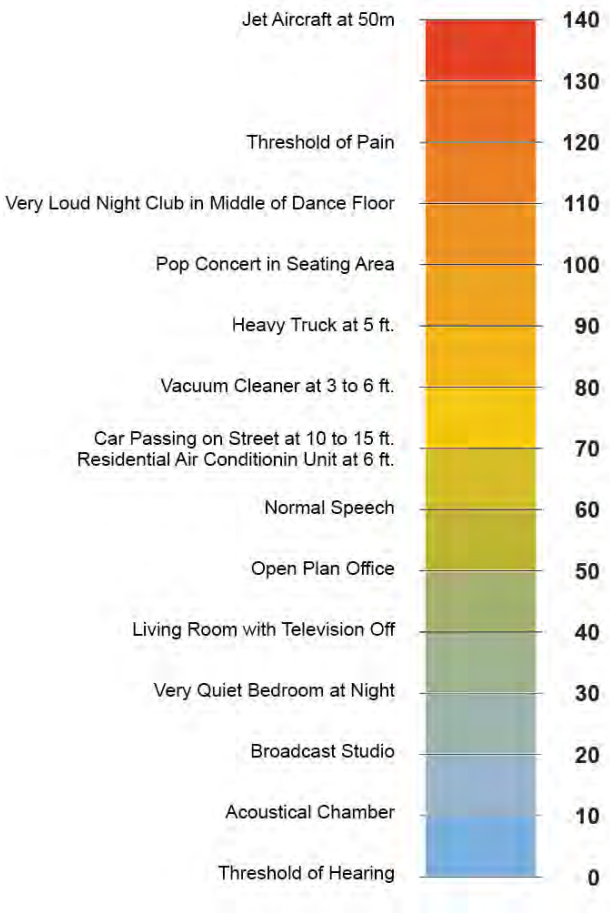


Figure 2. Acoustical thermometer showing the relative loudness in dBA of various sounds.

FORT LAUDERDALE NOISE ORDINANCE SUMMARY

The current noise ordinance of the City of Fort Lauderdale has a number of strategies to limit noise from disturbing its inhabitants.

It includes the following:

1. **Special entertainment Overlay District.** Dedicated areas where entertainment venues are classified as special entertainment overlay districts. Large cities often have areas where night time entertainment establishments exist. These are often categorized as entertainment districts and include a fairly dense geographical area, typically in the downtown, that allows higher sounds levels from amplified music in these areas. Where these directs are located, in terms of acoustic land use compatibility, these districts would be better located in a commercial district where only commercial adjacencies are located.

Table 3. Sound level limits contained in the Ft. Lauderdale Noise Ordinance compiled from Table and text

MAXIMUM PERMISSIBLE SOUND LEVEL LIMITS			
	Times	Outdoor	Indoor
Residential	7 am – 10 pm 10 pm – 7am	**60 dBA** ***65 dBA** if residential is within Commercial, Industrial or Mixed or within 200 ft of such **80 dBA** (Impulsive sounds that occur less than 4 times in 1 hour) **50 dBA** **70 dBA** (Impulsive sounds that occur less than 4 times in 1 hour)	45 dBA 35 dBA
Commercial	24 hours	65 dBA	55 dBA
Industrial	24 hours	75 dBA	65 dBA

SPECIAL ENTERTAINMENT DISTRICT			
Measured 5 ft from building, structure or establishment	Mon-Thur 12pm to 12am	85 dBA, 95 dBC	
	Mon – Thur 12am-2am	70 dBA, 80 dBC	
	Mon-Thur 2am-12pm	65 dBA, 75 dBA	
	Fri-Sun 12pm to 1am and Legal holidays	85 dBA, 95 dBC	
	Fri-Sun 1am-3am and Legal holidays	70 dBA, 80 dBC	
	Fri-Sun 3am-12pm and Legal holidays	65 dBA, 75 dBC	

2. **Sound level change for days/times**. Different sound level limits at different days and times for source measurements enforcement.

3. **Sound Level Limit Weighting**. Provides A and C weighted sound level limits at the source. The difference between the A and C weighted sound level limits is 10 dB.

4. **Measurement Metric**. An Lmax is defined as the maximum sound level measured during the sound measurement period and is the measurement metric for source sound levels.

5. **Receiver sound level limits**. Provides receiver sound level limits measured at grade during the day and night for residential, commercial and industrial uses.

6. **Indoor and Outdoor limits**. Provides residential, commercial and industrial sound level limits both outdoors and indoors.

7. **C-weighted sound level limit within "premises" from "amplified sound device".** There is a provision to limit sound level limits "within premises" for commercial, mixed use or industrial uses. This may be an attempt to limit amplified music entertainment sound levels inside mixed use spaces, however "premises" is not defined in the noise ordinance. It may mean inside the physical building or it may mean the entire property including the building, site and outdoor spaces on the property.

Table 4. Sound level limits contained in the Ft. Lauderdale noise ordinance that relate to Commercial, Mixed Use or Industrial occupancies.

COMMERCIAL, MIXED USE OR INDUSTRIAL			
	Time of Day	dBA Limit	dBC Limit
Measured within the premises of a complainant	12pm-10 pm	Use limits in Table 1	60 dBC
	10pm – 12 pm	Use limits in Table 1	55 dBC

***Sound level limits from Table 1 apply when measurements are taken outdoors or within the property line of the complainant**

9. **Continuous sound**. Continuous sound is defined as any sound with a duration of more than 1 seconds, as measured with a sound level meter set to the "slow" response.

10. **Plainly audible limit in residential area.** In residential areas, Section 17-7 states that amplified "sound shall not be plainly audible for a period of one (1) minute or longer at a distance of twenty-five feet or more when measured from the source property line between 10:00. p.m.-7:00 a.m, or at a distance of fifty feet or more when measured at the source property line between 7:00 a.m. and 10:00 p.m.

11. **Noise Management Plan for Construction of large public works transportation projects**. If large scale transportation projects exist, the noise ordinance calls for a fairly robust noise management plan, which includes among others, a "description of the anticipated noise impact of the construction on adjacent properties, how the plan might mitigate negative impacts, continuous noise monitoring during the construction period, the results of a baseline ambient A-weighted sound level noise study, etc.

Special Entertainment Overlay Districts

The City of Fort Lauderdale has implemented, through the Code of Ordinances, Special Entertainment Overlay Districts (Chapter 5: Alcoholic Beverages, Article III Special Entertainment Overlay District). These special areas are located in urban areas with mixed uses noted as Regional Activity Centers (RAC) and are intended to:

> *… create the opportunity to and encourage the development of areas which promote the cultural, economic educational and general welfare of the people of Fort Lauderdale in conjunction with the development of areas catering to and promoting tourism and providing entertainment centers for the utilization and enjoyment of the public.*
>
> Sec 5-51. Code of Ordinances, City of Fort Lauderdale

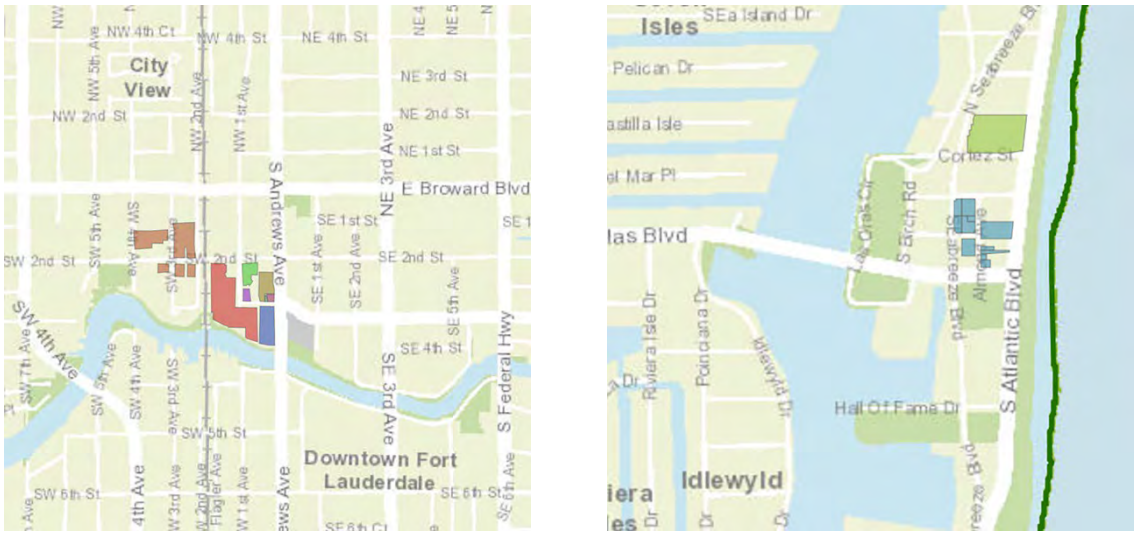


Figure 3. Maps showing Downtown (left) and Beach Entertainment Districts.

As illustrated in the maps in Figure 3, the special overlay districts are generally limited to individual properties or a collection of properties within a single urban block. Amplified music generated in the overlay districts is given specific limits crafted to specific hours, days of the week, and any holidays allowing activities to occur until 2:00 am on weeknights and 3:00 am on weekends and holidays. Sound level measurements taken to evaluate compliance with the ordinance are designated to be taken at five feet (5') from the property line of the sound source. The measurement duration is a 30 second period and there are to be no less than three (3) 30 second measurement durations. Measurement of the Lmax (maximum level) during the 30 second period is used to determine if the sound is in compliance with the code. A-weighted or C-weighted Lmax levels may be used to evaluate the sound based on the limits and times of day/week graphed in Figure 4 below.

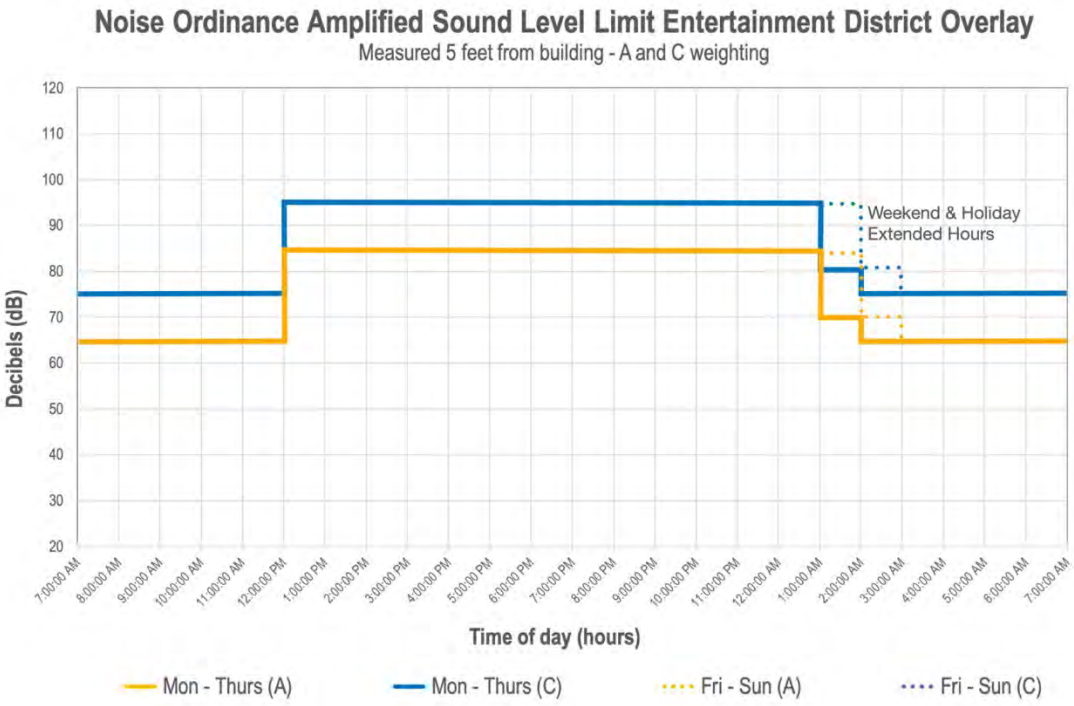


Figure 4. Allowable amplified sound levels within Entertainment District Overlays. The blue lines are for C-weighted sound levels (dBC). The orange lines show the limits for A-weighted sound levels (dBA).

Commercial, Mixed Use, Industrial and Adjacent Residential Districts

Commercial, Mixed-Use, and Industrial areas are regulated differently than the Entertainment Overlay Districts noted earlier in this report. Both within these areas and when they are adjacent to residential properties, sounds emanating from given sources, are measured at the property line of the resident or commercial property owner's property line who complains about the noise. Allowable sound level limits for the complainant's property designation, such as Residential Use, apply during the measurement. Table 3 lists the allowable levels of noise sources.

In addition to the sound level limitations noted in Table 3, for general noise, the Fort Lauderdale municipal code also prescribes Specific Restrictions (Section 17-7 of the Code of Ordinances) on amplified sound of any type. Amplified sound shall not be plainly audible for a period of one (1) minute or longer at a distance of twenty-five (25) feet or more when measured from the source property line between the hours of 10:00 p.m. and 7:00 a.m. daily. Amplified sound shall not be plainly audible for a period of one (1) minute or longer at a distance of fifty (50) feet or more when measured from the source property line between the hours of 7:00 a.m. and 10:00 p.m. daily.

Amplified sound covers all forms of content including music, bass sound, speech, and any other type of amplified sound. In 2017, Florida Statute, F.S. §316.3045 was ruled unconstitutional based on an exception to amplified sound for businesses (ice cream truck) and political content. In 2022, the Florida Legislature revised F.S. §316.3045 to remove the exception for business and political content. Courts in the US have

generally agreed that ‘clearly audible’, ‘plainly audible’, or ‘loud and raucous’ are sufficiently clear and can be used as a basis to regulate sound.

The Fort Lauderdale Code of Ordinances also identifies specific limitations for impulsive sounds, animal sounds, HVAC equipment, emergency generators, boats, construction, and commercial sanitation. The latter two are limited to operations between 7:00 a.m. and 10:00 p.m. and all equipment used during those hours must have the muffling equipment provided by the original manufacturer installed.

Table 5: Allowable noise levels at the complainant’s property for sounds other than amplified music.

	Times	Outdoor	Indoor
Residential	7 am – 10 pm	**60 dBA** ***65 dBA** if residential is within Commercial, Industrial or Mixed or within 200 ft of such **80 dBA** (Impulsive sounds that occur less than 4 times in 1 hour)	45 dBA
	10 pm – 7am	**50 dBA** **70 dBA** (Impulsive sounds that occur less than 4 times in 1 hour)	35 dBA
Commercial	24 hours	65 dBA	55 dBA
Industrial	24 hours	75 dBA	65 dBA

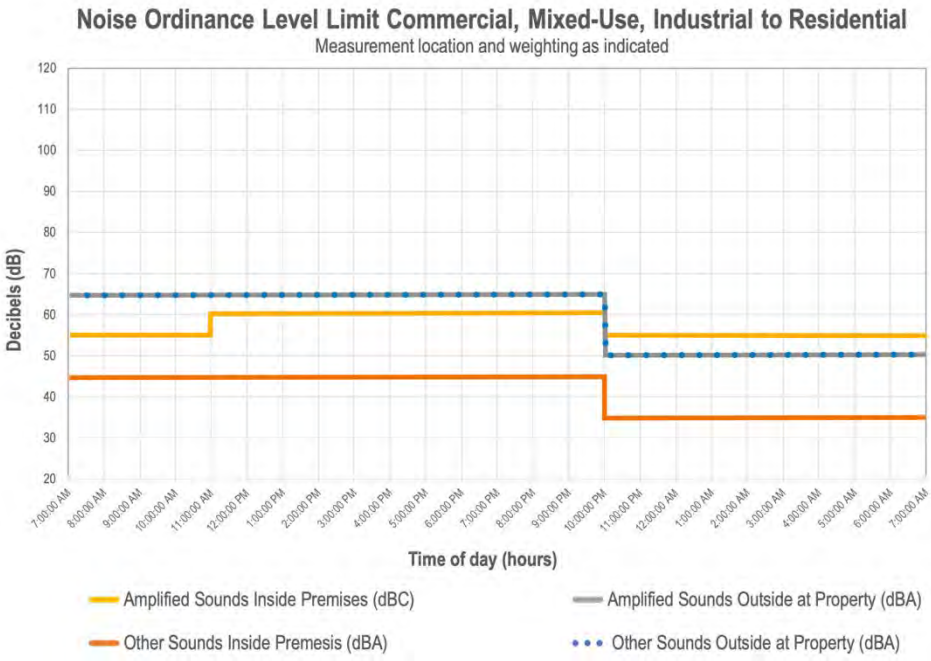


Figure 5. Noise level limits in commercial, mixed-use, industrial, and residential districts plotted over twenty-four (24) hours.

ACOUSTICAL STUDY METHOD

MEASUREMENT TIMES

Acoustical measurements were made by the Consultants during two trips to Fort Lauderdale. The first trip was from Thursday, February 16, 2023, until Sunday, February 20, 2023. The long-term meters were picked up on February 26, 2023 after recording data continuously for 9 to 10 days. The second trip began on Friday, April 21, 2023, and lasted until Sunday, April 23, 2023. The long-term meters were picked up on April 25, 2023 after recording data continuously for 5 days.

MEASUREMENT AND INSTRUMENTATION

Three types of acoustical measurements were made; long-term measurements of existing ambient sound levels; short-term measurements made at multiple locations during soundwalks at different times of the day and night; and short-term sound levels of specific acoustical events and locations.

Measurement of Sound in Complex Urban Contexts

The context of high and mid-rise structures around the open-air venue has a substantial impact on how sound radiates from the source into the city. There are four dominant phenomenon that effect the loudness and frequency content of sound in dense urban environments that might be heard at a given residence or receiver location in the vicinity of the sound source.

1. **Acoustical line of sight** is the primary path from the sound source to the receiver and in this high-rise context, multiple residences have a direct line of sight from their balcony or window to the Wharf, which is also a direct, unobstructed sound path from the source to the receiver.
2. **Reflective Amplification** is the increase in loudness of sounds reflecting off building surfaces that can subsequently reinforce and increase the loudness of the sounds at specific receiver locations.
3. **Acoustic Shadows** can reduce the sound levels near the source, if there is a physical barrier or obstacle between the sound source and the receiver.
4. **Environmental Filtering** occurs as sound is reflected by buildings, travels through the air, encounters vegetation, and then is transmitted through building materials. In the context of downtown Fort Lauderdale, higher frequencies are typically filtered out when being reflected, traveling through the air, encountering trees or vegetation, and transmitting through building materials such as walls and windows. The remaining sound energy is often in the lower frequencies or bass sounds. As amplified music also typically has repetitive low-frequency sounds, the remaining bump, bump, bump, without the musical context, can be annoying to people of normal hearing sensitivities and also difficult to measure using typical overall A-weighted sound levels.

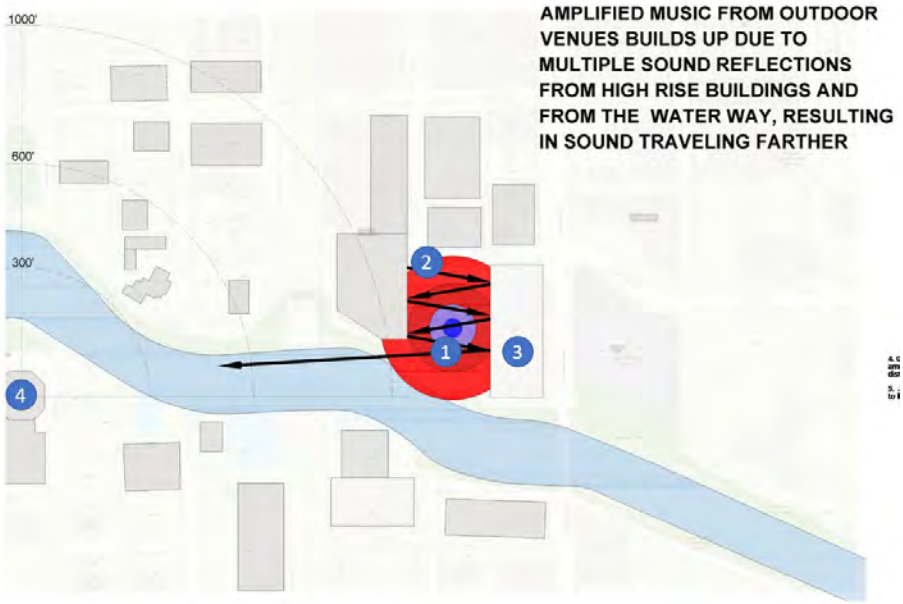


Figure 6. Conceptual sketch showing reflected sound from the Wharf building up as it reflects off the buildings that surround it and then propagates off site. (MR)

When measuring the amplified sound at locations with fences or other barriers in Entertainment Districts such as the Wharf or the Rock Bar, the wooden fences could potentially reduce sound levels in the vicinity of the fence outside the establishment at 5 feet from the fence depending upon the exact height and distance relationships between the loudspeakers making the sounds, the top of the fence and the location of the sound level meter. The fence could have an attenuating effect reducing the sound level measured at the five-foot distance designated in the Ordinance. Consideration could be given to measuring the sound levels above the fence line at a specified distance, finding a location along the source property boundary that is open with no obstructions in the sound path, measuring at a vertical height that represents the acoustical line-of-sight to the potential receivers, or measuring at affected receiving properties. One of these strategies would help to measure the sound that is propagating to potentially affected properties nearby so that the measured sound levels are more representative of the sounds heard by people in their homes or on their balconies.

Measuring amplified music on the A-weighted scale greatly reduces the impact of low frequency or bass sounds on the overall measurement. Using a C-weighting measurement or octave band measurement could improve the correlation between the measured levels and concerns of receivers in and near the Entertainment Overlay Districts.

Alternately, measurements at the receiver locations could account for the factors of sight line, reflective amplification, and environmental filtering. Identifying locations of historic, present and potential future concerns and outfitting them with sound monitoring equipment, could provide the necessary information in real time to control the sound level at the source to reduce disturbances.

Long-term Instrumentation

The long-term measurements were made with 3 Svantek SV 307A meters and 2 Rion NL-52 sound level meters on Trip 1 in February and with 6 Svantek and 2 Rion NL-52 and 1 Rion NL 32 sound level meters in April. The Rion NL-52 and NL-32 meters meet ANSI requirements for type I sound level meters. The Rion equipment was calibrated with a Larson Davis CAL200 pistonphone prior to and after testing. The

calibration levels were 114 dBA and varied by < ±0.1 dB from the beginning of the measurement periods to the end. The microphones on the Rion meters were attached to an extension rod and the environmental cases strapped to trees or mounted on a tripod on a residential balcony approximately 6 ft. to 8 ft. above ground level.

The Svantek SV307A meters meet the IEC 61672-1:2013 for Class I sound level meters. The meters were set to the fast, A-weighted mode to acquire data. The Svantek SV 307A meters are internally calibrated before and after each use. The Svantek meters record files continuously during the measurement period and the files are uploaded to a cloud server for later use and analysis. The microphones were covered with wind screens and positioned approximately 6 ft. to 8 ft (above reach height) above grade chained to trees, mounted on tripods, or chained to balcony railings at residential units.

The meters were placed in secure weatherproof boxes and set to record sound levels every second for approximately 5 to 10 days. Graphs illustrating the A-weighted the maximum A-weighted and C-weighted sound levels (LA max and LC max), plotted vs. time for each time period are shown in Appendix A. Data were downloaded from the meter's memory card to a laptop computer and analyzed in our office.

Short-term Instrumentation

The soundwalks and short-term measurements were made with Larson Davis 831 sound level meters as the basic instrumentation. These meters can record overall, octave and one-third octave band sound pressure levels over user programmed time periods. The meters meet ANSI standards for Type 1 sound level meters. Calibration of the meters with a Larson Davis Cal 200 calibrator occurred before and after each measurement period. The calibration levels were within ±0.1 dB from the beginning of the measurement period to the end. The meters were hand held or tripod mounted with the microphones on the meters at a height of approximately 5 ft. 6 in. above grade. Windscreens were attached to the microphones for all measurements. Overall A-weighted, C-weighted, and octave band spectra of significant acoustic events were recorded at all locations. The data were downloaded to desktop computers in our laboratory where the data were analyzed.

Soundwalk Instrumentation

The Larson Davis type 831 sound level meters described in the section above were also used to take the measurements during the soundwalks. The meters were handheld at approximately 5 ft. 6 inches above grade during the sound walks. A windscreen was attached to the microphone for all of the measurements. The same calibration procedures described in the section above were used for the meters during the soundwalks.

LONG-TERM ACOUSTIC MEASUREMENT LOCATIONS

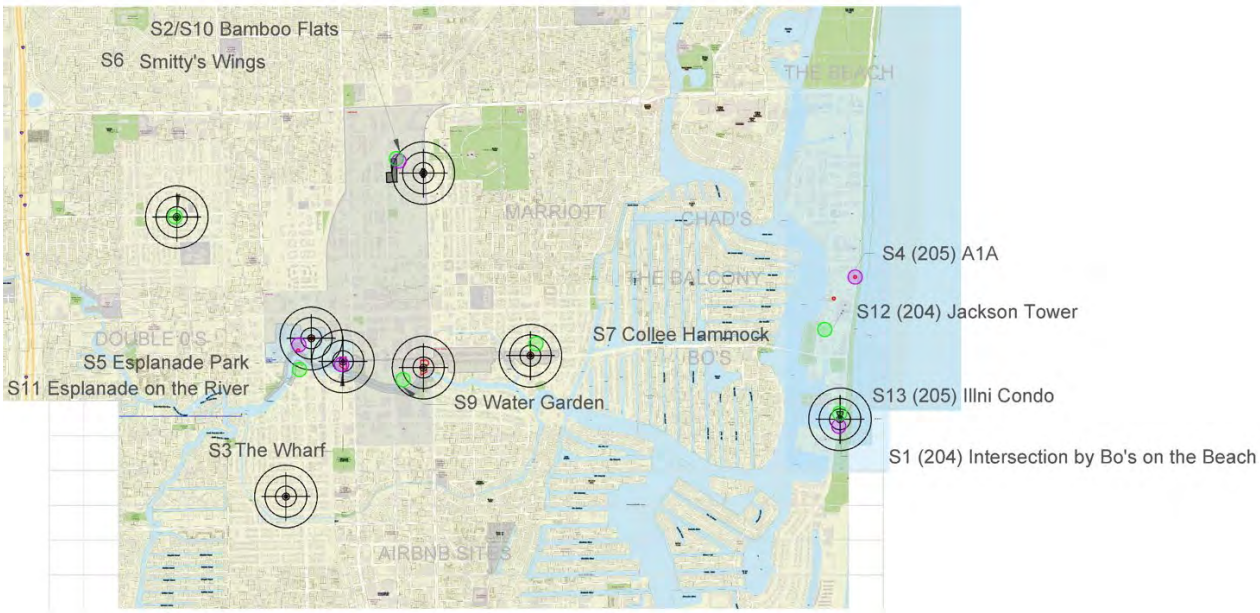


Figure 7. Map of Ft. Lauderdale showing the long-term measurement locations. Purple circles indicate long-term meter locations from Trip 1. Green circles indicate long-term meter locations from Trip 2. MR-MISSING AIA NORTH AND AIA SOUTH NEED BULLS EYE AT JACKSON TOWER

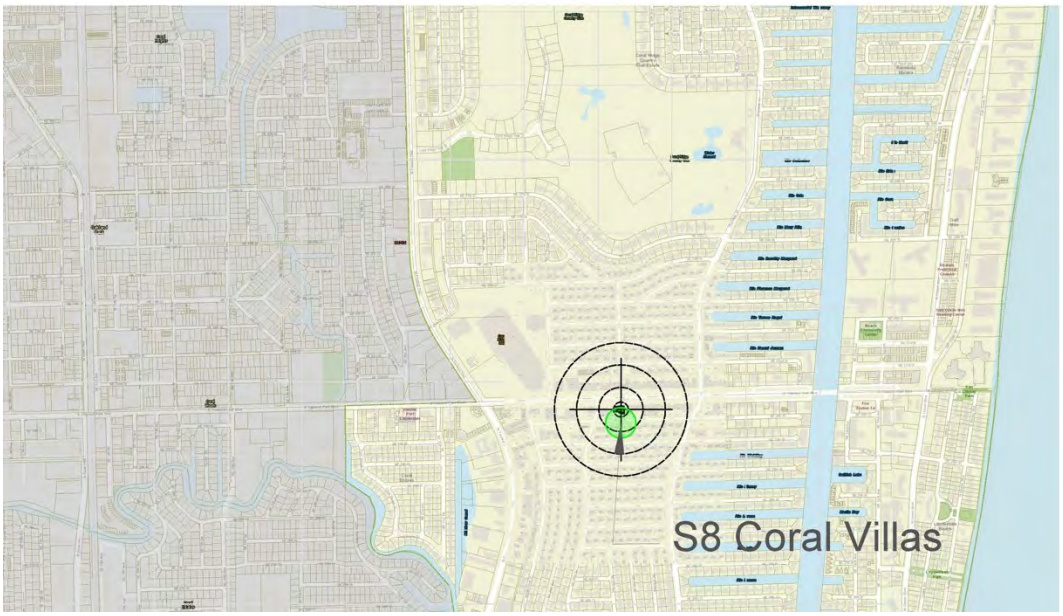


Figure 8. Map of Ft. Lauderdale showing the long-term measurement location in the residential area outside of Truth Lounge. The green circle indicates this is a long-term meter location from Trip 2.

Long-term measurements were made during 2 trips to Fort Lauderdale. Measurement locations during the first trip were at locations near entertainment venues where noise issues had been identified in the past. Measurement locations during the second trip were at locations near residential receivers who had expressed concerns about entertainment noise in the past. Sound level meters were placed in each of the zones identified by City staff and the Noise Control Advisory Committee (NCAC) as being representative of the different sections of the City described above. Appendix A contains graphs of the data from the long-term measurements plotted as dBA and dBC vs. time for each day (24-hour period of time). Appendix B summarizes the long-term data in tables where the measured sound levels are broken out by the times of day and night when they occurred.

Trip 1 Measurement Locations

1. **The Riverwalk near The Wharf**
   Rion 7 was mounted in a tree in a small garden in the Riverwalk adjacent to the New River across a public open space from the Wharf. The Wharf is an entertainment district that is adjoined on 2 sides by residential/mixed use towers. There are openings between the towers across the New River to the south and into the city center via SW 1st Avenue to the north. The meter recorded sounds of activities in the public open space, boats and people moving along the New River and activities in and around The Wharf. This is a very active area with pedestrians moving along the Riverwalk all day long, the active Wharf and the water craft moving along New River.

2. **Esplanade Park between the Stage and the Restroom Building**
   Rion 8 was located in a tree between the stage and the Restroom Building in Esplanade Park. This is a relatively quiet location when there are no events in the park because it is reasonably far away from SW 2nd Street. There was a special event in the park on Saturday during the measurement week. There was also Jazz in the Park on the Sunday of the measurement week. The Himmarshee Entertainment District is located to the east of the park.

3. **Median of AIA on the north**
   Svantek 205 was located in a tree in the median on the northern side of A1A where it separates into separate northbound and southbound lanes. Data were only recorded for 4 days with this meter due to a malfunction of the external battery for the unit. Sounds at this location are primarily vehicles traveling on A1A.

4. **Median of AIA on the south**
   Svantek 204 was located in a tree in the median on the southern side of A1A where it separates into separate northbound and southbound lanes. Sounds at this location are primarily vehicles traveling on A1A and secondarily sounds from Bo's on the Beach and events in the beachfront park.

5. **Flagler Village**
   Svantek 203 was located in a tree on the side of NW 4th Avenue street at the northern end of Flagler Village just south of NW 6th Street. The north side of Flagler Village adjoins an area that has several entertainment venues located in it, some of which play amplified music. Flagler Village is a relatively quiet residential development with a commercial area located on NE Flagler Drive. There is a train line on the west side of Flagler Village and there are several entertainment venues located across the railroad tracks that have amplified entertainment in them. These venues are

buffered from residential occupancies at the present time by distance and the commercial activities along NE Flagler Drive. Future development on open parcels in this area may need special planning to provide acoustical compatibility with the existing venues.

6. **Smitty's Wings**
   A sixth sound level meter (Rion 7) was placed in a tree in a parking lot just west of Smitty's Wings. There was a technical error in the writing of the measured data to the meter hard drive so data were not available from this meter. The meter was successfully deployed during Trip 2 at the same location.

Trip 2 Measurement Locations

1. **Illni Condominium upper floor unit balcony/Bo's on the Beach**
   
   Bo's on the Beach was identified as a source of noise complaints for residents living in the Illni Condominium in the past along with loud cars and motorcycles traveling on AIA. Bo's has an operable louvered roof and operable windows that are opened frequently while amplified music is played in the dining establishment. The music is usually played on weekends. The Illni tower is across an alley from Bo's on the Beach and residential units overlook the roof of Bo's. Svantek Green 205 was located on the balcony of a residential unit on the 10th floor of the building. According to the resident, the music had been loud enough in the past to shake glasses in the cabinets, however it has not been that loud anymore. The resident stated that they have called the establishment when the music gets too loud and asks them to turn it down. According to the current noise ordinance, because this building is located within 200 ft of a commercial establishment, the residential sound limit would be 65 dBA during the day.

2. **Jackson Tower 6th floor mezzanine/Rock Bar backyard patio**
   
   The Rock Bar was identified as a source of complaints for residents living in Jackson Tower in the past. The Rock Bar has an outdoor dining area to the east on A1A and a patio with a pool area to the rear. Residents have identified sounds coming from the pool area as being the source of amplified music that is heard. The east side of the residential tower has a direct line of sight both visually and acoustically to the rear pool area. There is a solid fence along the west side of the outdoor activity area that would possibly reduce sounds measured at 5 ft. from the property boundary to be within the sound level limits of the noise ordinance, while sounds can move over the top of the wall and propagate to the multi-story condominium across Seabreeze. Svantek Red 204 was located on the mezzanine walkway on the sixth floor of the building facing the Rock Bar and Sea Breeze. Music from the Rock bar was plainly audible on grade and on 6th floor facing Rock bar. Bass music was plainly audible during afternoon hours when the long-term meter was placed at this location.

3. **Bamboo Flats/Rose and other entertainment venues**
   Svantek 291 Pink was placed in a tree at the top of the fence separating one of the residential units on the north side of Bamboo Flats from the adjacent properties on the north. The location is diagonally across NE NE 8th Street from the measurement location. The Bamboo Flats neighborhood was described in the section on Trip 1 measurement locations.

4. **Water Garden upper floor unit balcony/Yolo**

Yolo has been identified as a source of noise complaints in the past for the residents in the Water Garden. Yolo has an outdoor area covered with a canopy that has amplified music. Measurements were taken on the balcony of a residential unit on the 26th floor of the Water Garden facing Yolo with Svantek 284 orange. Data were only available for 4 days with this meter due to a malfunction of the cord connecting the meter to the external battery. There is a direct line of sight from the balcony to Yolo. The lower floors of the Water Garden are partially blocked from a direct sound path to the entertainment sounds by the parking garage that is located between the 2 buildings. Furthermore, the ambient sound levels at grade are elevated compared to those above due to the presence of mechanical equipment and traffic on the streets at the street level.

The resident stated that on Friday and Saturday nights she typically has to wear ear plugs when she goes outside on the balcony and wears ear buds when she is inside the unit.

5. **Esplanade on the New River upper floor unit/Himmarshee Entertainment District and The Wharf**

The Esplanade on the New River is a multi-story condominium building that is located on the south side of the New River across from the Esplanade Park. The Himmarshee Entertainment District is located approximately 630 to 750 ft. to the north-northeast of the building. The Wharf Entertainment District is located approximately 1,100 ft. to the east-northeast. Svantek 282 Purple was located on the balcony of an upper floor unit in the building. There are clear direct sound paths from the balconies on the northwest, north and northeast sides of the building both entertainment districts and also to the Riverwalk and Esplanade Band Shell where special events are held in addition to Sunday Jazz Brunch in the park. Boats in New River with loud engines and/or playing amplified music also have direct acoustical lines-of-sight to the units. Interestingly, the configuration of balconies on multi-story residential buildings captures the direct sound from the sound sources. In addition, sounds propagating upwards strike the underside and side walls of the balconies are reflected back to the balcony increasing the perceived loudness of the sounds.

Sounds at this location were especially difficult when a night club that has since closed was operational. The amplified sounds, especially the bass sounds, could be clearly heard inside the units even when the large, hurricane patio doors were closed. Residents also spoke of how the sounds from the entertainment districts now last until 4:00 am when previously the limit was at midnight.

6. **Colee Hammock/The Balcony and the service alley**

Colee Hammock is a traditional residential neighborhood about ½ block off Las Olas Boulevard. The first row of residences are separated from the Las Olas commercial strip by a service alley. There are many activities in the service alley such as trucks coming to service the restaurants along Las Olas during night time hours that residents expressed concerns about as well as building equipment and amplified music. Rion7 was placed on an exterior balcony at a residence whose rear yard was along the alley. The residence was diagonally across the alley from The Balcony. There is a large opening on the rear of The Balcony covered with a screen mesh through which sounds propagate across the alley to the nearby residences.

7. **Coral Villas/Truth lounge**
   Svantek 203 was located in a tree at the edge of the driveway of a residence on NE 30th Place across the street and to the south of the rear of the Truth Lounge. Truth Lounge is located on East Oakland Park Boulevard which is a east-west roadway. Coral Villas is a relatively quiet residential area. Residents have complained about sounds from the Truth Lounge propagating to their homes in the past. Truth Lunge is an enclosed building with solid walls on the sides and rear of the building that face Coral Villas with several doors located in the walls. The front or north side of Truth Lounge is glass. Amplified sounds occur inside the closed building.

8. **Smitty's Wings**
   Smitty's Wings is located on NW 6th Street which is a busy road on the edge of a low-density residential district. Complaints from residents in the past were related to sounds from people parking a lot across the street from Smitty's and playing loud music in their cars while they gathered and talked. The sound level meter was originally located at this location during trip 1, but the data did not record and store properly, so the Rion 4 sound level meter was placed again at the location in a tree in the parking lot across the street from Smitty's where people congregate. Smitty's does have amplified music played sometimes, but this has not historically been a source of noise concerns from residents. Sunday afternoon/evening was identified as a time when noise-related activities occurred in the past near Smitty's.

LONG-TERM ACOUSTIC MEASUREMENT RESULTS

Long-term measurements were made with sound level meters that continuously record sound levels from February 16-26, 2023 and April 21-25, 2023. The meters were placed at 13 locations selected by the Noise Control Advisory Committee as representative of key sound complaints in Fort Lauderdale. A summary of the measurements is included in Table 6. Graphs of the average sound levels plotted vs. time for each day are included in Appendix A. The data recorded were average sound levels or LAeq's, LAFmax and LCFmax when available and Day-Night Average Sound levels or LDN's in dBA that were calculated from the measured average sound levels.

A LDN is the average of the sounds made during the day time hours of 7:00 a.m. through 10:00 p.m. and the night time hours of 10:00 p.m. through 7:00 a.m. with 10 dB added to the levels that occur in the night as a "penalty" that was established to protect people from noise disturbances while they rest and sleep at home. The U.S. Environmental Protection Agency (EPA) uses the LDN to classify lands based on the average sound levels. Lands with LDN's of 55 dBA or less are thought to be acoustically healthful. This represents the desired level for residential properties. LDN's of 65 dBA and less are recommended by a number of Federal agencies including Housing and Urban Development (HUD), Federal Transit Administration (FTA), Federal Aviation Authority (FAA), and others as suitable for residential development with typically constructed residential buildings. These same agencies recommend noise mitigation be used in buildings and exterior social and play spaces with LDN's between 65 dBA and 75 dBA. They recommend that residential uses not be allowed in areas with LDN's > 75 dBA.

S1 (204) was located in the median by Bo's of the Beach off A1A. The LDNs ranged from 70-76 dBA. The range of average day time sound levels at this location varied between 68 and 85 dBA over the measurement period. This location is on grade at a main thoroughfare on the Beaches. It is adjacent to a

restaurant. Sound levels tended to remain fairly consistent, picking up sounds from the traffic, wind, amplified music from venues and the motorcycles and loud cars on the road. Sound levels between 2am and 5am dropped off to approximately 47 dBA at the lowest to 70 dBA. Day time sound levels between 70-85 dBA were typical. At this location, it was difficult to see any major increase in sound level from amplified music during the evening hours. This is likely because the busy traffic on SR A1A tended to mask some of the music sound levels. There were over 30 to up to 90 events above 90 dBC each day at this location, likely due to motorcycles and loud cars.

S2 (203) was located in a tree in the Bamboo Flats residential area on NE 4th Street located near the restaurants and nightlife. The LDN's at this location ranged from 62-65 dBA at this location with one day having a 72 dBA LDN from Feb 16-25, 2023. The range of average sound levels at this location varied between 53 and 75 dBA over the measurement period. This is a residential location adjacent to a neighborhood street so individual car pass bys would increase the sound level to the 70's. Sound levels during the weekend tended to increase around 10:00 p.m. and decrease around 2:00 a.m. Sound levels during the late evening and early morning hours were measured between 60-80 dBA. The sound levels began to decrease to 45-65 dBA during the early morning hours between 3:00 a.m.-7:00 a.m. Sound levels would then increase in the morning and remain fairly consistent until approximately 10:00 p.m. on the weekend. The increased sound levels are seen more clearly in the LCFmax (dBC) metric, with those levels increasing to 78-95 dBC and then decreasing to 60-75 dBC in the early morning. The A-weighted sound levels do not appear to increase dramatically during the late nights and early mornings, however, the increase in C-weighted sound level is clearly seen. This indicates that bass sounds from amplified music are impacting the area, even though the middle and higher frequencies remain relatively the same as those measured at other times of day.

S3 (Rion 7) was located in a tree on the Riverwalk at rear of The Wharf. The LDN at this location ranged from 71- 79 dBA from Feb 16-25, 2023. Short-term sound levels increased in the day and night hours on Friday and Saturday to approximately 70-75 dBA, and tended to decrease around 2:00 a.m. during the weekend to approximately 55-60 dBA. Tuesday had sound levels that rose in the evening around 10:00 p.m. and varied from 79-93 dBA until approximately 4:00 a.m. This day had a sound signature that was unlike the other weekend days. Sound levels during the evenings without amplified music were approximately 55-60 dBA.

S4 (205) was located in the median at the intersection of A1A and Seabreeze at the northern point where A1A divides into separate northbound and southbound lanes. The LDN's at this location ranged from 73-74 dBA. This location was another area in the Beach that is heavily travelled by automobiles. Day time sound levels ranged between 70-85 dBA. On Feb 19, 2023, a resident noted that a large number of motorcycles and ATV's had just passed by. Sound levels at that time were 102 dBA and 104 dBC. Many spikes in the vicinity of these levels are seen in the graphs, with 32 events above 100 dBC on that same day alone.

S5 (Rion 8) was located in a tree in Esplanade Park located between the stage and the Restroom building. The LDN at this location ranged from 61-66 dBA from Feb 16-25, 2023. Day time sound levels tended to vary between 50-60 dBA and remained relatively constant during the evening and nighttime hours on the weekend with several spikes over 80 and 90 dBA. Night time sound levels drop to approximately 45-55 dBA during the late night and early mornings. Saturday between 11:00 a.m. to 4:00 p.m. sound levels increased to 60-78 dBA during the chili cookoff due to amplified music playing at the band shell, large numbers of people in the park and on the streets near the park, and a high activity level in the area.

S6 (Rion 4) was located in a tree in the parking lot adjacent to Smitty's Wings. The LDN at this location ranged from 69-71 dBA from April 21-25, 2023. This location is adjacent to a fairly busy road, Sistrunk, in a residential area with Smitty's serving the local community. On Sunday, April 23, 2023, sound levels increased to 63-87 dBA with a number of spikes over 90 and 100 dBA during this 3 ½ hour period. This is a time and day that residents have stated that many people congregate in the empty lot across the street from Smitty's to socialize and play music from their cars. Night time and early morning sound levels tended to decrease to 45-65 dBA, with day time sound levels increasing to 58-65 dBA LAeq and 75-85 dBA LAFmax largely attributed to traffic on Sistrunk except for Sunday afternoon/evening.

S7 (Rion 7) was located on the 2nd story balcony in a residence at the rear of The Balcony and other establishments in the Colee Hammock residential area. The LDN's ranged from 64 to 65 dBA. The LAeq sound levels tended to remain fairly constant from day to night, however the LAFmax values show that louder specific acoustic events were taking place. The fairly constant LAeq is typical of a location near HVAC units that are operating almost constantly. Saturday and Sunday show a decrease in sound level around 1:00 to 2:00 a.m. from 60-70 dBA, with quieter sound levels between 2:00 a.m. to7:00 a.m. ranging from 50-60 dBA. There are a number of spikes over 70 and 80 dBA during the late night and early morning hours. The resident at this location observed that the music from the venues was not necessarily an issue at this location. The music was heard by several residents who lived closer to The Balcony. Their street was apparently being disturbed by delivery trucks, cleaning trucks, etc., using the alley at times during the early morning hours.

S8(203) was located in a tree in the front yard of a residence at the rear of the Truth Lounge in the Coral Villas residential neighborhood. The LDN's varied from 63-65 dBA. Sound levels tended to increase during the day and decreased during the evening. Day time sound levels ranged from 65-80 dBA LAFmax. On Saturday evening, the sound levels increased to approximately 75-80 dBA LCFmax around 11:00 p.m., while the A-weighted sound levels were 55-70 dBA LAFmax. Sound levels from Friday early morning were also raised to 76-80 dBC from 12:00 a.m.-2:00 a.m., and began to decrease and level off around 3:00 a.m. through 5:00 a.m. The amplified music is seen using the C-weighted metric at this location more so than the A-weighted sound levels. On Monday, there were a number of events over 90 up to 100 dBC throughout the early morning and day time hours at this location.

S9 (284) was located on the balcony of a residence at the Water Garden on the 26th floor. The LDN's varied between 68-70 dBA. Day time sound levels ranged from 65-75 dBA and 75-90 dBC. Sound levels tended to reduce in the early morning by approximately 2:00 to 2:30 a.m. and stayed low until approximately 6:00 a.m. with levels in the high 50's and low 60's dBA as the quietest sound levels. The resident explained that Friday and Saturdays were typically the noisiest and that she needed to wear ear plugs outside and ear buds inside to maintain acoustical comfort. The graphs for Friday and Saturday show a decrease in sound level during the late night hours of 3:00-4:00am that was seen in many of the other locations. On Monday at this location, there was an increase in sound levels in the morning and early afternoon.

S10 (291) was located in a tree in a residential courtyard that adjoins a lively entertainment area in Bamboo Flats. The LDN's ranged from 61-63 dBA. On Saturday, sound levels increased around 10:00 p.m. and stayed elevated until past 2:00 a.m. (80-90 dBC and 60-70 dBA), then lowering to (48-60 dBA and 58-70 dBC) until about 6:00 a.m.. Day time sound levels tended to range from 55-70 dBA and 65-80 dBC. There were a number of events that went over 90 dBC during the late night and early morning hours.

S11 (282) was located on the balcony of an upper level unit at the Esplanade on the New River Condominium. The LDN's ranged from 68-70 dBA. This location is located across the water from Esplanade Park. The Himmarshee Entertainment District is farther across the river to the north,

approximately 800 ft. from the building. The Wharf is to the east approximately 1,100 ft. up the river and across from the River Walk. The Esplanade on the New River is also located along the waterway and as such, boats with amplified music come along the waterway. According to the resident, the amplified music from the entertainment districts, boats traveling on the river and Jazz in the Park is heard through the windows at this location. It was mentioned that at this location previously, the amplified music was finished at 12 midnight. Now with the revision of the entertainment district requirements, amplified music is played until 4:00 am. The resident stated that it is difficult to find respite at night. Data from this location appears to generally agree with the resident's observations. There is an increase in sound level starting around 10:00 p.m. on Saturday that stays consistent until approximately 4:00 a.m. (65-70 dBA and 73-78 dBC), then gradually decreases. Sound levels are lower from approximately 5:00 a.m. to 7:00 a.m. with levels of 55-68 dBA and 68-75 dBC. Because the sound levels fall off around 4:00 a.m., it is assumed that the Himmarshee district is a major contributor to the sound level at this location, as some of the other nearby entertainment establishments close earlier than 4:00 a.m.

S12 (204) was located on the mezzanine balcony on the 6th floor of the east side of Jackson Tower. This location was chosen to take sound level measurements that are representative of sounds that residents in living units above experience that are in close proximity to the entertainment district. The LDN's at this location were measured at 72 dBA all 3 days. Elevated sound levels were recorded on Saturday between 2:00 to7:00 p.m., (85-95 dBC) and 70-80 dBA. This was also recorded on Sunday from 4:00 -7:00 p.m. as well. There appears to be an increase in sound level around 11:00 p.m. on Saturday to 85-95 dBC and 70-80 dBA. The level decreases around 1:00 a.m.

S13 (205) was located on an upper floor balcony at the Illni Condominium overlooking the roof of Bo's on the Beach. The LDN's ranged from 69-70 dBA. Sound levels tended to increase in the late afternoon from 5:00 p.m. through 9:00 p.m. on Saturday and Sunday. Several residents stated that during the times when the measurements were taken, the louvered roof of the restaurant was left closed. This condition was studied in a 3D computer model to simulate sound levels if the louvered roof were open compared to being closed. Results from that analysis are presented in the 3D Computer Modeling section. Sound levels during this time (5:00 -9:00 p.m.) ranged from 70-80 dBA and 83-95 dBC. Sound levels then decrease to 65-75 dBA and 70-80 dBC. A large number of events were recorded at this location with sound levels above 90 dBC, some of which are attributable to loud vehicles on AIA and Seabreeze.

Table 6. Summary of Day-Night Average Sound Levels (LDN) (dBA) at the long-term measurement locations for Trips 1 and 2.

Location	Meter	Date	Average LDN (dBA)	Range of LDN's (dBA)
Riverwalk Near the Wharf	Rion 7	16-Feb-23	75	73-79
Esplanade Park Between Rest Room and Stage	Rion 8	16-Feb-23	64	61-66
Bamboo Flats on Street	Svantek 203	16-Feb-23	64	62-65 with 1 day at 72
Median in A1A South on the Beach	Svantek 204	17-Feb-23	72	70-76
Median in A1A North on the Beach	Svantek 205	17-Feb-23 thru 20-Feb 23	73	73-74
Parking Lot Across from Smitty's Wings	Rion 4	21-Apr-23	70	69-71
Colee Hammock near The Balcony and Service Alley	Rion 7	21-Apr-23	65	64-65
Coral Villas near Truth Lounge	Svantek 203	21-Apr-23	65	63-65
Water Garden Upper from Living Unit	Svantek 284	21-Apr-23	69	68-70
Bamboo Flats in Yard Closest to NE 8 the Street	Svantek 291	22-Apr-23	62	61-63
Esplanade on New River Upper Floor Living Unit	Svantek 282	21-Apr-23	69	68-70

Jackson Tower 6th Floor Mezzanine	Svantek 204	22-Apr-23	72	72
ILLNI Upper Floor Living Unit	Svantek 205	21-Apr-23	70	69-70

The average of the LDN's for all days measured at all locations was 69 dBA with a range of LDN's at all locations of 61 to 75 dBA. The range of 14 dB in average LDN's can be divided into 5 dB groups to categorize locations in the City by their average sound levels if one is interested in considering the existing ambient sound levels in the refinement of the noise ordinance and acoustical planning strategies. The Lden of Day, Evening Night average sound level is used in the European Union. The Lden was equal to or within 1 dB of the LDN measured at each location on each day in this study.

There are 3 locations with average LDN's that are less than 65 dBA. These locations include Bamboo Flats 1, Bamboo Flats 2, and Esplanade Park. These areas have on average the quietest day and night sound levels of those measured. There is low speed, low volumes of traffic on the roads near the measurement locations. The sounds of entertainment establishments at night can become more evident in quieter areas at lower levels than in areas with higher average sound levels. U.S. HUD and other Federal agencies do not require additional noise mitigation for typically constructed residential buildings built in areas with LDN's < 65 dBA.

There are 4 locations with average LDN's that are between 65 and 69 dBA. These include Colee Hammock, Coral Villas, Water Garden, and Esplanade on the New River. These locations are also not near to major roads. Residents at all locations have expressed concerns about sounds from entertainment establishments and other activities. The long term acoustical measurements documented sound levels from entertainment establishments at these locations. These levels would be required to have additional noise mitigation for HUD and other Federally subsidized or mortgaged residences. Typical recently built residences constructed in south Florida using hurricane or impact windows would likely meet the outside to inside Noise Level Reduction (NLR) required by HUD in these areas. Higher end residences often come with expectations for greater acoustical privacy than what is provided by HUD. Therefore, additional noise mitigation may be required in these areas to reduce exterior sounds to the expected lower interior sound levels.

There are 5 locations with average LDN's between 70 and 74 dBA: A1A South, A1A North, Smitty's Wings, Jackson Tower, and Illni. These locations are affected by heavy traffic on heavily traveled roads including A!A, Seabreeze as well as loud vehicles traveling on these roads. Entertainment sounds were identified at Jackson Tower and Illni even in the presence of the road traffic sounds.

There was 1 location with an average LDN > 75 dBA: Riverwalk, near the Wharf. The Wharf was found to be in compliance with the sound level limits of the Noise Ordinance in each of the measurements made there. This area has a complex soundscape as described above with some entertainment sounds, high levels of activity and amplified music playing on boats in the river, sounds of watercraft and other sounds of people talking as they walk along the Riverwalk. Buildings in areas with average LDN's > 70 dBA would require acoustical upgrades to the windows, walls, doors and other construction assemblies to maintain residential sound levels inside the home.

SHORT-TERM ACOUSTIC MEASUREMENT LOCATIONS

A number of short-term measurements were taken at specific locations throughout the City of Fort Lauderdale to quantify acoustic events, isolate the events of interest from other background or intruding sounds to the extent possible, and to survey ambient or background sound levels at representative locations in various neighborhoods and districts.

These measurement locations, average sound levels, and graphs of the sounds measured are plotted as sound level over time for each measured event. This information is included in Appendix C of this report.

SOUNDWALK ACOUSTIC MEASUREMENTS

A soundwalk is an acoustic measurement process where the consultants are outfitted with sound level meters and a method of taking notes on paper or digitally. The consultants walk through the City as a citizen does, and records the sounds as they move through the streets or areas. Soundwalks are performed to capture the experience of citizens as they inhabit the areas of interest, recording the sound levels, frequencies and .wav files of the soundscape in real time. The soundwalks were taken at different times of day during the measurement times.

Soundwalks were taken throughout the 2 weekends at different times and locations. Appendix D contains several selected soundwalk maps showing the locations of the measurements. It also contains graphs of the sound levels recorded on those sound walks. Soundwalks were taken around Bamboo Flats and the surrounding area, AIA and Seabreeze on the Beach, the Riverwalk and surroundings, Himmarshee Entertainment District, and Las Olas Boulevard along its entire length.

Neighborhoods and Districts of Evaluation

The soundscape team worked closely with the Noise Control Advisory Committee to identify areas within the greater Fort Lauderdale area that were representative of locations where acoustical issues have been historically identified. There is a desire to explore the soundscape in these areas to identify potential strategies and regulations that could help to balance sounds from entertainment establishments and other sources and the residents who live near those establishments that sometimes find the sounds disturbing. Some of the locations are within or adjacent to designated entertainment districts and others are at or near establishments in commercial districts that are adjacent to residential occupancies and neighborhoods. The study locations represent a range of occupancies including single-family residential neighborhoods, low-rise residential neighborhoods, high-rise residential and high-rise mixed-use buildings. The locations also represent the range of conditions in Fort Lauderdale including the urban core, beach areas, arterial roads, and low-density residential fabric.

Entertainment Districts

The Soundscape Team traveled with code enforcement officials on sound walks, observed various acoustic event spaces, talked with stakeholders, and measured sound levels at multiple times during the day and night, using the criteria in the Ordinance in addition to other sound level metrics which were stored for presentation later in this report. The City has recently purchased sound level meters that can record sound levels, store them and allow them to be printed out for enforcement purposes. The meters also measure A-weighted and C-weighted sound levels simultaneously. This will allow staff to record both sound levels for the 3- 30 second periods of time to have technical back up for any enforcement actions. As noted previously, the C-weighted sound level is a better measurement to use in cases where low frequencies are

prominent in the amplified sound because it does not deduct substantial amounts of sound in the lower or bass frequencies the way that the A-weighted sound levels do.

The Soundscape team conducted multiple sound walks in these entertainment districts and adjacent areas on weeknights and weekends in February and April of 2023. The sound walks occurred during the mornings, afternoons, early evenings, late nights, and early morning hours allowing a full contextual evaluation of the soundscape as daily activities change. The team cataloged many notable acoustic events and identified sound levels that are representative of the ambient sounds at multiple locations in the entertainment districts. Summarized sound levels are included for specific locations in the entertainment overlay districts in this section in addition to the full data sets that are included in the appendices to this report.

Ambient Sounds of the Riverwalk and Entertainment Overlay Districts

The urban center of Fort Lauderdale is a bustling urban hub. Ambient sounds are dominated by people talking as they walk through the city, breezes in in trees, automobiles moving through the city, bridge crossings, fountains, mechanical equipment in the many large buildings, and various amplified music sources from commercial establishments. Even in quieter evening hours ambient sounds, exceed the residential nighttime sound level limit of 50dBA. This was generally true for many of the measurements taken around the Special Overlay and Commercial districts surveyed,

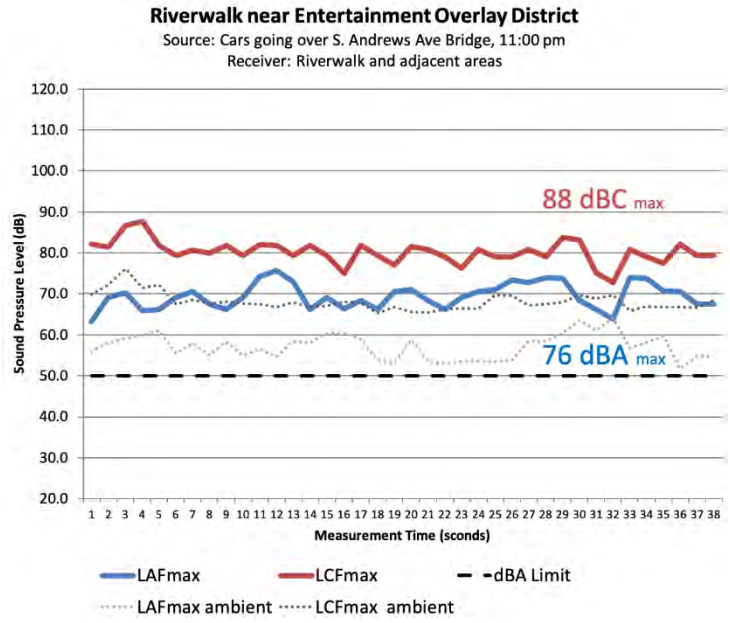


Figure 9. Cars transit the South Andrews Avenue bridge along with ambient sounds around the Riverwalk and Downtown. Please note that the cars driving on the bridge exceed the residential nighttime sound level limits of 50 dBA by 15 to 20 dB or 65 dBA by 5 dB or more.

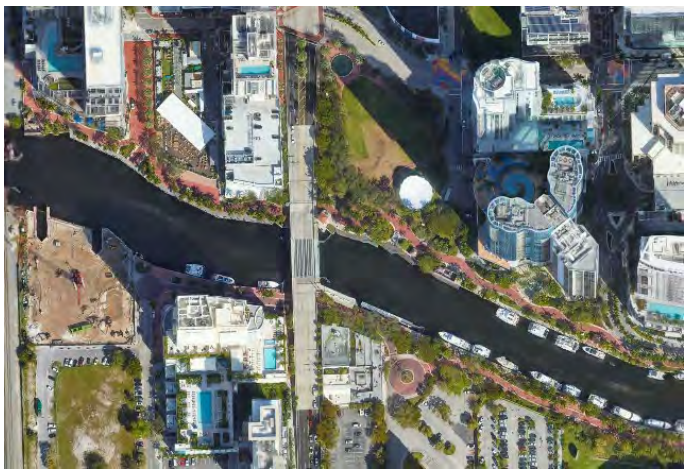


Figure 10. Andrews Street bridge showing proximity to residential high-rise buildings.

Measurement data shows that cars transiting the bridge can be quite loud and clearly audible against the ambient sound levels measured. The measurements were taken at a distance of approximately 100' from the bridge. The cars themselves were not loud or playing loud music but rather the primary sound is from the tires rolling over the steel grating of the drawbridge.

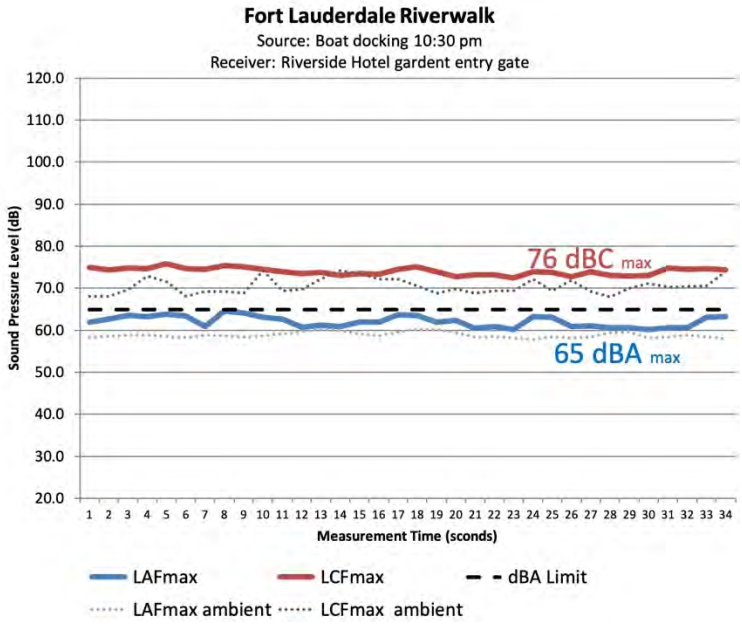


Figure 11. Measurement of large commercial boat docking near the Riverside Hotel. The sound levels are very close to the ambient levels with the lower frequencies somewhat above the ambient. Docking is louder than general operation and the duration is typically less than 10 minutes.

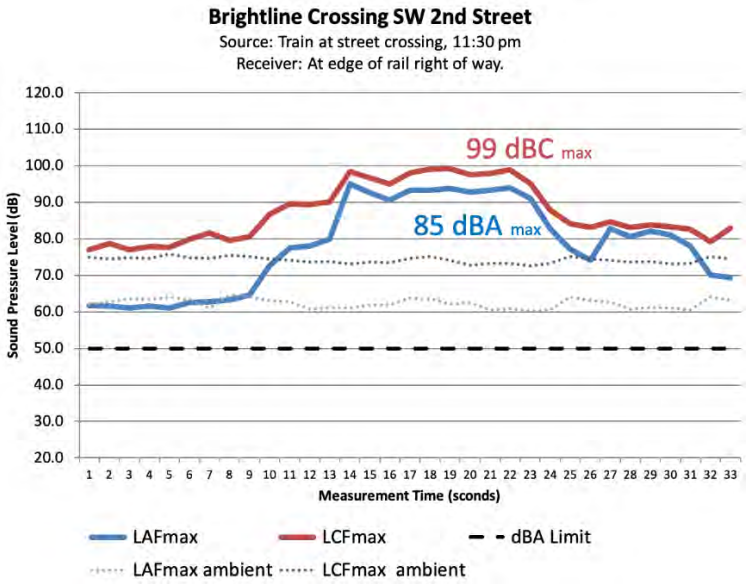


Figure 12. Measurement of the Brightline commuter rail transiting SW 2nd Street.

The train event consists of the warning bells and low frequency sound prior to the train arriving which are indicated in the measurement from 1 to 8 seconds – approximately 60 dBA. When the train passes, it is quite a short time (from 8 seconds to 33 seconds) with a substantial increase in both A and C weighted levels. It is important to note the large difference between A and C weighted levels as the train approaches – approximately 16 dB. This is an indicator of the low frequency sound radiated from the ground and rail surfaces as the train vibrates those surfaces.

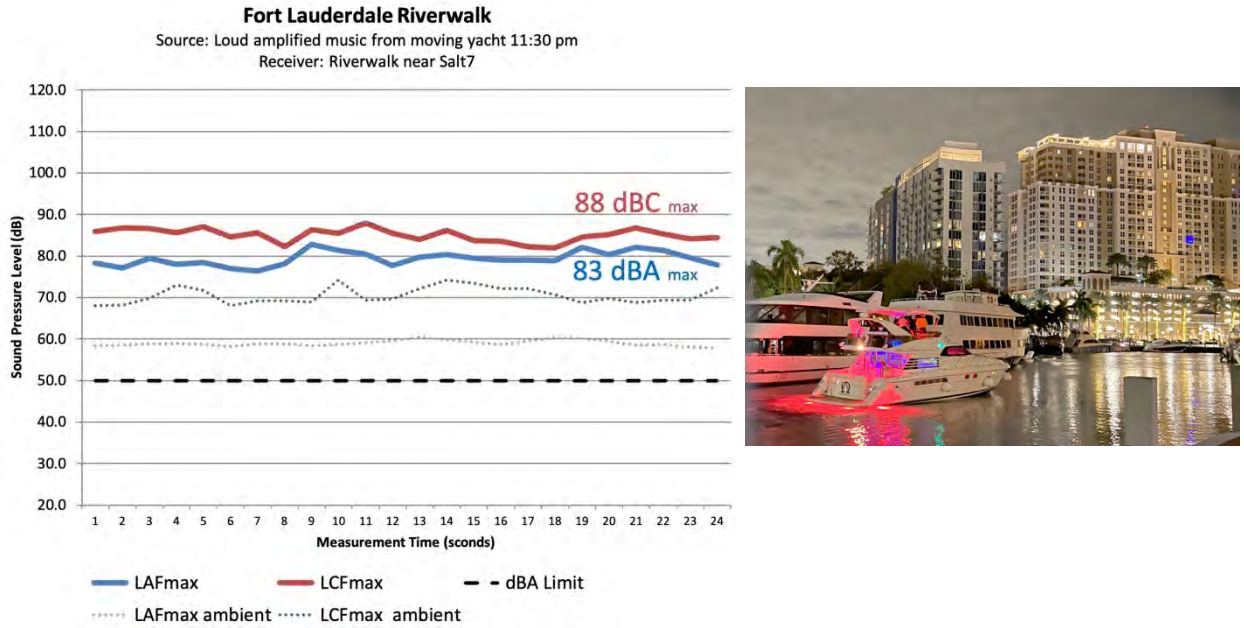


Figure 13. Sound levels and image of loud music from yacht traveling down the New River at approximately 11:30 pm.

With the requirement for slow-speed no wake navigation, it took some time for the yacht to clear the downtown area, perhaps 20 to 30 minutes. During the time of the measurement the boat was clearly audible as the primary and dominant sound source in the Riverwalk District.

Riverwalk at the Wharf

The Wharf is an open-air restaurant and entertainment establishment located at 20 West Las Olas Boulevard and spans a city block between Los Olas Boulevard and the New River. The site is bounded by multiple tall and mid-rise buildings with mixed-use commercial/residential, commercial, and parking garage uses. The site is located within the Downtown Reginal Activity Center (RAC) and the site is designated as a *Special Entertainment Overlay District*

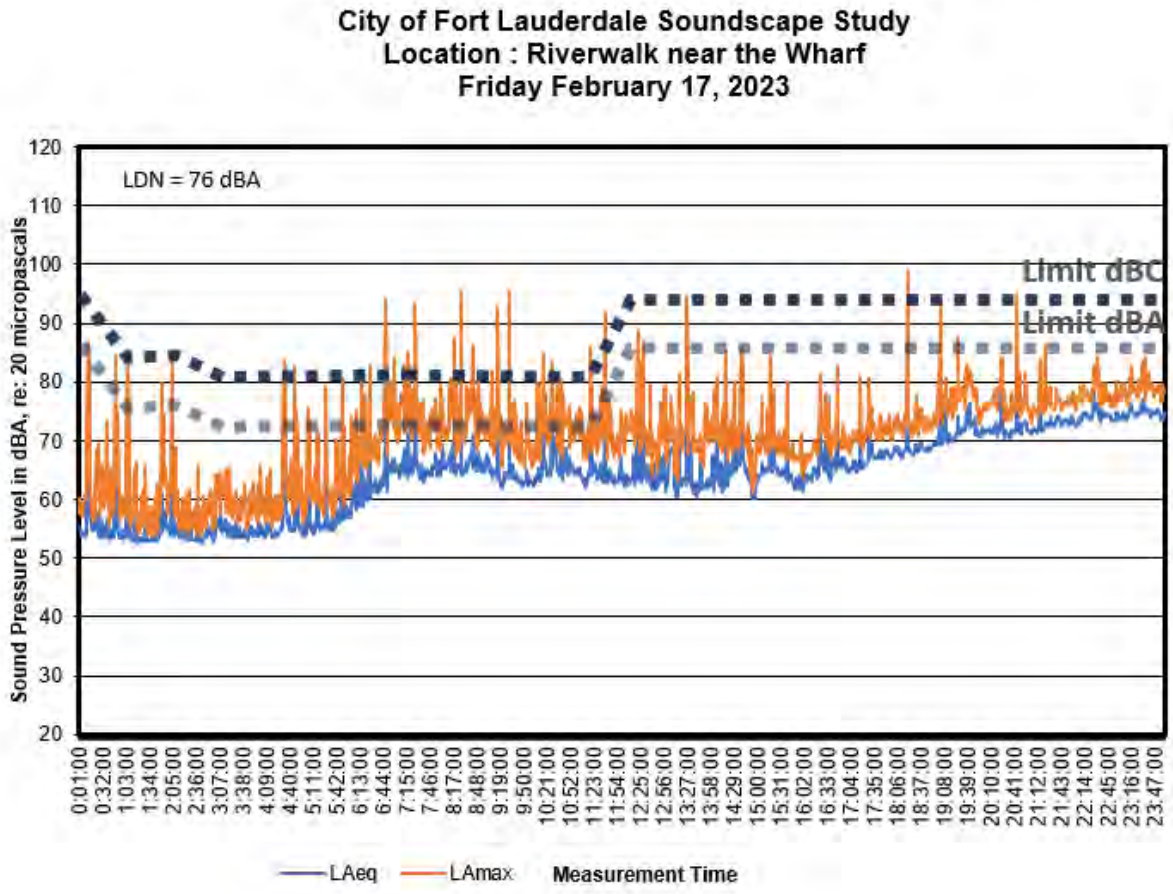


Figure 14. Graph of overall A-weighted sound levels measured on the Riverwalk near the Wharf. The short-term transient sounds shown as "spikes" in the graph are from boats passing on the waterway, pedestrians or others playing music as they walk along the Riverwalk, sounds from boats passing playing music and other short-term sources of sound. There is a general increase in sound levels shown by the blue line during times when the Wharf is open that remains below 80 dBA at this location indicating that The Wharf is operating within the requirements of the ordinance.

It has been expressed by some residents living near the Wharf, that they clearly hear the music, that it is typically low frequency sound they hear, and that it can be disturbing even when measurements at the sound source indicate the Ordinance levels are being met.

Measurements conducted at the Wharf at various locations around the open-air structure at five (5) feet from the building (in this case a wooden fence) were generally in compliance with the sound level limits of the noise ordinance. Measurements were conducted at various times throughout the 24-hour day including late night and early morning on weekdays and weekends. Continuous noise monitoring was conducted at the site for a period of one week. Measurement results are summarized in Figure 14.

Figure 15. Aerial view of the Wharf looking south.

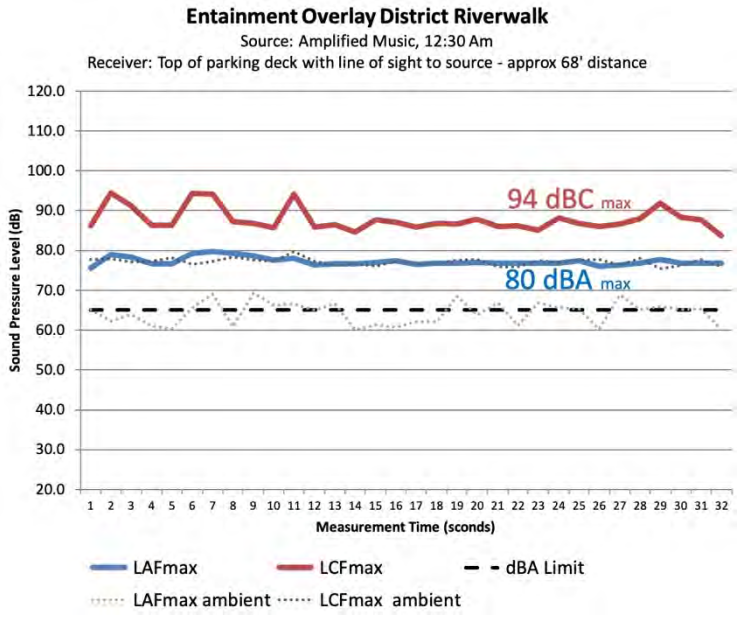


Figure 16. Sound levels measured from parking garage overlooking entertainment district establishment from an adjacent parking deck (approximately 68' distance above source).

Measurements taken in the overlay district at a distance of 5 feet from the property line (as prescribed by the code) were largely in compliance with the 85 dBA limit. In the case shown in Figure 16, measurements were taken at distances equivalent to nearby residences (68 feet above grade), the levels were substantially higher than the residential property line limit of 65 dBA within 200 feet of commercial establishments. Additionally, the A-weighted measurement of 80 dBA is well below the 85 dBA limit prescribed at the sound source property line. However, the 94 dBC level at this distance is only 1 decibel below the prescribed limit at the 68-foot distance. Accounting for distance, the amplified music from the sound source, would be exceeding the dBC limit (95 dBC) even though it was likely meeting the dBA limit (85 dBA) if measured 5' from the source property line. In this case, measuring dBC rather than dBA, would be a better characterization of the sound and would also be in compliant with the current Ordinance.

Himmarshee District

Figure 17: Himmarshee district from rooftop of municipal parking garage.

Acoustical measurements were taken in the Himmarshee district during the day as well as late at night. The Himmarshee district is an area where many bars and clubs are located. It is in an entertainment district. When walking down the street passing by a number of clubs, sound levels were measured at 98-111 dBC and 85 to over 90 dBA. These levels do exceed the noise ordinance values for source locations and begin to approach levels that could potentially cause health effects for pedestrians walking on the street. NIOSH and OSHA have sound level limits of 85 and 90 dBA respectively as sound levels where hearing protection is advised for those working in environments with these sound levels. These levels are shown to be dangerous over an 8-hour duration. NIOSH recommends that people should be exposed to sound levels of 91 dBA for less than 2 hours per day. If the sound levels inside the venues are calculated, it could be estimated that sound levels inside the buildings were 90-95 dBA or higher depending on where the loudspeakers are located and 101-117 dBC or higher depending on the locations of the loudspeakers. This is estimated based on 1 doubling of distance from the sound source. With these levels, staff who work at these establishments and patrons who spend a significant amount of time in these establishments are at risk for potential temporary or permanent threshold shifts and also hearing damage.

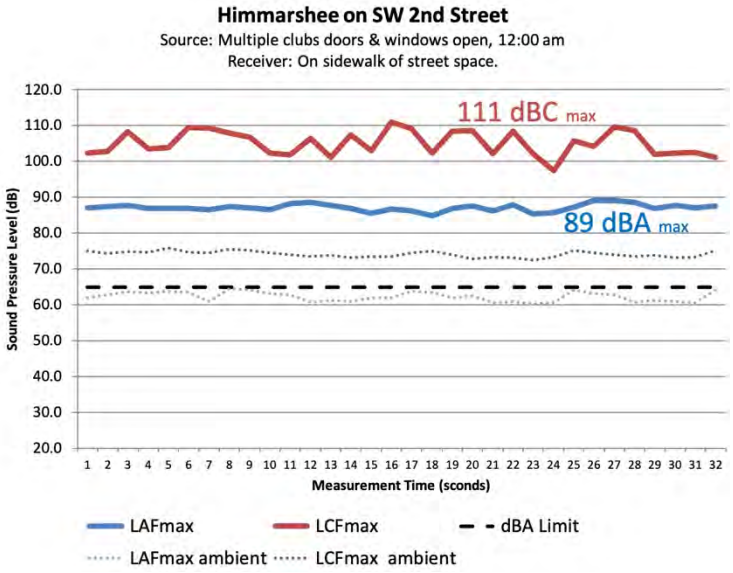


Figure 18. Sound levels measured during a soundwalk on the street in the Himmarshee Entertainment District. Both the A-weighted and |C-weighted sound levels exceed the sound level limits in the noise ordinance. Sound levels measured during other sound walks show equal and higher sound levels in this area.

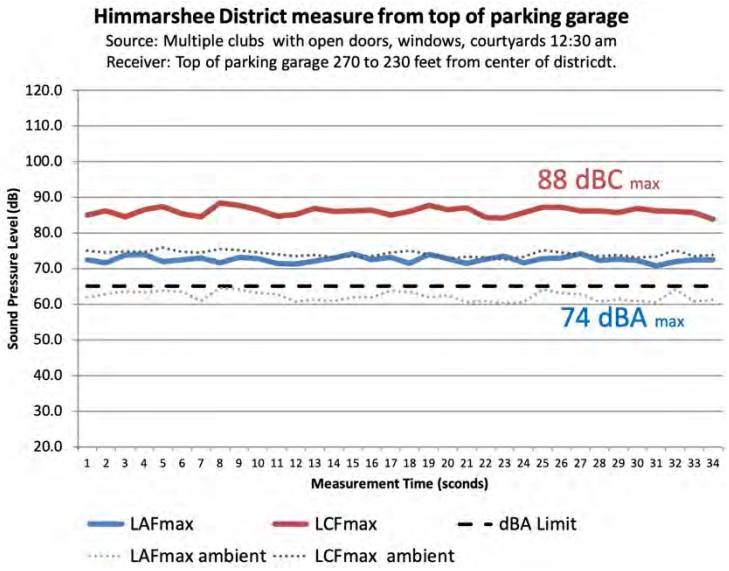
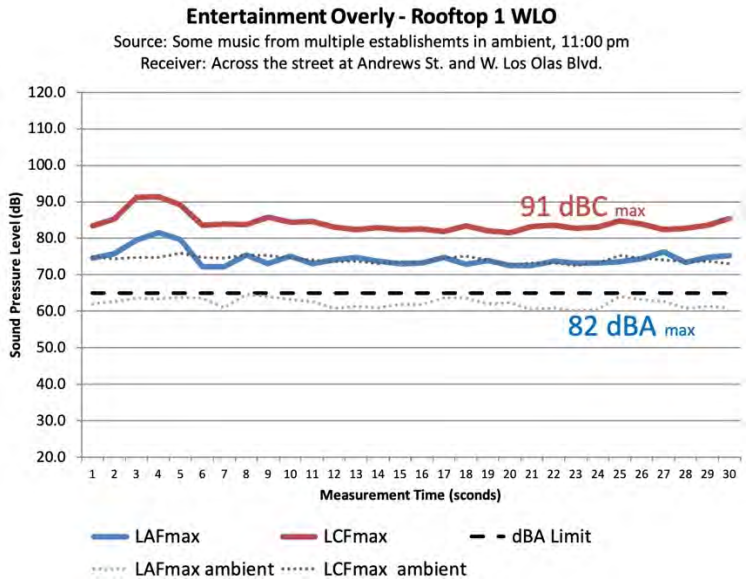


Figure 19. Sound levels measured from the parking garage located at the Brightline and SW 2nd Street crossing with a clear line of sight to multiple sources of amplified music.

The data in Figure 19 above illustrates the propensity of sound to travel and maintain strength in the low frequencies. At this measurement location nominally 250 ft from the center of the district, sound levels are well above the limits for residences within 200 feet of the commercial area and twice as loud (another 10dB higher) for residential districts farther than 200 feet from commerce.

Rooftop @1WLO



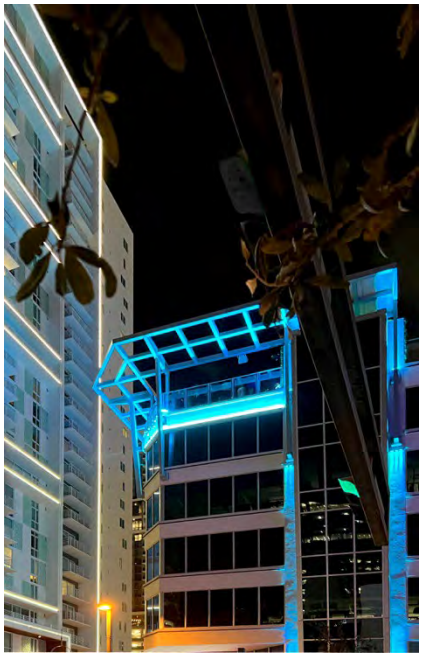


Figure 20. Shows sound levels measured at the street level near the location of the Rooftop 1 WLO and the site as seen from the street.

During the late evening/early morning, music was audible from the Rooftop @1WLO at the street below and across the street in Huizenga Plaza. Standing close to the fountain, the music from the Rooftop was masked but audible again, farther away, from the fountain. In the localized area of the fountain, it was the dominant sound source.

As an Entertainment Overlay District Establishment, amplified music sound monitoring and enforcement requires measurements to be taken at five (5) feet from the property line of the entertainment establishment. In the case of the Rooftop, located on the 7th floor roof terrace, one can only effectively measure the sound at ground level. This measurement would not be consistent with measuring equivalent establishments that are located at the ground level. Alternate sound level measurement protocols that could be considered for use at this establishment could include installing a permanent sound monitoring device at a strategic location to alert staff when levels approach the ordinance sound level limits, perhaps structurally mounting the monitoring device to the facility 5 ft. off the edge of the roof deck; having enforcement staff use a tripod with a 5 ft extension arm that could be projected out from the edge of the facility to a distance of 5 ft from the roof, selecting an alternate, practical measurement location for these types of venues, taking the measurements at affected residences at locations above grade, and other means that could also provide effective notification to staff and potential enforcement if needed.

Party Bus – Veza Sur Tourbus

The 'Veza Sur Tour' bus was traveling down Los Olas Boulevard at approximately 8:00 p.m. on February 17th (Friday), playing loud music with substantial bass sound energy. This amplified music, occurring in the right of way (city street) could be regulated under the current regulation that the sound cannot be "plainly audible a distance of twenty-five (25) feet or more from the source. This restriction would also apply to boats on the New River playing loud music. However, the mobility of these sources makes it difficult to enforce as the source has typically moved on before enforcement officers could measure it. One strategy could be to conduct proactive stops with warnings and then citations toward building a consensus on acceptability. A second would be to have sound level meters at some intervals in areas where these activities occur that could record their pass-by sound levels.

The Rock Bar (Beach Entertainment Overlay District)

Narrative

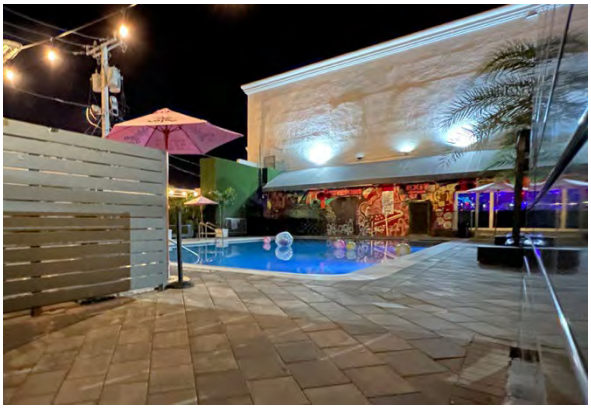


Figure 21 Rock Bar front on SR A1A (left) and the Rock Bar outdoor pool area (right).

The Rock Bar is one of a number of establishments in the Beach Entertainment Overlay District just north of Los Olas Boulevard and facing the Atlantic Ocean along Florida State Road A1A. During sound walks along SR A1A, Las Olas Boulevard and the adjacent street grid to the north and west of A1A, amplified music was generally mixed with people talking, laughing, and generally enjoying dining and drinking in the open air and patios along the streets. Automobile traffic was a prominent element in the soundscape with an ebb and flow of autos, music, and people being the dominant ambient sources of sound in the area.

Loud mufflers from cars, motorcycles, and motor scooters and amplified music playing from these vehicles dominated the soundscape in the area when present.

Much of the area to the north and west of the establishments along Los Olas Boulevard and SR A1A is dedicated to municipal parking lots and on-street parking. During visits in the day, evening, late night and early morning, the sound levels in this area included automobile traffic, some mechanical equipment noise, and breezes in the trees comprising the ambient sounds. Long-term sound level meters were placed at several locations along the beach areas. There were a number of occasions where loud sound levels from motorcycles and other vehicles were documented.

Some of the entertainment venues in this area have outdoor areas that face Almond Avenue and Seabreeze to the west. There are residential condominiums across Seabreeze from the entertainment venues. There is a tall fence that surrounds the outdoor areas of the entertainment venue. If one were to measure sound levels for compliance at a distance of 5 ft. from the property line of the entertainment venue the fence would significantly reduce the level of the sounds propagating in this direction likely showing compliance with the ordinance. However, concerns are expressed by residents of the near-by multi-story buildings that suggest that sound levels at their units which are elevated above street level may be worthwhile to look at. A long term sound level meter was located on the 6th floor mezzanine balcony at Jackson Tower in April, 2023. Please refer to the discussion of those sounds.

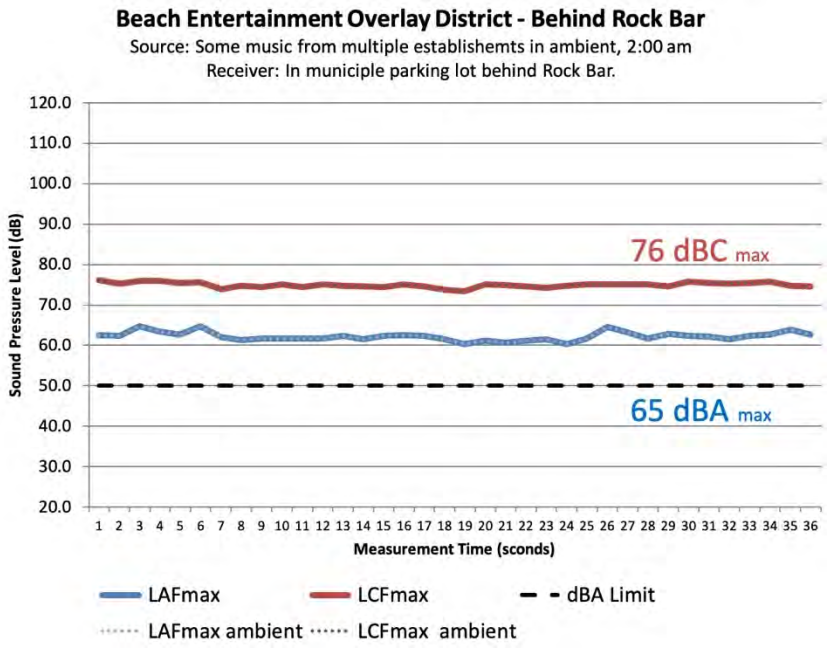


Figure 22. Sound level measurements taken at the rear of the Rock Bar in accordance with the Overlay District Guidelines.

The sound levels measured in early morning hours at the Rock Bar were the same as the ambient measurements. In other words, there was no sound emanating from the Rock Bar during the measurement period at 2:00 a.m. The ambient sounds in the area were the only sounds heard on multiple occasions on weekend early mornings and early evenings at this location.

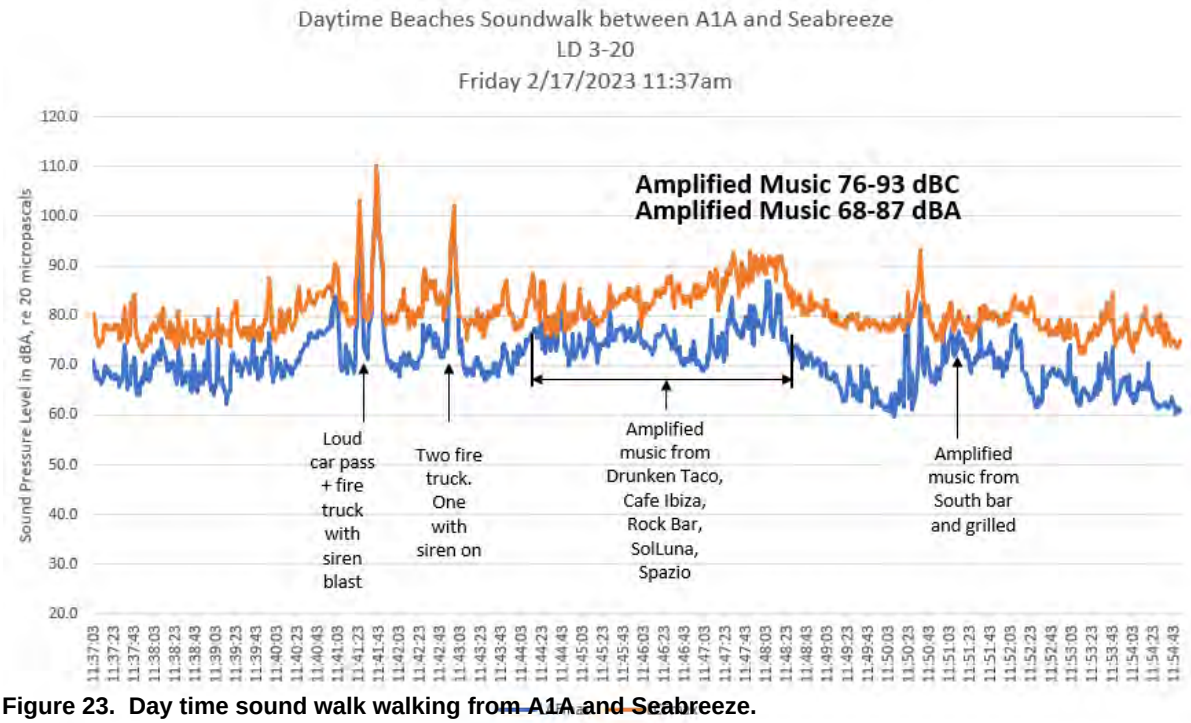


Figure 23. Day time sound walk walking from A1A and Seabreeze.

Riverwalk and Salt7

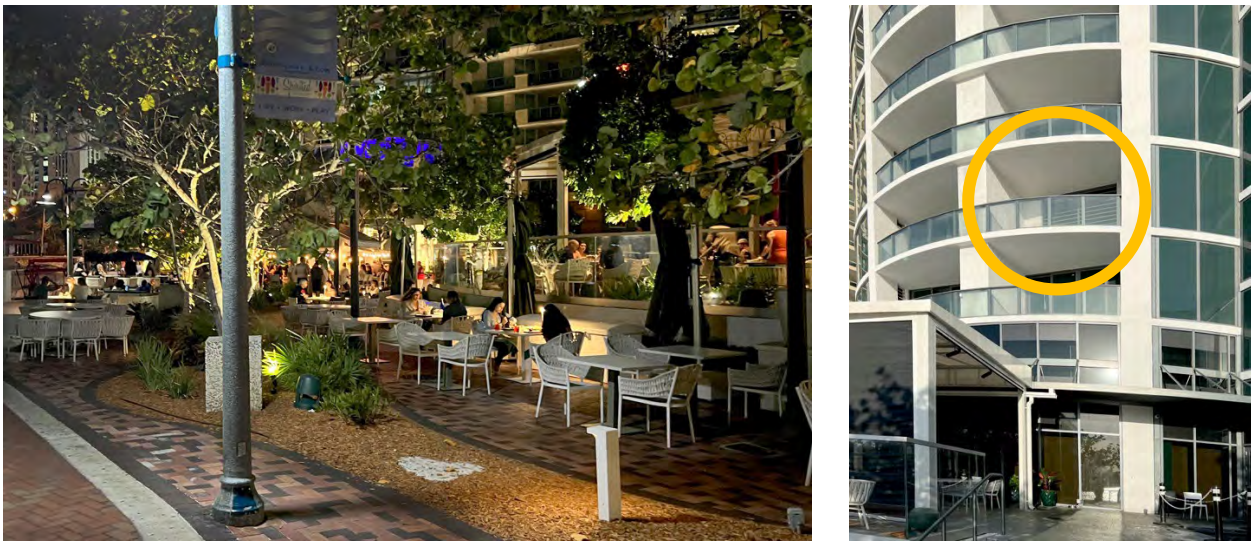


Figure 24. Salt7 during the evening with outside dining and soft music playing (left) and during the daytime with mechanical sound source emanating from the third level of the building (right).

In the late evening, the ambient sounds at the Riverwalk near Salt7 are mostly wind blowing through the trees, people talking as they walk along the Riverwalk, and nominal noise from occasional cars and boats passing by or boats docking. The amplified music from Salt7 is just barely audible within the mix of ambient sounds. Other sound sources outside the terrace at Salt7 included water fall sounds from the fountain at the Water Garden shown in Figure 24 and breezes in trees. During the daytime breezes in the trees, cars, and boats comprised the ambient sound levels. There was a repetitive banging noise emanating from an apparent mechanical space with a louvered exterior façade on the fourth floor of the building over Salt7 (Figure 24 right). Additionally, the sound of a mechanical fan, perhaps with a bad bearing, seemed to dominate the ambient sounds with some other construction noise.

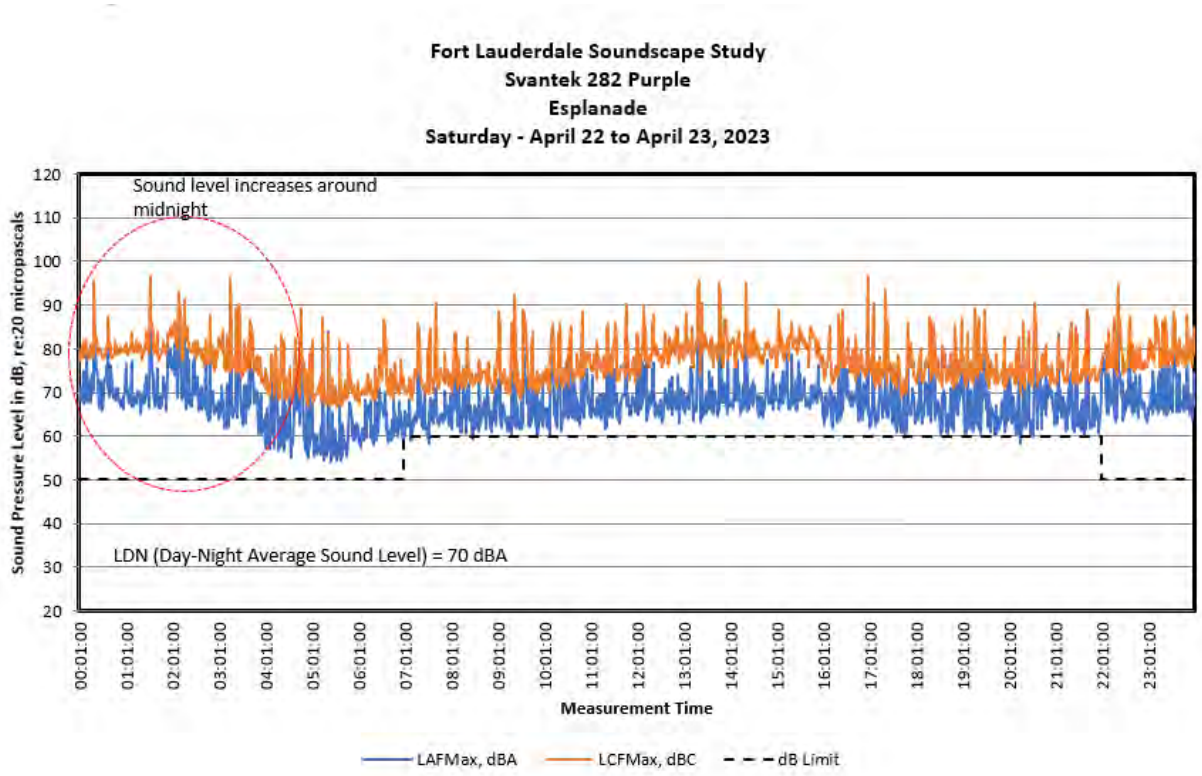


Figure 25. Overall sound levels (dBA and dBC) measured on the balcony of an upper floor unit in the Esplanade in the New River residential tower across the river from the Esplanade Park. Notice the increase in sound level that begins around 10:00 pm on the right side of the graph and continues after midnight until 3:00 to 4:00 am on the left side of the graph.

Across from the Esplanade (Esplanade on the River Condominium)

Sound levels across from the Esplanade tended to be higher on the upper floors of the residential tower than in the Esplanade Park below. This is likely because the Esplanade park area is somewhat shielded on grade from the amplified music sound sources at Himmarshee and The Wharf. As one moves up higher, the ambient sound levels are higher, and there are high sound levels in the evening until approximately 4:00 a.m. At 4:00 a.m., sound levels decrease for approximately 2 hours, and then begin to increase after 6:00 a.m. as day time activity in the city begins. The sound levels tend to rise until approximately 4:00 p.m.,

when they drop slightly until approximately 10:00 p.m. At 10:00 p.m., the sound levels tend to rise, likely from amplified nightlife and do not decrease until 3:00 a.m. to 4:00 a.m.

Los Olas Boulevard at YOLO (You Only Live Once) and the O lounge

Figure 26. YOLO patio dining in the foreground (green awning) and O Lounge beyond (maroon awning).

The YOLO and O Lounge are adjacent dining, drinking, and dancing establishments. The YOLO bar and restaurant has an outdoor patio and plays amplified music during the early evening hours. The O lounge, is an indoor bar/club that plays amplified music until 2:00 a.m. on Saturday night (Feb 18/19). Music emanating in the early morning hours from the O Lounge was barely audible above the ambient sounds of wind in trees and distant automobiles. At approximately 1:45 a.m., the double doors at the entry were held open while the loud music was still playing inside. At that time, the music was clearly audible in the areas outside the O Lounge. Please refer to the discussion of long term sound levels made at the upper floor of the Water Garden where these sounds are also heard.

MG- please EDIT FIGURE HEADING “across”

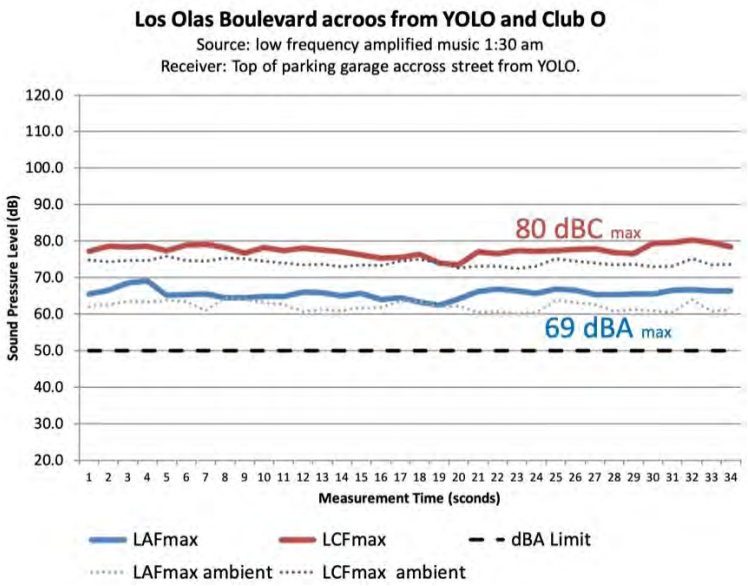


Figure 27. Measurements taken from the parking deck across the street from Yolo and O club with line of sight to the establishments.

Colee Hammock

Sound levels were measured at Collee Hammock, as it is fairly close to a number of eating establishments. Discussion with the homeowner revealed that one source of noise complaints in this area was actually not from the amplified music at the eating establishments, but rather from sounds in the service alley directly behind the residential street. The alley adjoins the back yards of the homes and faces the eating establishments. It was used as access by delivery trucks, service trucks and other vendors during late night hours to the commercial properties. The back up beepers, sounds of trucks unloading, vacuuming, etc., associated with these vehicles were a primary source of noise issues according to the homeowners at this location. The long-term measurement graph shows a relatively uniform LAeq sound level over 24 hours, which means this location likely has HVAC units on at the neighboring properties and road traffic that keep the ambient sound level fairly consistent. There are also a series of "spikes" representing short term activities such as those noted above that rise above other ambient sound levels.

Potential strategies for improving this difficult adjacency could include:

- Planning: Residential adjacency to service area for restaurants. Orient the buildings away from service areas. Require solid walls or other buffers between service areas and adjacent properties.
- Operational: Require service trucks to come between hours of 8:00 a.m. to 7:00 p.m. so residents aren't disturbed by their activities.
- Require acoustic controls on HVAC operation, kitchen exhausts and other building equipment for commercial occupancies.

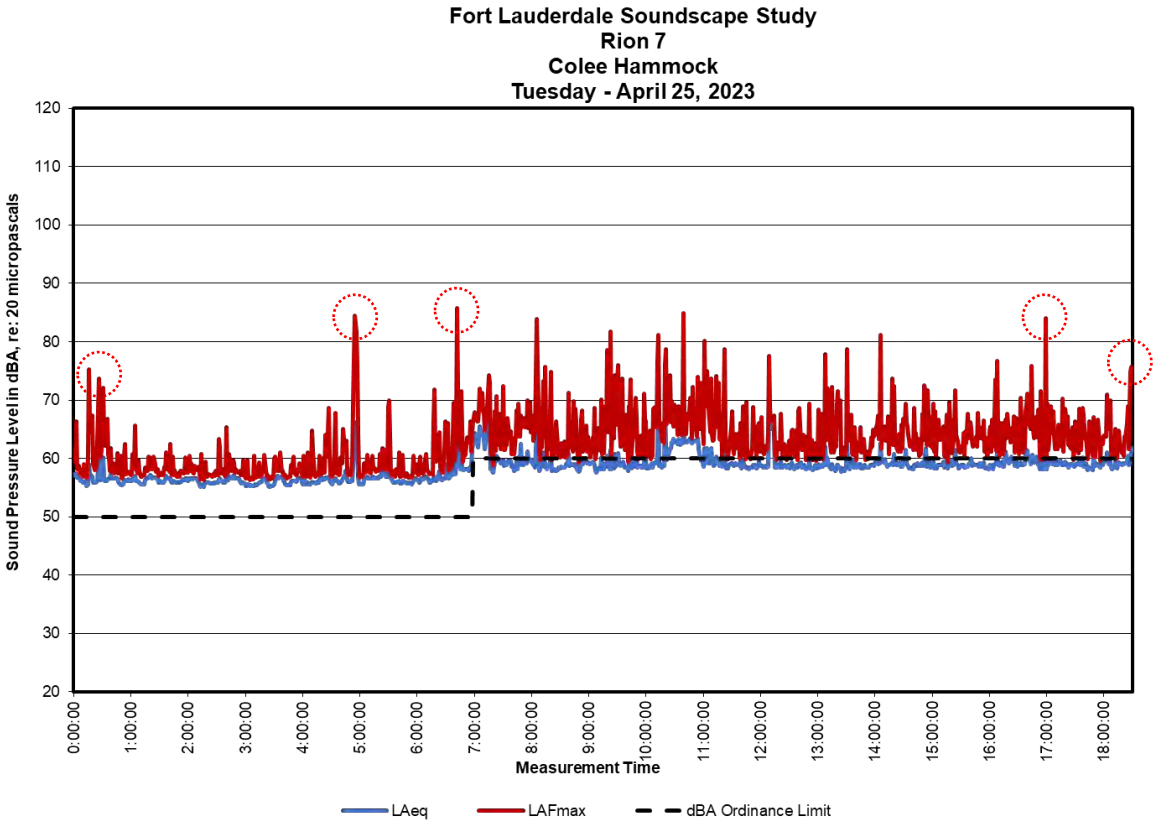


Figure 28. Sound levels in Collee Hammock. Red circles show loud sound levels during late night and early morning hours right outside the bedroom window of a residence. Short-term intermittent sounds that are 10 to 20 dB above the ambient sound levels are loud enough to cause disturbed sleep or to wake older people or young children who are light sleepers.

Colee Hammock at The Balcony

Figure 29: The Balcony and Bo's Pub across a municipal parking lot in the Colee Hammock neighborhood at 2:15 am.

The Balcony is located at 1309 E. Los Olas Boulevard with a restaurant at ground level (Bo's Pub) and a bar and nightclub on the second level (The Balcony). The commercial establishment is located across an alley and within a city block of the established Colee Hammock neighborhood.

Although there is an opaque wall at the rear of The Balcony, significant amplified music dominated by low frequency bass energy was heard emanating from the establishment and recorded at a neighboring property approximately 180 feet from the rear of The Balcony/Bo's Pub. Figure 30 illustrates the levels of the low frequency sounds measured with a C-weighting (dBC) at 18 decibels above the A-weighted (dBA) sound levels. This C-weighted measurement is indicative of the impact of low frequency sound as an annoyance that is not well measured using A-weighted sound levels.

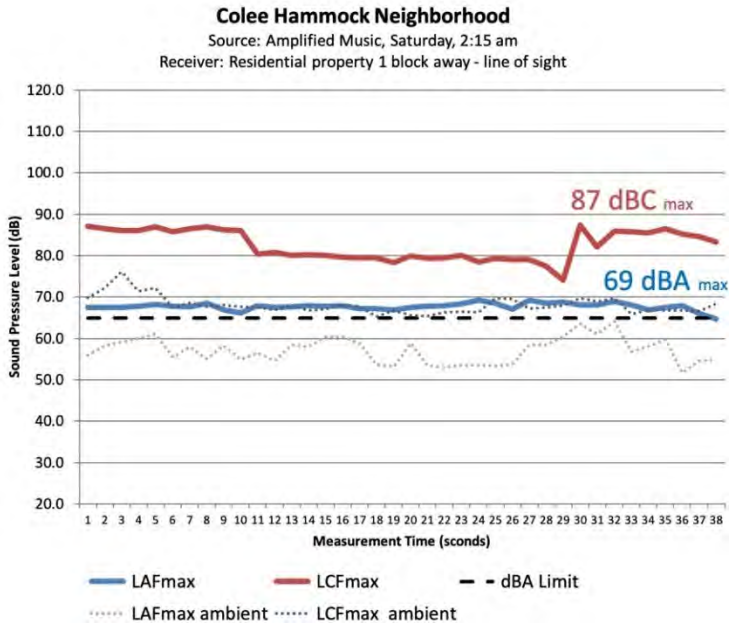


Figure 30: Sound levels measured approximately 180 feet from The Balcony, at a residential property at 2:15 a.m. February 18, 2023.

Bamboo Flats

The residential areas of Bamboo Flats are adjacent to a lively restaurant and entertainment area, where amplified sounds from the nearby establishments are a source of complaints from some of the residents. It was found the sound levels at the residential location tended to increase in the evening beginning at approximately 10:00 p.m., and stayed relatively high until approximately 3:30 a.m., as shown in Figure 31. There is a direct line-of-sight from a number of the residential areas to the bars and establishments with amplified music. Sound levels at this location tended to be above the 50 dBA residential sound level limit in the evening. Although the quiet ambient sound levels dipped below 50 dBA at times.

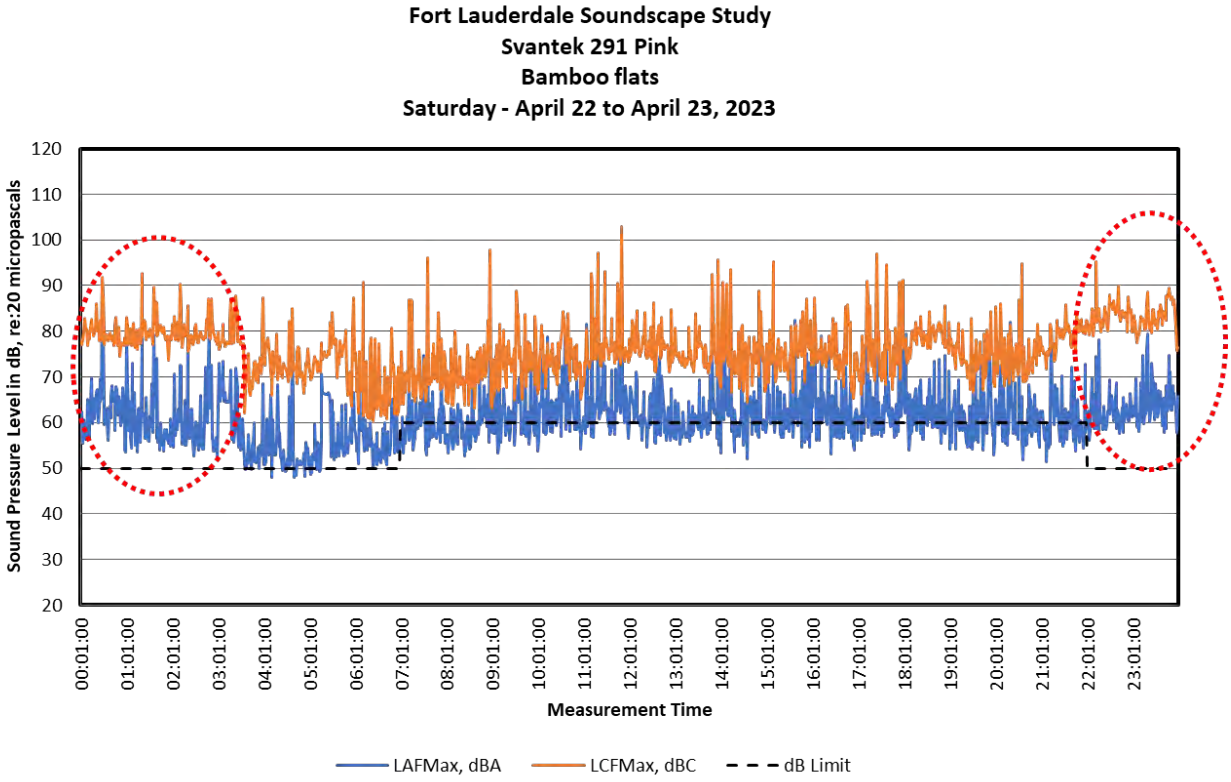


Figure 31. Sound levels measured in the Bamboo Flats residential area that show an increase in sound level in the evening hours from approximately 10:00 pm to 3:30 am.

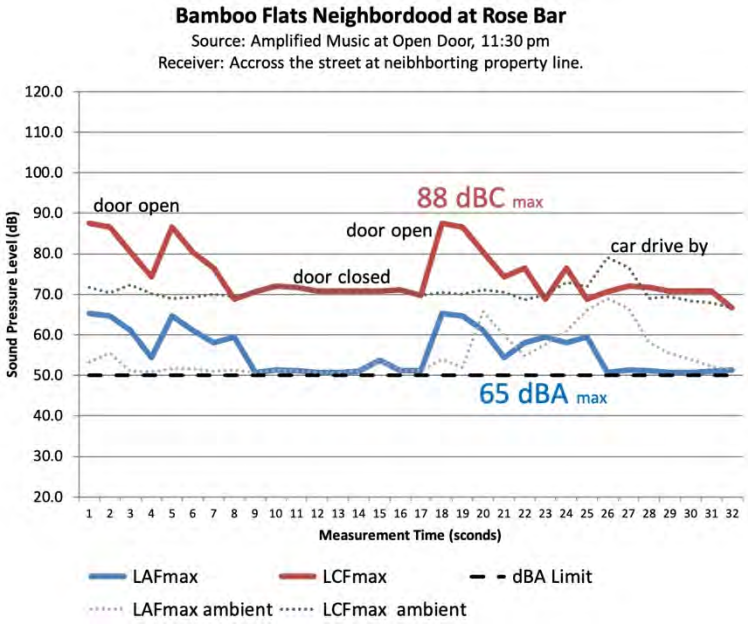


Figure 32. Measurements across the street (south side of the road) from the Rose Bar showing door open and door closed levels.

Measurements at this location show the clear difference in amplified music sounds emanating from the establishment when the doors were open and closed. When the doors are closed, the sounds emitted were commensurate with the ambient levels in the neighborhood. When cars drove by, they were the dominant sounds source near the Rose Bar location.

Truth Lounge

Sound levels in the Coral Villas residential area behind the Truth Lounge were measured. Short-term sound level measurements made behind Truth Lounge included levels from 51-64 dBA and 68-76 dBC. The music sounds from the club tended to be within the ambient sound levels when the doors were closed at the front and rear of the building. When the doors opened, sound was more audible and sound levels increased. Providing a sound lock vestibule at the entrance could be a possible design intervention that could be considered to help reduce sound from escaping when the doors open as guests enter and exit the building. Some low frequency sounds may also be radiating out through the roof of the building. Roof assemblies of typical commercial buildings that have a metal roof deck on bar joists with insulation and an acoustical tile ceiling below have a relatively low sound transmission loss in the lower or bass frequencies. This means that sounds from subwoofers inside a typical commercial building could radiate out of the roof and propagate to adjacent properties. Sounds also propagated across the street when the doors in the rear of the building were opened.

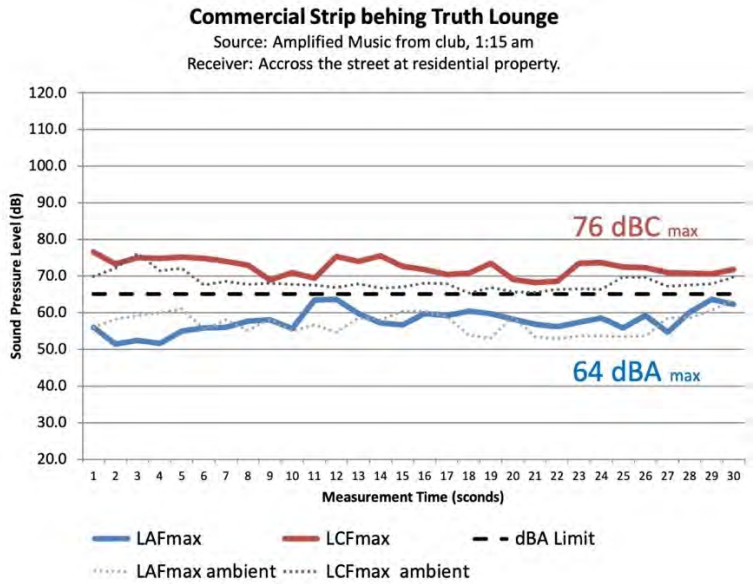


Figure 33. Sound levels measured in the residential area behind Truth Lounge.

Smitty's

Sound levels were measured in the parking area across the street from Smitty's Wings several times. Historically, sound complaints from this location were not associated with the operations of Smitty's, but rather with people who would congregate in the parking lots surrounding the establishment, playing amplified music in their cars and socializing. This was historically noticed on Sunday afternoons and evenings. Sound level measurements were made for 4 days in this location. Typical sound levels ranged from 75-85 dBA LAFmax during the day time hours, due to the large amount of traffic on NW 6th Street or Sistrunk Boulevard. However, amplified music in the parking lot was measured at levels of 80-105 dBA LAFmax from approximately 6:00 p.m.-8:30 p.m. on Sunday, April 23, 2023. Figure 34 shows the data from this day with the red dotted ellipse showing the sound levels from the amplified music and other activities in the parking lots.

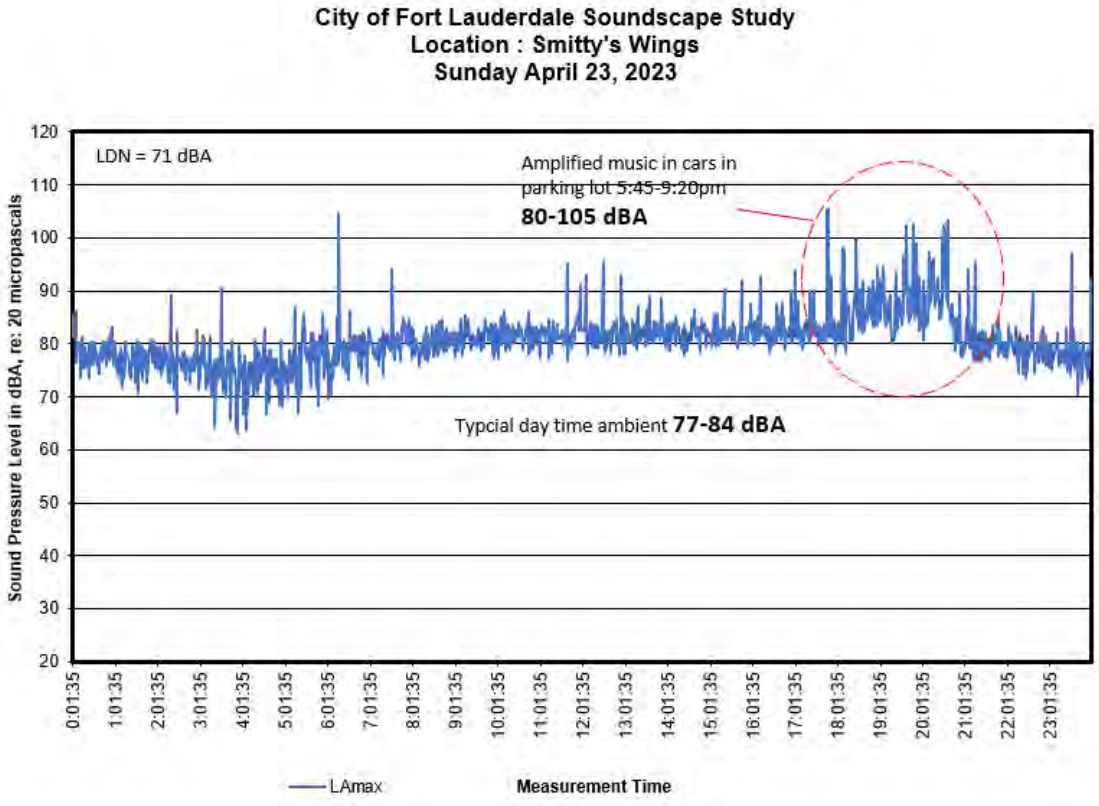


Figure 34. Data from Sunday April 23, 2023 showing the sound levels from cars playing amplified music in the parking lots. Notice the increase in sound levels between approximately 6:30 to 8:30 p.m. on this Sunday evening.

MOTORCYCLE AND LOUD VEHICLE SOUNDS

There are a number of locations in Ft. Lauderdale that are regularly impacted by loud vehicular traffic. These locations include primarily along A1A at the Beach locations, however, loud vehicles are present throughout the city.

Loud motorcycles were measured at levels over 100 dBA and 100 dBC. The sounds from loud vehicles were measured at the long term locations in the Beach area and during soundwalks at the Beach and in other areas of the City. These sounds are particularly challenging to address from the perspective of the Noise Ordinance, as they are extremely loud, short duration events that can take place frequently, especially if large groups of riders are circling the Beach area. The source of sound is moving, often rapidly, so enforcement is difficult. During the first measurement trip, sounds from the loud vehicles took place over 30-90 or more times in a 24 hour period. Loud, short duration sounds like those from motorcycles and loud vehicles can cause sleep disruption and other effects.

It has been discussed that recent police enforcement has resulted in less calls regarding sounds from loud vehicles.

There are new devices that are able to detect loud vehicles in traffic. They may be integrated with an automatic ticketing system that would generate a ticket if a vehicle with excessive noise is detected. These

devices are currently being tested and several cities around the world have implemented them. It may be worthwhile to test this kind of device on a trial basis in locations on the Beach or other areas that experience excessive loud vehicle traffic to see if the technology would be beneficial to the City.

ACOUSTIC COMPUTER MODELING OF URBAN SOUND PROPAGATION

Measurements were taken on the 2nd trip to help identify the specific sound paths that the sounds from entertainment sources must travel to reach the potentially affected receivers. Sound level measurements were taken on grade, as well as on floors where residents have been affected by noise.

It is our understanding that the City of Fort Lauderdale previously took sound measurements for code enforcement purposes in the residences or on the balconies of residences where noise complaints originated. It was suggested that this protocol was changed, and now sound measurements are conducted on grade level, rather than at the affected residence which may be on the upper floors of a high rise residential or mixed-use tower.

This computer model study was performed to investigate the differences in sound levels at various heights above grade, relative to potential sound sources, with contexts approximating selected sites in Fort Lauderdale.

The entertainment sounds such as amplified music or loud voices, measured on grade, were often mixed in with ambient sounds so that a clear measurement of only the entertainment sounds is quite difficult. At upper floors of buildings direct acoustical lines-of-sight between the entertainment sound sources and the residential occupancy resulted in clear and plainly audible sounds being heard at long term measurement locations at Jackson Tower, Water Garden, Esplanade on the New River, Bamboo Flats and Colee Hammock among others. This phenomenon was seen in the computer models that were constructed of certain areas of the cities. They show areas where due to shielding from buildings, some areas on grade are blocked from the direct sound, whereas areas up higher with a clear acoustic line of sight have higher sound levels.

The grade level ambient sounds were also reduced in level due to increased distance from the amplified music sound sources and shielding from other building structures.

City staff has commented that there are practical difficulties encountered in accessing residential living units that may preclude this as an option for enforcement measurements. However, due to the potential for large differences on grade and on balconies on upper floors, consideration should be given to accommodating this kind of measurement.

Open vs. Closed Building Infrastructure Investigation

Using the building infrastructure as a way of providing noise mitigation was explored in a 3-dimensional computer model. The model shows the approximate effects of having an operable roof structure in open and closed conditions on the sounds propagating from inside a venue to the surrounding environment.

The model assumes sound levels of 95 dBA played inside the entertainment venue. With the roof open, the sound spread covers the near side of the adjacent building and wraps around the sides of the building. Figure 35 shows the open condition. Sound levels of 75 to 85 dBA are shown as emanating from the open building with levels of 75 dBA striking the adjacent building.

With the roof closed, the sound levels would likely be reduced by 15-20 dBA. Figure 35 shows this closed condition with sound much more contained resulting in sound levels of 50-55 dBA projected across the

facade of the building. This is a noticeable sound reduction, and would be heard as 3-4 times quieter with the roof closed rather than open.

This concept can be applied to many of the existing entertainment venues, especially those who might be located in or around residential areas, who may have operable roofs, windows, doors, roll up doors or other features.

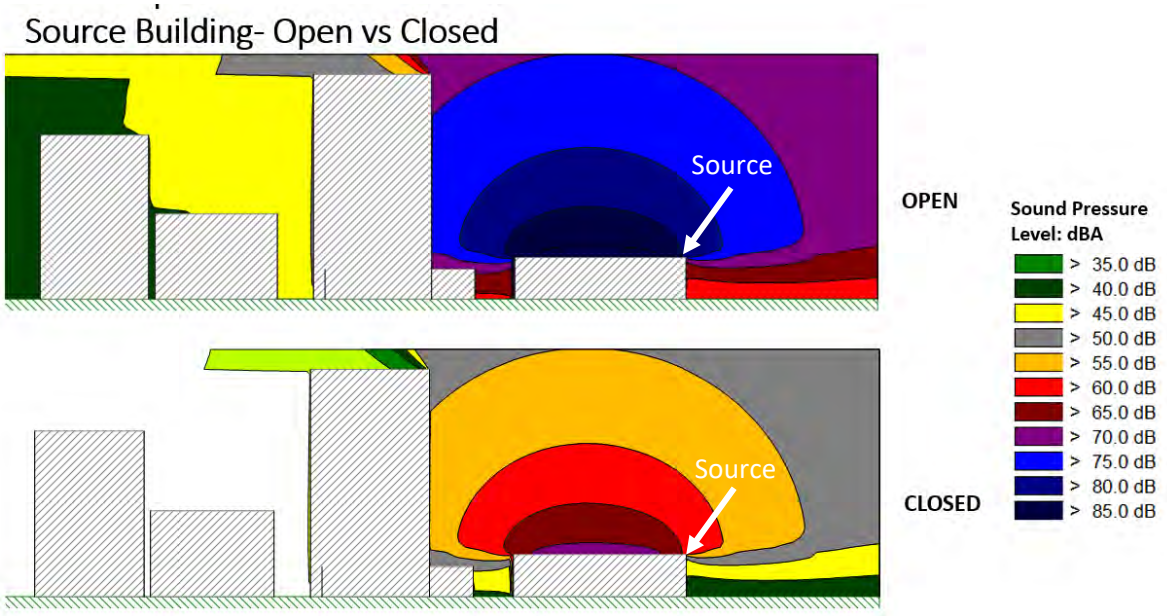


Figure 35. Computer model showing conceptually an entertainment establishment with the roof open (top) versus with the roof closed (bottom). There is a 20 dB difference in sound levels at the receiver location between the 2 conditions.

Operational controls could be considered at different times of day or for different activities inside the building such as special performances that may play louder music than typical activities as a feasible sound control strategy to contain sound spread to the extent possible. Keeping the roof, windows and doors closed will help contain the spread of sound to neighboring areas.

The use of sound lock vestibules at entry and exit points to entertainment occupancies might also be considered in establishments. This would essentially create a small entry vestibule with a second door whereby people could enter the establishment, the first door would open while the second door remained closed. After the guests entered the vestibule, the first door would close and then the second door would open into the main area. This strategy would result in blocking the direct sound path from inside the facility to the exterior through the single open door reducing sound propagation to near by properties. Similar strategies are often used in theaters and performance spaces to contain the spread of sound and light into a performance space.

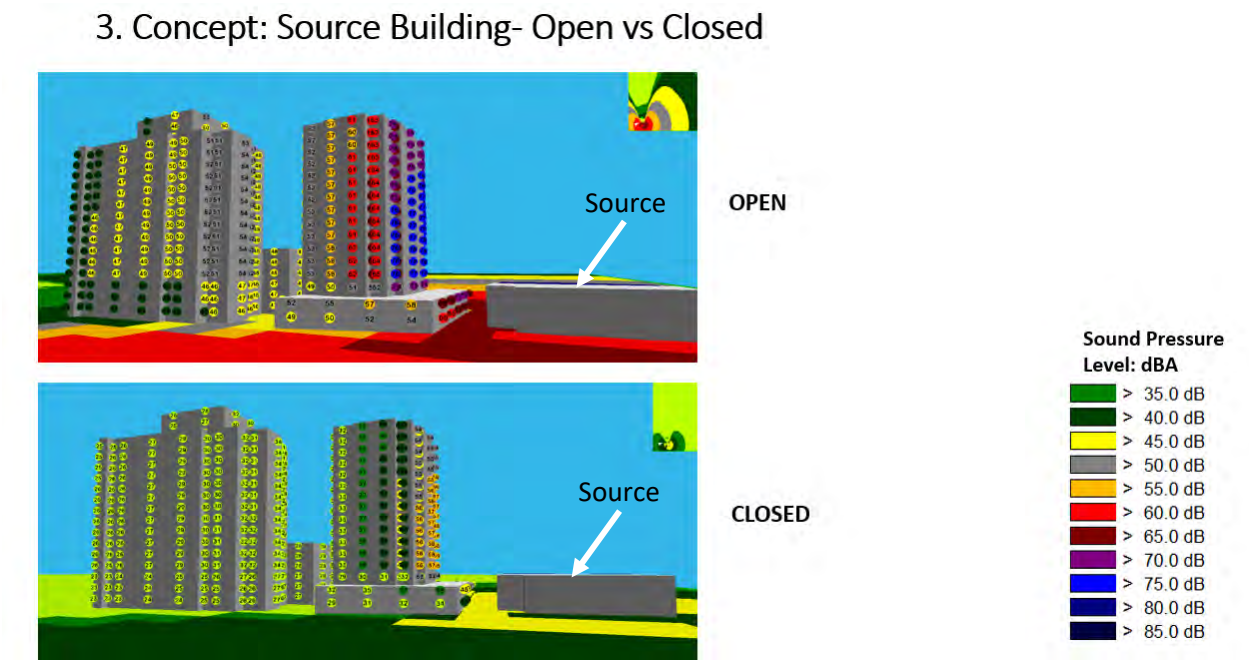


Figure 36. Computer 3D model showing conceptually an entertainment establishment with the roof open (top) versus with the roof closed (bottom). The elevated sound levels cover the front façade of the adjacent residential building that faces the entertainment venue and wrap part of the side walls as well.

Low frequency sound propagation

Low frequency bass energy is a major component of amplified music. It includes frequencies from 20-150 to 250 Hz typically and results in the feelable perception of music in one's chest and body. Low frequency sounds have extremely long wavelengths and are reduced less than middle and higher frequency sounds as they travel through the air and as they pass through building walls, windows, doors and roofs . They carry farther and with less reduction due to distance than the middle and higher frequency sounds. The low frequency sound waves can also cause building vibrations and window shaking.

A 3D model was built to study the spread of low frequency sound versus overall A-weighed sound level. The overall A-weighted sound level because it reduces the low frequency sound level, does not include the effect of low frequency sound.

The model on the top shows the A-weighted sound level on the facades of buildings with an entertainment establishment playing music. The A-weighted sound level across the facade of the building is 30-45 dBA.

The model on the bottom shows the sound levels in the 63 Hz octave band. The 63 Hz octave band is one of the lower or bass frequencies. The spread of this frequency is much farther than the overall.

This means that even if sounds are measured with an A-weighting, that the measured sound level in dBA may not tell the whole story about what the low frequency sounds may be doing in that area.

This brings up two items for consideration:

1. Using an A-weighting to measure sound level, especially at the residences, may not show the low frequency sound from the entertainment establishments. Consider using a C-weighted sound level limit in addition to the A-weighted sound level. Alternately, sound level limits could also be required in individual octave bands similar to Rule 4 of the Duval County Environmental Protection Board which is used in the City of Jacksonville.

2. Low frequency sound travels much farther, propagates with less reduction into adjacent buildings, and sometimes results in vibrations of building materials that are then perceived by people than middle and higher frequency sounds. Consider limiting low frequency sound levels overall or during specified times such as late night or early morning.

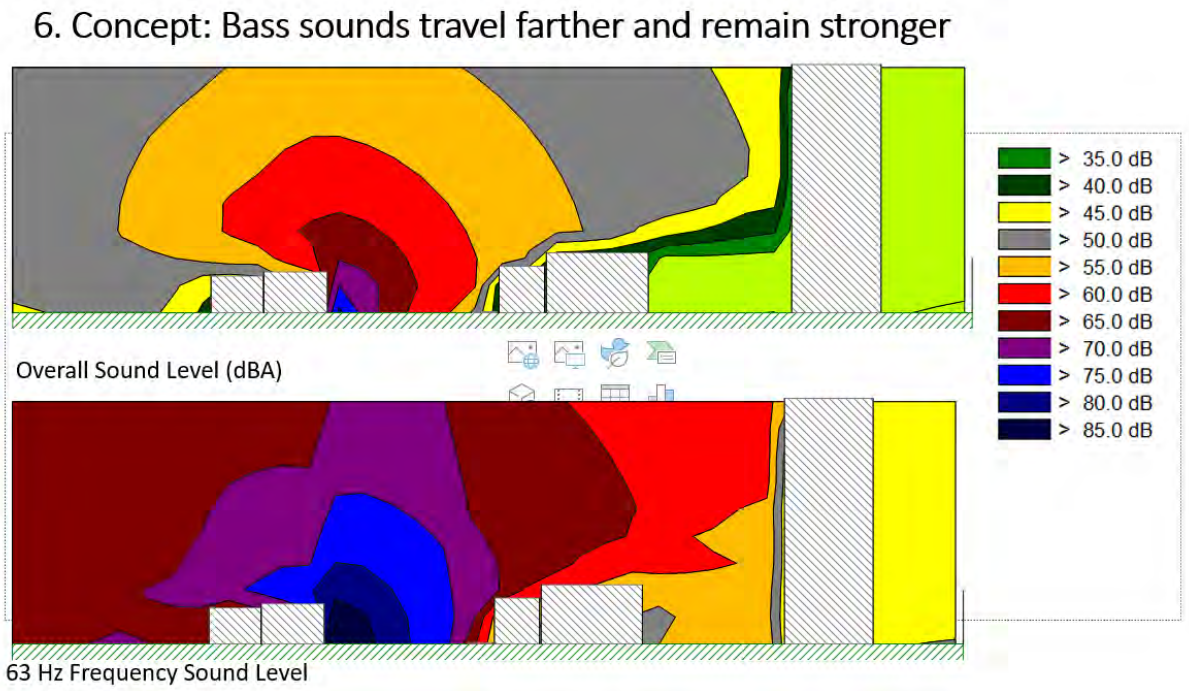


Figure 37. Overall A-weighted sound level spread from entertainment establishment (top). And low frequency 63 Hz octave band sound level (bottom). Low frequency sounds travel farther with more energy than middle and higher frequency sounds and the overall A-weighted sound levels do not show the intensity of these low frequency sounds.

Figures 36 and 37 model the interaction a reference sound source in the context of the Bo's on the Beach entertainment venue and adjacent residential condo tower the Illni.

Figure 38 shows the A-weighted sound level contours at adjacent buildings with levels of 45 dBA at Jackson Tower for example. Figure 39 shows the sound levels in the low frequency band of 63 Hertz. In the case of the low frequencies, the levels are 15 dB louder than the A-weighted average. Perceptually, 15 dB is considered 3 times louder. The model shows how the low frequency energy extends to farther distances and is subsequently much louder than the A-weighted levels at any given distance. Low frequency sounds are better characterized with a C-weighted measurement or a measurement in the 63 Hz. and 125 Hz. octave bands than with A-weighted measurements.

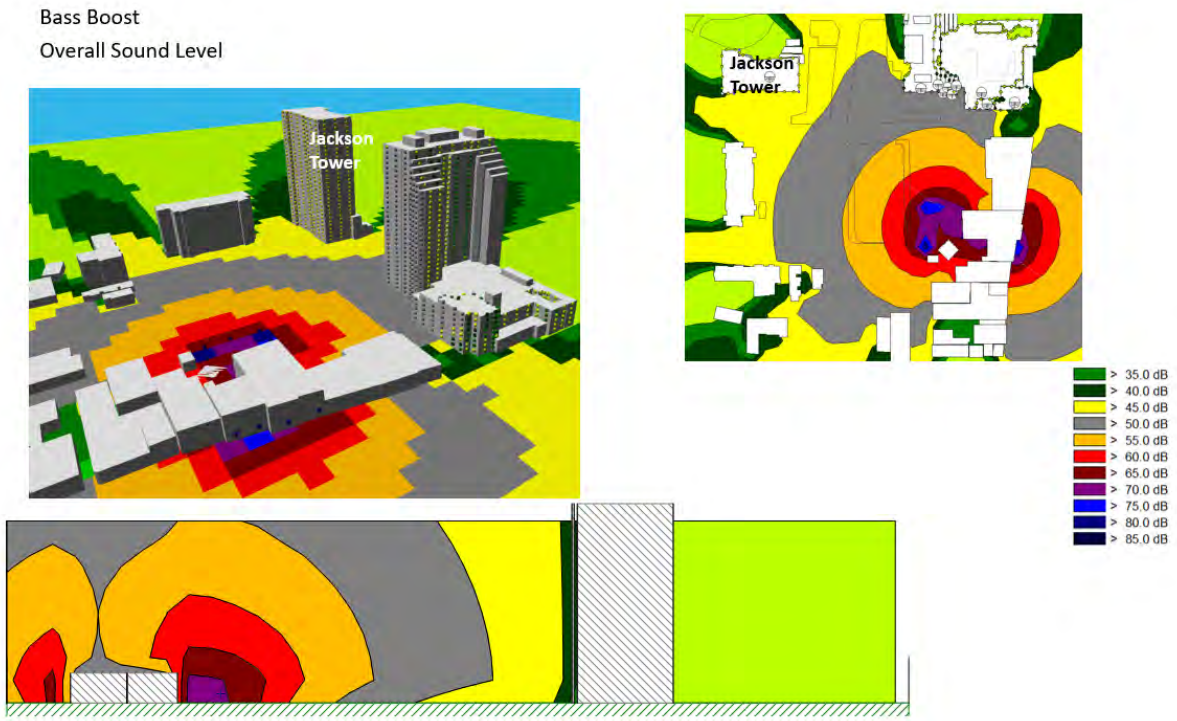


Figure 38. Overall A-weighted sound level from an entertainment establishment. Notice the overall sound level at Jackson Tower in the 45 dBA contour.

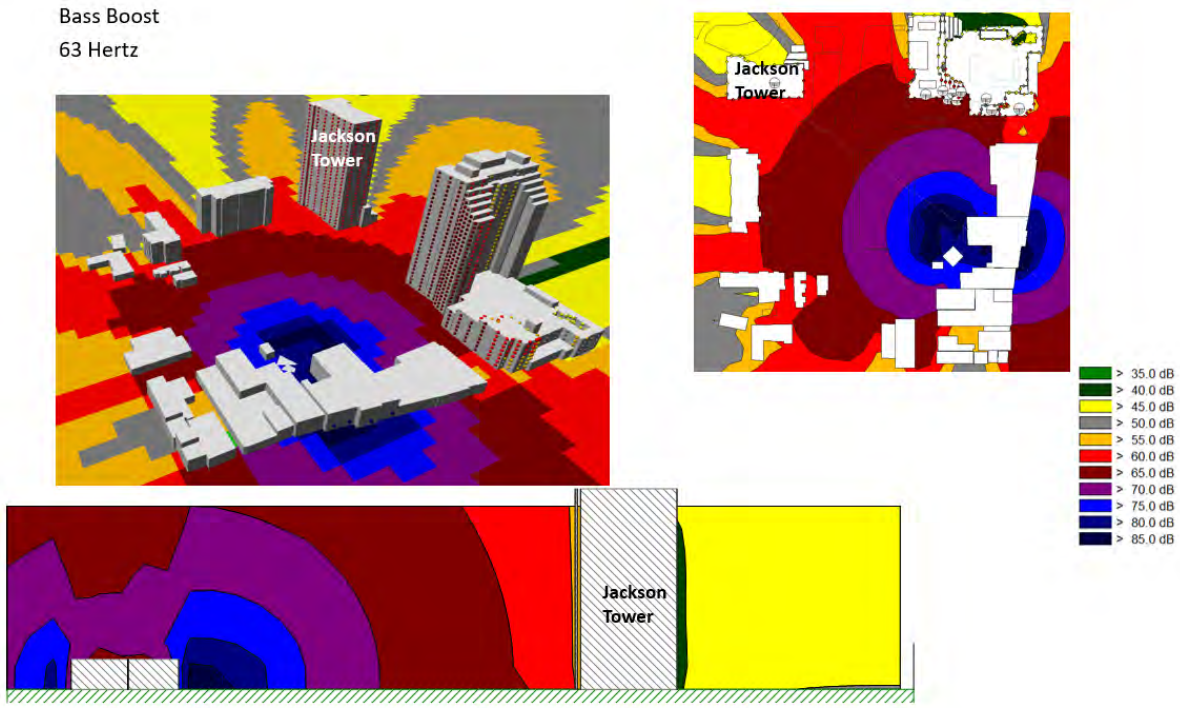


Figure 39. Low frequency sound level of 63 Hz sound level from entertainment establishment. Notice the sound level at Jackson Tower in the 63 Hz. octave band contour.

Time of respite

There are a number of residential locations that have raised sound levels starting in the late evening and continue until 2:00-4:00 am. The sound levels may stay somewhat low until approximately 6:00 am when they begin to increase again as day time activities in the city start. This means that in many areas, there are only 2-4 hours of relative quiet between the time when amplified music stops and the time when the city begins to wake up. These elevated sound levels likely make it difficult to sleep, which can have negative health impacts.

Consider applying the Noise Level Reduction (NLR) to meet the interior design noise levels that are contained in the NLR section.

HEALTH EFFECTS OF NOISE

Introduction

Hearing loss is well documented in the literature as one of the primary health effects experienced by people exposed to high levels of noise, especially in the workplace and in leisure activities. There is also a substantial body of research that deals with identifying annoyance, speech interference and other potentially damaging effects of noise related to hearing. The World Health Organization (WHO) (Schwela, 2001) has identified 5 primary categories into which the effects of noise on people can be grouped.

1. Temporary or permanent hearing impairment.
2. Interference with communication
3. Sleep disturbance
4. Temporary and permanent impact on physiological and psychological functions in people
5. Social, behavioral and annoyance effects.

This section summarizes documented physiological effects of noise on people. It will also briefly address other aspects of noise effects as they may be pertinent to develop an understanding of the reactions of people exposed to high levels of noise on a regular basis.

A discussion of the physiological effects of noise should consider the goal of maintaining a healthful environment for high quality living and comfort. The presence of disease or illness is identified by an irregularity of physiological functions which are found to require treatment. This is determined by comparing measured values of physiological indicators to the mean and standard deviations of a “normal” population. If a continuum is drawn from a diseased state requiring treatment to a low quality of life standard and extending to a high quality of life standard, the average for the “normal” population with its standard deviation will overlap the beginning of the standard deviation for the part of the population in jeopardy. High quality acoustical environments where people do not experience physiological or psychological symptoms and a relatively high degree of acoustic comfort are noted to have an A-weighted equivalent continuous sound level (LA_{eq}) of 30-35 dBA and maximum A-weighted sound level (LA_{max}) of 45 dBA. Annoyance, sleep interference and other psychological and physiological symptoms begin in the 55 - 65 dBA range. People living and working in environments with an average sound level or LA_{eq} < approximately 70 to 75 dBA are considered to be in a reasonably healthful environment. Jeopardy for symptoms related to noise begins at approximately 70 to 75 dBA. Hearing loss occurs in environments with LA_{eq} > 78 to 85 dBA. Extra aural overstrain occurs at L_{max} > 99 dBA.

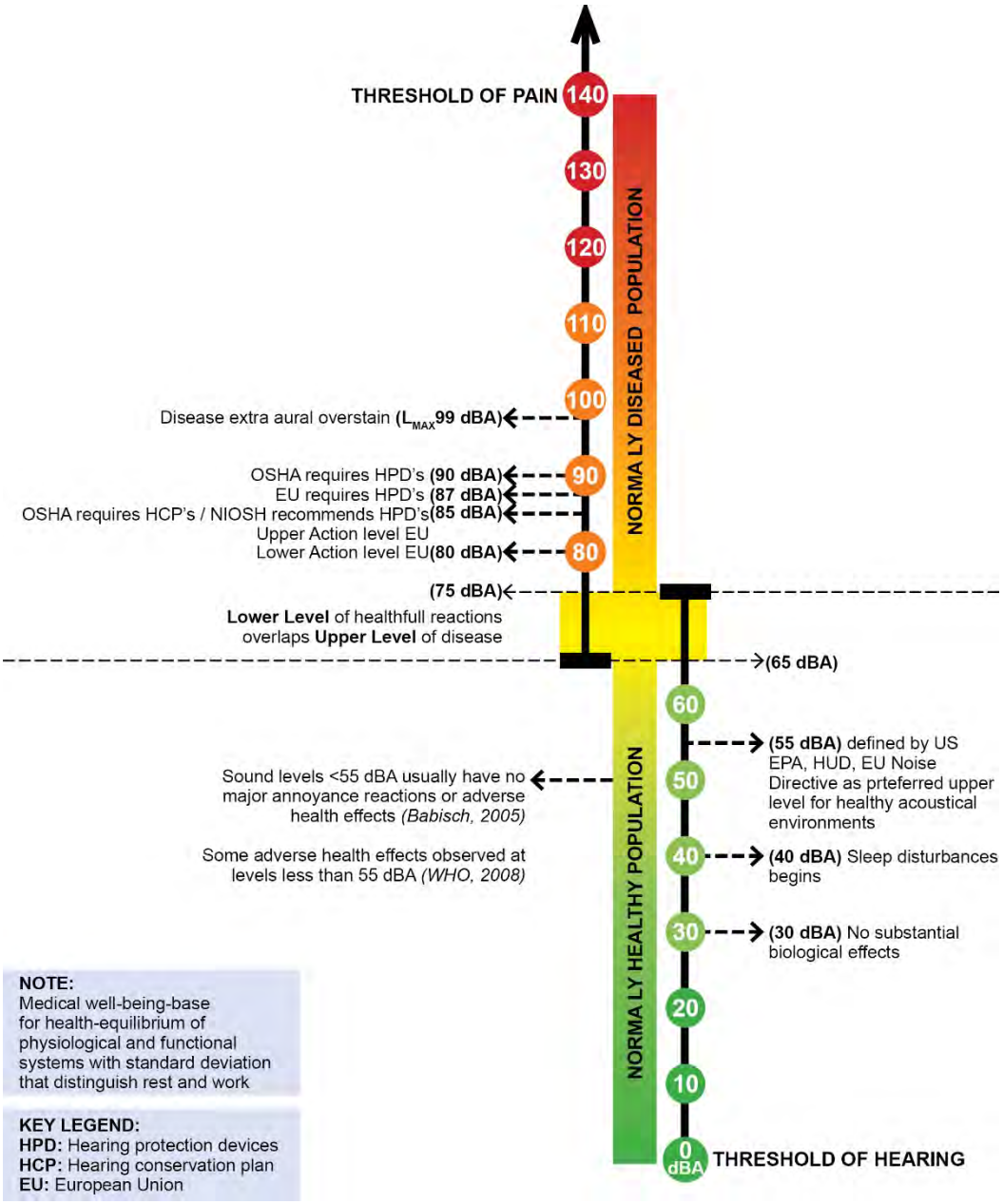


Figure 40. Diagram illustrating healthful and harmful acoustical environments.

Temporary Hearing Loss

Working, playing, or living in high levels of noise gives rise to the possibility that people may suffer noise induced hearing loss. There is a considerable variability in the human sensitivity to noise and resulting hearing impairment. Damage risk criteria have been developed to assess the probability that a noise induced population will suffer hearing losses. It is generally agreed that damage risk is negligible in environments with 8 hour sound levels < 70 to 75 dBA. Thresholds published by the World Health Organization are 70 dBA average sound levels over a 24 hour time period with maximum sound levels < 110 dB for industrial and commercial activities for continuous noise and a peak sound level of 140 dB 100mm from a person's ear for impulsive sounds. In the work place in the United States OSHA, the Occupational and Safety

Hazards Administration, has requirements that a hearing conservation program be administered in environments where the 8 hour sound level is > 85 dBA and hearing protection devices be worn in environments > 90 dBA. OSHA also recommends that people not be exposed to impulsive sounds > 140 dB.

Occupational Safety and Health Administration Requirements

The Occupational Safety and Health Administration (OSHA) states in Title 29 of the Code of Federal Regulation (CFR) Part 1910 Subpart G Occupational Noise Exposure Standard 1910.95 that feasible administrative or engineering controls must be utilized for covered employees subjected to sound levels exceeding those listed in Table 7. If the controls fail to reduce sound levels within the levels of Table 7, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table. The acoustical measurements conducted in this study identified areas of the City where sound levels exceeded the levels in Table XX. Areas of the City were also found to have sound levels above the 85 dBA required by OSHA for inclusion in a Hearing Conservation Program in covered industries. Sounds at these levels on the public rights-of way including sidewalks in the City could contribute to the noise dose that citizens experience at work thus adding to their overall noise exposure and potentially moving them into categories where the implementation of either administrative controls, engineering controls or the use of hearing protection devices reduce to noise exposure becomes required.

Administrative controls may include reducing the allowable sound level limit in the noise ordinance for sounds on sidewalks and public rights-of-way. This could also involve the posting of noise level warning signs as people enter areas with higher noise levels and possibly also buildings with higher noise levels so the public is aware of the potential risks involved. Engineering controls could include requiring clubs, entertainment establishments, industries, and other occupancies to contain noise within the physical boundaries of their facilities and to use noise mitigation systems to control the emission of sounds to accepted safe levels. Other options could include requiring residential and other potentially noise sensitive occupancies that are either built or renovated in areas of higher sound levels use noise mitigating construction assemblies for doors, windows, walls and roofs to reduce exterior sound levels to appropriate interior sound levels.

Many state and city staff and people working in establishments with 10 people or less are not covered by OSHA. However, the OSHA requirements may suggest a standard of comparison to evaluate the noise impact to which people may be exposed that could possibly result in temporary or permanent hearing damage.

Table 7. Permissible Noise Exposures (*OSHA 29 CFR Subpart G Part 1910.95 b Table G-16*).

Permissible Noise Exposures	
Duration per day, hours	**Sound level, dBA, slow response**
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
1/2	110
1/4 or less	115

According to OSHA a Hearing Conservation Program (HCP) must be administered by the employer when the Time Weighted Average (TWA) sound level exceeds 85 dBA. The Hearing Conservation Program must have the following primary elements.

1. **Monitoring.** The sound levels that employees are exposed to should be monitored on an ongoing basis.

2. **Employee Notification**. The employer must notify employees of potential noise exposure to sound levels of 85 dBA or greater based in the results of the monitoring.

3. **Observation of Monitoring**. The employee or their representative can observe any noise measurements made during the monitoring.

4. **Audiometric Testing Program.** Audiometric testing paid for by the employer must be made available to all employees exposed to sound levels of 85 dBA or higher.

5. **Audiometric Test Requirements**. Audiometric tests shall consist of pure tone, air conduction, hearing threshold examinations, with test frequencies including 500, 1000, 2000, 3000, 4000 and 6000 Hertz performed separately for each ear.

6. **Hearing Protectors**. Hearing protectors selected by the employees and paid for by the employer shall be available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater.

7. **Hearing Protector Attenuation**. The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. Hearing protectors must attenuate employee exposure at least to an 8-hour time-weighted average of 90 decibels for normal hearing employees and 85 decibels for employees who have experienced a standard threshold shift.

8. **Training Program**. The employer shall institute an annual training program covering a) the effects of noise on hearing, b) the purpose, use and types of hearing protectors and c) the purpose and explanation

of audiometric testing for all employees who are exposed to noise at or above an 8-hour time-weighted average of 85 decibels.

9. **Access to Information and Training Materials**. The employer shall make available to affected employees or their representatives copies of the Department of Labor Occupational Noise Exposure Standard [Code of Federal Regulations, Title 29, Chapter XVII, Part 1910, Subpart G, 36 FR 10466 May 29, 1971; Amended 48 FR 9776-9785, March 8, 1983] and shall also post a copy in the workplace.

10. **Record keeping.** The employer shall maintain an accurate record of all employee exposure measurements and audiometric tests.

National Institute of Occupational Safety and Health Recommendations

The National Institute of Occupational Safety and Health (NIOSH) has published guidelines for noise exposure in the work place that are intended to serve as "best" practices and as recommendations for revisions to OSHA. These include an 85 dBA threshold for implementation of the controls noted above with a 3 dB exchange rate in place of the 90 dBA threshold and 5 dB exchange rate used by OSHA. The NIOSH document also presents more detailed requirements regarding the Hearing Conservation Program and continued noise monitoring that should occur for exposed workers. Among these practices are the posting of large signs indicating potential noise hazards in areas with sound levels that exceed 85 dBA.
Similar legislation in other countries around the world including the European Union (EU) has standards of a low end of action of 80 dBA and a high end of action at 85 dBA with a maximum level of 87 dBA with a 3 dB exchange rate as the thresholds for initiating noise monitoring, hearing conservation programs and administrative, engineering, or personal protection device controls of the noise environment. These requirements are contained in the EU Noise Directive 2003/10/EC with subsequent updates.

Interference With Communication

There is a substantial body of literature that has explored the ways in which verbal communication is hindered in noisy environments (Basner et al, 2014). Metrics such as Speech Privacy Class (SPC), Articulation Index (AI), Privacy Index (PI), speech intelligibility (SI) and speech interference levels (SIL) are among the many indices that have been developed to relate how well people can hear and understand words in the presence of noise. Normal communication with people speaking at "normal" levels occurs among people at distances of 3 ft or greater. Analysis of the data recorded on Himmarshee shows that normal communication cannot occur among people at distances of 3 ft or greater. The high ambient noise levels in the Himmarshee Entertainment District and other similar areas of the city interfere with speech communication among residents, law enforcement officers and City staff. Maximum distances for "just-reliable" communication with different voice levels can be estimated from metrics in the literature *(Handbook of Acoustical Measurements and Noise Control, 3rd Edition* by Cyril M. Harris and *Noise and Vibration Control, Revised Edition* by Leo L. Beranek). "Just reliable communication" is the ability for people to just barely communicate with each other in noisy situations. The maximum distances for "just-reliable" communication are presented in Table 8.

The values in the table for A-weighted sound levels of 85-90 dBA and higher show that for effective communication between people to occur, even when shouting, they must be 3' or less from each other. This

means that one person could not speak to another while walking along a sidewalk in the city and have a conversation. Communication could not occur across a street or a room until levels of < 55 dBA are reached assuming "normal" vocal effort and "normal" hearing abilities of the occupants. This means, for example, that if an officer is trying to talk to someone causing a disturbance and a fellow officer sees him about to be attacked from the rear, shouts of warning could not be heard unless the second officer is within 3 feet of the first officer. This puts the officer in a potentially dangerous situation.

Table 8. Maximum distances for "just-reliable" communications at different noise levels. (Harris, 1991, p.16.10).

	Maximum distance for "just-reliable" communication			
A-weighted sound level, dBA	**with Shouting**	**with Very Loud voice**	**with Raised voice**	**with Normal voice**
110	<2"	NRC*	NRC*	NRC*
105	<6"	NRC*	NRC*	NRC*
100	6"	NRC*	NRC*	NRC*
95	1'-6"	NRC*	NRC*	NRC*
90	2'	6"	NRC*	NRC*
85	3'	1'-6"	<6"	NRC*
80	5'	3'	1'	NRC*
75	10'	5'	2'	1'
70	16'	8'	4'	2'
65	28'	14'	7'	4'
60	55'	25'	12'	7'
55	100'	48'	22'	12'

NRC* = No Reliable Communication

Other effects of noise on communication include fatigue as one attempts to listen for periods of time in the presence of noise; concentration problems, decreased work capacity and misunderstandings. Psychologically these effects are sometimes manifest in lack of self confidence, irritation and uncertainty about what to do.

Sleep Disturbance

Noise from vehicular traffic, entertainment venues, building equipment, and other urban activities may impact residents who are trying to sleep or take naps during different times of day as part of their normal daily routine. The World Health Organization recommends average interior sound levels (LA_{eq}) of 30 dBA during night time (sleeping) hours. An LA_{eq} is the level of a steady sound that would have the same A-weighted sound energy as a time varying sound over the same time period. The Organization for Economic Cooperation provisionally recommends LA_{eq} levels of 35 dBA for light sleep and 50 dBA for deep sleep.

The European Communities Commission recommends interior night time noise levels of 30-35 dBA with maximum peak levels of 45 dBA to minimize sleep disturbance. Griefahn found that the threshold for people awakening during the night was a peak noise level of 60 dBA. Electroencephalogram or brain wave (EEG) readings begin to show effects of peak noise levels as low as 37 dBA. It takes people 2-3 times longer to fall asleep with peak noise levels > 60 dBA than in a continuous background noise of 40 dBA. People will wake up at peak sound levels of 60 dBA and will stay awake longer once they awake as the noise level increases above 60 dBA. Heart rate increases and vasoconstrictions occur at peak noise levels between 60-85 dBA. Thresholds for physiological reaction to night time noise begin to occur at peak noise levels of 50 dBA for children, 55 dBA for middle aged and older people and 60 dBA for young adults.

Temporary And Permanent Impact on Physiological Functions

There are 3 general types of physiological responses to noise.

1. Adaptation. This usually occurs at low doses where one may elect to close a window for example when they hear unwanted noise.
2. Reversible damage which disappears when the noise stops.
3. Non-reversible damage which usually results from severe exposure and usually results in hearing loss.

The adaptive responses include muscle activities such as startle responses and increased muscle tension in response to the onset of sudden, high intensity sounds. These effects diminish with repeated exposure to the noise stimulus.

The evidence of epidemiological effects including change of blood pressure, increase in cholesterol levels, the appearance of mental anxiety and depression at sound levels between 50-75 dBA is not clear and is somewhat ambiguous. The evidence becomes much more clear at higher sound levels.

According to Jansen (1998) cardiovascular effects in adults are the most visible of the physiological effects of noise. These include changes in heart rate, reduction in the diameter of blood vessels (vasoconstriction) in peripheral regions (mostly the skin) and increases in blood pressure. Respiration is accelerated and oxygen consumption is increased in the presence of noise. There is a reduction in salivation and intestinal action. Modifications of the amount of secreted gastric juices and their composition can lead to intestinal irritation and possibly stomach or intestinal ulcers. Endocrine system effects are less visible than cardiac, respiratory and digestive effects, but they are the first responses to noise and cause other effects. (Basner et al, 2014)

Cardiovascular effects. Short term effects such as increases in heart rate when exposed to noise are eventually habituated after repeated stimuli and are usually considered as a startle response similar to the muscle activity discussed above.

Abnormal blood pressure levels have been found in both animal and human subjects exposed to noise in laboratory studies. The effects in the animals appear to be long lasting. Carter and Beh (1989) found increases in diastolic blood pressure in subjects exposed to 55 minutes of 92 dBA noise with no habituation. Van Dijk, Verbeek and de Fries (1987) found that people exposed to noise for 20 years in the work place had higher blood pressure and incidence of hypertension than those exposed for < 10 years. Wo, Ko and Chang (1987) found that workers in a ship yard who experienced noise levels of > 85 dBA at work had a higher incidence of hypertension and higher blood pressure than workers in jobs exposed to < 80 dBA sound levels. Talbot, et al found a strong relationship between severe high frequency hearing loss and hypertension in people > 56 years old. Rosenman (1990) found a relationship between noise exposure and

increased incidence of hypertension. Andren, Hansson and Bjorkman (1981) found a 12% increase in blood pressure in healthy men exposed to 95 dBA noise for 20 minutes.

Vasoconstrictions in blood vessels in the finger have been documented for a variety of noise exposures in the 70-95 dBA range. Ray, Brady and Emurian (1984) found increases in mean arterial pressure and digital pulse amplitude in subjects performing a work task exposed to 93 dBA of pink noise.

Several studies of reactions to impulsive noise at levels of 90 and 105 dBA showed significant increases in diastolic blood pressure and large changes in finger pulse.

Increases in serum cholesterol and lipoproteins have been observed in human subjects are exposed to noise levels of 80-90 dBA.

Endocrine system effects. A general model on how noise stimulates endocrine system responses was proposed by Van Dijk, Ettema and Zielhuis (1986). Their hypothesis states that noise activates the higher cortical centers and hypothalamus by autonomic pathways. This causes the hypothalamus to trigger an increase of secretions of ACTH (adrenocorticotropic hormone) by the pituitary gland. This causes the adrenal cortex and adrenal medulla to increase cortisol and catecholamine concentrations in the peripheral blood. This physiology basically describes a stress reaction. The hormones are found in urine samples.

Arguelles (1962 and 1970) found increases in epinephrine (E) and norepinephrine (NE) when people were exposed to noise in both normal patients and those who had heart attacks. Increases in blood pressure as well as E and NE increased at $p<0.05$ values in the noise exposed group. Cantrell (1974) found that chronic intermittent noise produced more sustained effects of blood cortisol and cholesterol which did not return to the basal levels 15 days after the noise exposure was ended. Klotzbucher (1976), Klotzbucher and Fichter (1979), Ising (1980), Cesana (1982) and Cavatorth (1987) all found increases in E and blood pressure among other indicators in noise exposed populations at $p<0.01$.

Selye found that white blood cells undergo modifications in the presence of noise. Lymphocytes disintegrate in the thymus and blood. Eosinicytes which regulate immunizing serolgical reactions and allergic responses disappear in the blood. As an organism is subjected to increasing noise it becomes weakened; more fragile; magnesium in cells is reduced; and there is an increase in blood leucocyte concentration.

Respiratory system effects. Larger, slower breathing movements occurred in response to a noise stimulus in a laboratory study. The magnitude of the effect increased with increasing noise levels. Subjects exposed to high levels of impulsive sounds showed increased resistance to respiration indicating a constriction of the bronchia followed by a slow decrease of the resistance. Subjects who were smokers or who were exposed to occupational noise had reduced reactions.

Gastrointestinal system effects. Healthy subjects exposed to noise at 105 dBA for 50 minutes after a "standard" meal showed increased, but delayed postprandial sigmoid colon motility. Increased motility was also observed in subjects exposed to an 80 dBA tone at 800 Hz.

Social, Behavioral and Annoyance Effects

Annoyance has been defined as a feeling of displeasure with any agent or condition known or believed by an individual or group to be adversely affecting them. Exposure to noise has been shown to bring about changes in mood, everyday behavior and other social indicators. Among the negative emotions identified

by people exposed to noise are anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, and exhaustion (Basner, et al, 2014).

Glass and Singer (1975) found that exposure to unpredictable and uncontrollable high intensity noise often leads to degradation of the quality of tasks being performed, impaired ability to resolve cognitive conflicts and lowered tolerance for frustration. Geen and O'Neal (1969) found that aggression increased in people exposed to high level noise.

Cherek (1985) found that smoking increased as noise levels increased in a laboratory study of noise exposure.

Conclusions of Health Effects of Noise

Studies point to significant cardiovascular effects including higher blood pressure and increased incidence of hypertension in people exposed to high noise levels. Stress reactions indicated by increased production of hormones have also been clearly associated with noise exposure. A variety of psychological effects of noise including increased smoking, anger, depression, anxiety and agitation have been observed. Speech communication is severely reduced in the presence of noise especially for people with reduced hearing abilities. Living and/or working in high noise environments brings with it decreased work capacity, fatigue and misunderstandings as part of the normal consequences of the difficult environment.

Sound Level Categories

The measurement data from the long term and short term measurements were organized in 9 categories based on observations of the sounds in the field and listening to recorded .wav files during the processing of the data. The plots shown are called box and whisker plots.

The upper side of the shaded box in the middle of the data represents the upper quartile meaning that 25% of the data are louder than this level.

The lower end of the box represents the lower quartile meaning that 25% of the data are quieter than this value.

The horizontal line near the center of the box is the median value of the data which is the value at which 50% of the data are louder and 50% are quieter.

The "whiskers" are the narrow vertical "tails" that extend above and below the boxes.

The ends of the whiskers are the maximum and minimum sound levels measured in each category.

The categories of sounds are listed below.

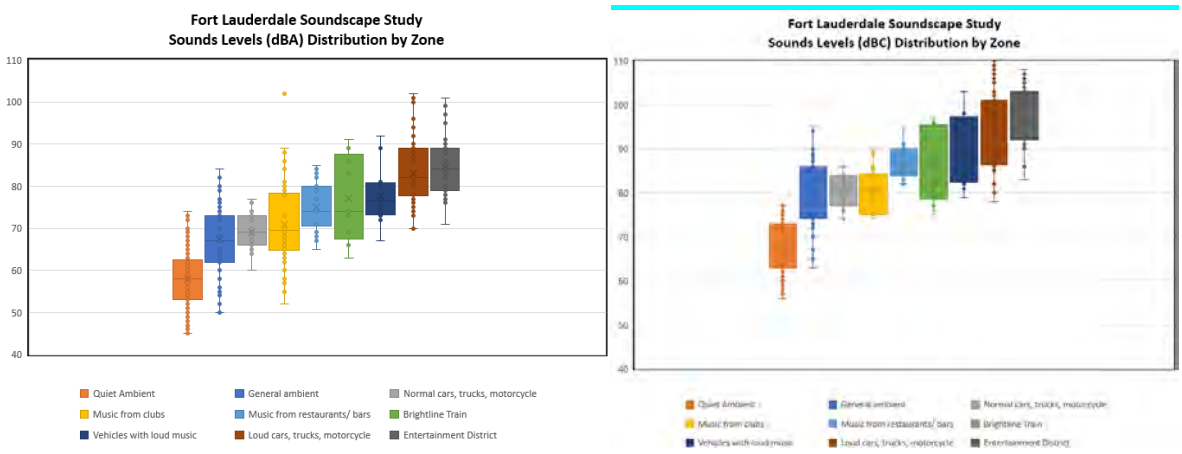


Figure Xx. Graphs of sound pressure level dBA (left) and dBC (right) of sounds by category derived from a combination of long term and short term measurement data..

1. **Quiet ambient**. These are the quietest sounds measured during breaks in traffic flows and when specific acoustic events could not be identified.
2. **General Ambient** sounds. These are sounds of relative quiet with the inclusion of air-conditioning equipment and other typical ambient sounds included.
3. **Ambient with typical vehicular traffic**. These are ambient sounds as described in items 1 and 2 with the inclusion of sounds from "normal" vehicular traffic. This category does not include sounds from vehicles with loud mufflers or those playing loud amplified music as they drive.
4. **Music from clubs**. These are sounds propagating to the exterior from enclosed music venues measured at residential occupancies near the clubs.
5. **Music from restaurants and bars**. These are sounds from exterior, open air restaurants and bars measured near the facility.
6. **Brightline train**. These are the sounds of the train including the train pass-by, horns, and warning signals at grade crossings.
7. **Vehicles with loud music**. These are measured sounds of vehicles passing by the measurement location playing loud music.
8. **Loud cars, trucks and motorcycles**. These are sounds measured of loud vehicles with straight pipes, tuned mufflers, and other devices that create loud sounds.
9. **Entertainment District sounds**. These are sounds measured in entertainment districts on public rights-of-way of sounds from entertainment venues.

In addition to the sorting of the sounds by category, the sounds in each category were sorted by location so that specific understandings of what the long term and short term measurements reveal about the soundscape of the City.

The range of sound levels varies from approximately 10 or 15 dB to over 30 dB in each category. The variation in sound level by category is affected by the type of sound being measured, the distance one can get from the sound source, and the particular location of the sound sources and receivers. For example, the quiet ambient sounds and general ambient sounds have ranges of approximately 30 dBA indicating that the ambient sound levels vary in different areas of the City. The range of quiet ambient sounds is only 20 dBC which indicates that the quiet ambient sounds do not have significant low frequency content because they are comprised of birds chirping, insects, breezes blowing through vegetation, and other middle and higher

pitch sounds. The range of 30 dBC of general ambient sounds indicates that the inclusion of building equipment in the ambient sound levels has low frequency content. There are 4 measurement locations where the quiet ambient sounds were less than 50 dBA including Bamboo Flats, Colee Hammock, Smitty's Wings and Coral Villas. This indicates that the lower density residential areas that are away from major roads have ambient sounds that are lower than the 50 dBA nighttime sound level limit for residential zoning. There were 2 measurement locations where the lower end of the quiet ambient sounds was between 50 and 54 dBA. There were 4 locations where the lower end of the quiet ambient sounds was between 55 and 59 dBA and 2 locations where it was between 60 and 64 dBA.

The range of "normal" vehicular traffic is the smallest of all of the categories at 15 dBA and 10 dBC. This is because from measurement locations on public rights-of-way the distances to the roads are relatively similar from the measurement location to the vehicle and the sounds of "normal" vehicles are relatively constant. The dBA to dBC difference of 10 dB suggests that the lower frequency sounds of after market mufflers or straight pipes and amplified bass music playing from vehicles are not present in this sound source category. Sound levels were in the 50 dBA range at 2 locations: Bamboo Flats and Esplanade Park. Both of these locations were away from streets and higher density and speed traffic. Sound levels of 55 to 70 dBA for ambient sounds with traffic were measured at 7 locations including The Wharf, Esplanade Park, Bamboo Flats, Colee Hammock, Coral Villas, and Esplanade on New River. Sound levels varied between 65 and 84 dBA at AIA North, AIA South, Smitty's Wings, Water Garden, Jackson Tower, and Illini. These locations are close to busy roads where high volumes of traffic are moving. These locations also had numerous incidents of louder cars, trucks and motorcycles and Cars playing loud music.

The median sound level of 70 dBA and 80 dBC for Music from clubs is approximately 5 dB quieter than the median sound levels from Music from restaurant and bars with outdoor music because the sounds from the clubs is more contained within the building. The range of sounds from Music in clubs is over 30 dB indicating that there are some clubs that play at lower levels than others and that the sounds at residential occupancies vary considerably with location in the city and proximity of the residences to the clubs. The length of the "whiskers" in these sound sources indicates a wide variation in both A-weighted and C-weighted sound levels among different clubs and restaurants.

The range of A-weighted and C-weighted sound levels for Vehicles with loud music and Loud cars trucks, and motorcycles is 24 to over 30 dB indicating a wide range of sounds and distances from these vehicles. The length of the louder side of the "whiskers" is over 10 dB indicating that over 25% of the vehicles are 10 dB or more louder than the second quartile. The measured sound levels varied between 70 to over 100 dBA and 80 to over 110 dBC at AIA North, AIA South, Smitty's Wings, Water Garden, Jackson Tower, and Illini. Loud cars passing at Bamboo Flats, Esplanade on New River and Coral Villas were measured at sound levels of 80 to over 105 dBC.

The sounds from Entertainment Districts are the loudest sounds in the City with measured levels of 71 to 102 dBA and 83 to 108 dBC. The median values of the measured sounds from this category are 85 dBA and 95 dBC which also represent the current sound level limits for this occupancy in the City Noise Ordinance. This means that a number of establishments in Entertainment Districts are operating within the sound level limits of the current noise ordinance. Sound levels measured at The Wharf, the Rock Bar, and Bo's on the Beach generally complied with the sound level limits in the ordinance when measured at the 5 ft. distance from the source property line. Sounds from multiple establishments measured in Himmarshee were above both the A-weighted and C-weighted sound level limits in the ordinance.

It also means that 50% of the measured sound levels in Entertainment Districts currently exceed the sound level limits in the City Noise Ordinance for this category of sound. This is likely due to several factors.

First, is that sound levels must be measured at 5 feet from the property line of the establishment. In several of the Entertainment Districts there are venues with open doors and windows and/or outdoor loudspeakers in close proximity to each other making enforcement of the ordinance difficult to achieve due to the combined effects of multiple sources of sound contributing to the sound levels at any given location. Second, is that it would be possible for the operator of an establishment to adjust the sound levels while a Code Enforcement Officer takes the required 3 sound level measurements outside the establishment so that a violation could not be documented. Therefore, it is recommended to consider alternate measurement and enforcement protocols for these districts.

A perhaps more subtle effect of the sounds produced by establishments in Entertainment Districts is that the sounds, 50% of which exceed the current sound level limits, propagate great distances off-site and are evidenced by the louder sound levels measured at residences that are hundreds of feet away from the Districts in the categories of Music from Clubs and Music from restaurants and bars. These sounds were evident at Esplanade on the Park and Jackson Tower. Sounds from restaurants and clubs were also evident at Water Garden and Bamboo Flats even though the sound sources were not located in Entertainment Districts. It is possible that when the current ordinances for Entertainment Districts were developed that people did not anticipate that sounds would travel as far as they do and that the City would grow into a thriving, mixed-use community.

It is recommended that the City address sounds in Entertainment Districts both within the Districts and in residential areas near the Districts with specific regard to the point of enforcement, sound level limits, and measurement protocols. This issue should also be addressed when plans for new entertainment and residential occupancies are proposed so noise issues are not created with new development in the City. Creative methods to address these issues will be necessary due to the physical and aural context of the City.

For example, one could use a self monitoring system such as 10 EZ inside the clubs in the Entertainment Districts so that Code Enforcement staff and the operators of the clubs could know how loud they are paying their music and get a warning signal from the system when they are nearing exceedances. The current measurement location of 5 ft. from the club could still be used in areas where a measurement that is not affected by sounds from other clubs can be made.

A third tier that could be considered would be to have compliance measurements be made at residences where exceedances are suspected. The sound level limit for these measurements would be the current sound level limit in the Noise Ordinance of 50 dBA or 55 dBC (new recommended residential limit). Enforcement of this strategy would likely require at least 2 officers to verify compliance or non-compliance. One officer would be at the residence recording the sound level measurements and a .wav file of the potentially non-compliant sound. A second officer in the Entertainment District would be listening to the sounds coming from each club. The officer would have to be in radio contact with the officer at the residence so they could determine what song was being heard at the residence and which club it was coming from.

A fourth tier to this strategy would involve using the plainly audible standard currently in the ordinance in this application. This would also require 2 officers so that one at the residence could state what song was being heard and a second one outside the clubs could determine which club the music was coming from. The concept that the ordinance could be enforced either in or near the source, at the residence and using either quantitative measurements or plainly audible would offer multiple avenues to determine compliance.

If one subtracts the median value of the A-weighted sound levels from the C-weighted sound levels in each category, there is an approximate dBC to dBA difference of 8 to 12 dB for all sounds not in the Loud car and Entertainment District categories in all areas of the City. The average dBC – dBA difference for all of

the sounds in the bar and whiskers plot is 11 dB with a range from 8 to 14 dB depending upon the source of sound. The 2 higher dBC to dBA differences were for the Loud cars, trucks and motorcycles category at 13 dB and the Entertainment District category at 14 dB. This corresponds well with the current dBC to dBA difference included in the City Noise Ordinance of 10 dB and the analysis of data from other cities presented in the literature.

The data show generally increasing sound levels from the quiet ambient category in the mid 40 dBA's to over 100 dBA and 108 dBC in the Entertainment Districts. The measured sound levels vary with location and with the category of sound. Quiet ambient sound levels throughout the city varied between the mid-40 dBA's to mid-70 dBA's and mid-50 to mid-70 dBC's. The range of quiet ambient sound levels suggests that considering multiple sound level limits for the City may be appropriate because the quiet ambient sounds usually occur late at night. In residential areas traffic and other general ambient sounds become intermittent and also reach the lower end of the range of measured values. Therefore, at these times sounds from louder vehicles, vehicles with music, and sounds from clubs, restaurants, and bars measured at residential occupancies could present a greater potential for sleep disturbance and annoyance than at other times of the day. The concept of having several sound level limits in the City reflects the diverse character of the City and the activities in each area. Lower density areas away from major roads and activity nodes have lower sound levels than areas near more heavily travelled roads and more intense activities. Having one sound level limit based on quiet ambient sound levels in residential areas may unnecessarily restrict activities in more intense activity areas. While setting one sound level limit based on the lower end of the more intense activities may present difficulties for those living in quieter areas.

Sounds from entertainment venues, restaurants, bars and clubs were evident in the long term sound level measurements at Bamboo Flats, Water Garden, Colee Hammock, Coral Villas, Esplanade on the New River, Illni, and Jackson Tower. Interestingly, the loudest sounds recorded from the long term meter at Colee Hammock were from service trucks, building equipment and other activities in the alley between the residences and the commercial occupancies. However, short term measurements made in this area were xxxx dBA. (MG –DATA)

Sounds from louder vehicles, which were primarily measured at the locations on the Beach and in some major downtown roads, and in the Entertainment Districts are the loudest sounds measured varying between 70 to over 100 dBA and 78 to 100 dBC. These levels which exceed the current sound level limits in the noise ordinance should be restricted to the current sound level limits at a maximum. Consideration to reducing these sound levels to those indicated as safe or healthy sound levels could be considered for the public rights-of-way to avoid having pedestrians in the city of the future exposed to sound levels that could potentially affect their hearing and other aspects of their health.

Sounds from Entertainment Districts, restaurants and clubs propagating to residential occupancies, even across great distances, could be regulated at the residence in addition to at 5 feet from the source. Furthermore, consideration could also be given to measuring these sounds at the location of the residence when the residence is in a multi-story building as opposed to on grade where they are currently measured. The upper end of the measured sounds in the Music from clubs category are sounds propagating to upper floors of residential buildings measured on the balconies of the residences. Consideration could also be given to installing permanent noise monitoring equipment at selected locations to provide Code Enforcement Officials, residents, and venue operators real time knowledge of sound levels at key locations and to not require code enforcement personnel to have to enter private residences.

CITY OF FT LAUDERDALE NOISE ORDINANCE STRATEGIES AND RECOMMENDATIONS

Noise Ordinance Study and Implementation Rationale.

The primary sources of excessive noise initially identified by the ***City of Fort Lauderdale*** and the ***Noise Control Advisory Committee*** as part of the process of this study has established a basis for the assessment and analysis of protocols to measure and control amplified music from entertainment facilities, amplified music from residential rental units, cars playing amplified music in parking lots, and vehicles such as motorcycles, cars, trucks, and others with loud mufflers specifically in the Beaches area. The recent enforcement actions by police have reduced the numbers of loud vehicles on the streets in the Beaches. It was determined, based on multiple field measurements that businesses and entertainment venues were generally within the current A-weighted sound level regulations. However, there were exceptions.

For the Noise Control Advisory Committee to effectively address balancing the interest of businesses and residences for sonic compatibility, a three-tiered approach is recommended. This includes (1) administrative controls, (2) engineering and audio system controls and (3) controls for specific sources of sound of interest such as amplified music sounds and motor vehicles in the case of Fort Lauderdale.

Administrative controls may include adjustments to the noise ordinance including the following items.

1. Expanding the use of the C-weighted or low frequency sound level limit

2. Including references to measurement methods so the measurements would be made in accordance with appropriate national standards. The City has been using at least type 2 sound level meters that store data allowing measured levels to be documented and referenced as part of the measurement process.
3. Using the existing C-weighted limits in the current noise ordinance for measuring amplified music rather than just the A-weighted limit. The code allows either to be used. Consider reducing the sound level limits by 5 dB globally at the Special Entertainment District Overlay regions.
4. Reviewing and resetting the permissible hours for outdoor amplified music to reduce early morning hour disturbances is another control option.
5. Adding administrative controls during the building permitting process that would require noise studies and designed mitigation systems in future buildings that are either potential producers of sound that might propagate off-site and possibly impact other buildings or that may be potential receivers of sounds produced by new and existing buildings.
6. Consideration could also be given to linking the planning and zoning process with the noise ordinance so that future projects must be shown that they can comply with the noise ordinance requirements at the time of permitting with the possibility of enacting a commissioning study to verify performance after completion of the project.

Engineering controls could include the following items.

1. Requiring future entertainment venues and dining facilities to limit noise propagated onto the street and other public spaces by containing noise within the physical boundaries of their facilities.
2. This may include requiring residential and hotel occupancies to be built and renovated to construct the exterior walls, windows, doors and roofs of the buildings to reduce exterior sounds that may enter the building and to also contain interior sounds. This may also include requiring

building materials that reduce interior sound levels to current and projected future sound levels for the specific location of the facility.

3. The use of barriers, filters etc be considered for outdoor establishments, number, aiming and location of loudspeakers, etc be included.

4. Adding sound absorbent finishes in strategic locations to reduce interior sound levels when needed to help control noise| exposure for patrons and workers and to reduce off site noise propagation.

5. Audio system controls that include the location and aiming of loudspeakers, equalization, bass boost, notch filtering, sound monitoring, etc.

Specific Sound Controls could include the following items.

1. The reduction of amplified sounds and motor vehicle sounds at the source. This could possibly involve the installation and operation of sound monitoring systems in entertainment venues to continuously monitor and record sound levels at specific locations in the venue to either report exceeding level limits or electronically govern the sound to maintain limits automatically.
2. This could also include community monitoring of traffic noise electronically and citing violations.
3. This could include requiring motor vehicles driven on city streets to have the original equipment mufflers and exhaust systems installed on their vehicles and the establishment of citing a violation if found to be in non-compliance.

In an effort to maintain acoustic compatibility of the diverse uses of the city, and in the framework of the three-tiered approach outlined above the following future strategies with specific recommendations are suggested.

Strategies and Recommendations

The strategies and recommendations contained in this section contain a mix of Administrative, Engineering and Specific Sound Controls that could work together toward achieving a more compatible sonic environment. This approach of compatibility is necessary to find a balance between highly active and diverse urban living with the complimentary need for quiet, respite, and a healthy sonic environment that supports the long-term well-being of citizens of the City of Fort Lauderdale.

Strategies Toward a Compatible Soundscape

1. **Sound Level Limits – Special Entertainment Overlay Districts: Source** The limit of 85 dBA or 95 dBC at a 5 ft. distance outside the source (from 12:00 p.m. to 1:00 a.m. Friday through Sunday) allows entertainment establishments in Entertainment Districts to play amplified sounds outside at high levels until 1:00 a.m. and fairly high levels (70 dBA and 80 dBC) until 3:00 a.m. These sounds are well above the ambient sound levels (60 dBA to 68 dBC) and can travel long distances and travel up the sides of buildings at relatively long distances away from the establishments until 3:00 a.m. Amplified sounds from entertainment district sources have been measured at the upper-level balconies of residences near entertainment districts. Amplified music adds to the other environmental sounds and increases the sound levels by 5 dBA and up to 20 dBA on the balconies of residences. A tiered sound level reduction could be enacted to attempt to bring the sound levels more in line with hearing health, communication for law enforcement and health of the population. This could include the following:

a. Enforce the noise ordinance that is currently in place.
b. Consider reducing the dBA and dBC level difference to 5 dB after a period of 6-12 months.
c. **A 5 dBA and dBC reduction in sound level across the posted limits for a trial period of 6 months.**

2. **Sound Level Limits – Health.** Permitting sound levels to be 85 dBA outside at a distance of 5-feet from the source property line suggests that the establishments are playing sounds at potentially hearing-damaging sound levels inside the boundaries of the establishment.

3. **Sound Level Limits – Entertainment Overly District – Source Self Limit.** A sound monitoring system could be used to track and/or limit sound levels inside a venue (preferred to better isolate the sounds coming from one particular establishment) or at 5-feet from the property line. This could be used by the venue to self-regulate their sound levels and demonstrate compliance if needed. This could be helpful to them in avoiding being mistaken as a sound level limit violator specially in Entertainment Districts where multiple venues are in close proximity to each other and identifying the contribution of any individual venue is difficult to achieve. A commercially available system such as 10EaZy could be used inside the establishment, at the door, or just outside the establishment at the 5-foot distance to monitor the venue sound levels. The data can be monitored in real time, streamed to an online website where the levels are logged, and then retrieved as need for evaluation. **Visit:** https://www.10eazy.com/products

4. **Sound Level Limits – Precedent Strategies Used by Other Cities.**

Noise Level Detection Device. The City of Hollywood, Florida requires the use of noise level detection devices for any nonresidential establishment from which amplified musical entertainment, whether live or recorded, emanates to alert the owners of the property that the sound is exceeding set limits.

Outdoor Loudspeakers and Public Spaces. The City of Tampa, Florida prohibits the use of loudspeakers on or above any public right of way. The City of St. Petersburg, Florida has a section in their municipal code dedicated to "sidewalk cafés" in which loudspeakers are regulated. Any loudspeakers that are located outside a building within or over the public right of way, shall be mounted overhead (preferably under an awning or other overhang feature) and oriented downward at an angle of 45 degrees or less toward the sidewalk café (away from the street). No speaker is allowed in a sidewalk café unless the speaker is specifically identified on the approved plan for the sidewalk café permit. The code includes a requirement that sound from the approved sidewalk café speakers may not be plainly audible at a distance of 200-feet between 8am and 11pm and at a distance of 50-feet between 11pm and 8am. INSERT NOISE ORD REF

6. **Sound Level Limits – Suburban vs Urban Areas.** The current 50 dBA sound level limit for sound sources in residential areas was exceeded by the ambient sounds of cars, wind in trees, mechanical cooling equipment and watercraft for much of the time in residential areas in the downtown and built-up areas of Fort Lauderdale and in locations at the Beaches that were immediately adjacent to A1A and Seabreeze that were included in this study. These sources contribute to an ambient sound that was typically 55 to 60 dBA. This suggests that meeting a 50 dBA noise limit for a particular sound source would likely not be measurable as it would be mixed in with other ambient sounds at some times during the day and night. The

50 dBA/55 dBC sound level limit is appropriate for residential properties in areas with single family detached homes on suburban streets that are distant from major roadways during night time hours (Bamboo Flats, Collee Hammock, Esplanade Park and Coral Villas). However, in the urbanized areas of Fort Lauderdale this 50 dBA limit could possibly be reconsidered to be more commensurate with the measured ambient levels of 55 dBA and 60 dBC in specific locations (The Wharf, Riverwalk, A1A and Seabreeze). Furthermore, any changes could be implemented with test periods prior to implementing within the municipal code.

7. **Sound Level Limits – Weighting.** A-weighted and C-weighted sound levels are established options for measuring sound in the Entertainment Overlay Districts. This allows the enforcement officials to use either weighting. However, at the initiation of this study, enforcement officials did not have sound level measurement equipment capable of measuring C-weighted sound levels. Since initiating the study, the City of Fort Lauderdale has purchased meters that can measure C-weighted sound levels. C-weighting is more sensitive to bass frequencies associated with amplified music from venues, residences or vehicles. Consider using C-weighted sound levels for other areas beyond the entertainment districts when amplified sound is causing disturbances. Or, consider more refined octave band sound level standards with limits in each octave band frequency range. This would also target sounds with recognized pitch, hiss, whistly, or grind that are clearly audible but at the same their overall sound level is within the ambient sound level.

8. **Sound Level Limits – Weighting – Precedent Strategies Used by Other Cities.**

   A and C weighted metrics are included in the noise ordinances of cities such as Tampa, Sarasota, and Port St. Lucie. ADD MORE CITIES

   85 dBA or 87 dBC between the hours of 6:00 p.m. and 3:00 a.m., and 65 dBA and 75 dBC between the hours of 3:00 a.m. and 6:00 p.m. have been established by the City of Tampa, Florida to limit sounds within the Ybor City Historic District and the Arena district. This includes designating the measurement be taken at the property line of the source for 30 seconds and the 30 second Leq must not exceed either the A-weighted or C-weighted limits.

   65 dBA or 70 dBC sound level limits have been established by the City of Sarasota, Florida between the hours of 10:00 p.m. to 7:00 a.m. for amplified sounds **not in a completely enclosed building**. The measurement is to be conducted at the source or receiver property line, approximately 5-feet above ground.

   60 dBA and 65 dBC sound level limits during the hours of 7:00 a.m. to 11:00 p.m., and 55 dBA and 60 dBC for residential receiving properties between 11:00 p.m. and 7:00 a.m. have been established by the City of Port St. Lucie, Florida.

   65 dBA or 65 dBC sound level limits during the hours of 7:00 a.m to 10:00 p.m. and 55 dBA or 55 dBC from 10:00 p.m. to 7:00 a.m. for residential areas have been established by the City of Hollywood, Florida. ADD OTHER CITIES THAT ARE MORE SIMILAR TO WHAT THEY ASPIRE TO BE

9. **Sound Level Limits – Metrics.** Maximum sound levels are defined as ‘LMAX’ in the Fort Lauderdale Code of Ordinances. This has been interpreted as LAFmax, which is the maximum sound level measured with a 125ms. time constant with an A-weighted filter applied to the measured data. LAFmax breaks down to: L-sound level, A-weighting, F-fast (125 ms). LAFmax, or LCFmax, are metrics that can capture short transient sounds in a source sound such as amplified

music. Consider clearly specifying LAFmax and LCFmax to improve clarity in the measurements specified to measure sounds in the code of ordinances.

Plainly Audible. This metric is viable for sounds when a designated distance from the source or location such as a receiver property line has been designated as a measurement location. However, in vibrant urban environments, one should expect to hear the sounds of the city and sounds may be plainly audible when measured within ambient sound levels due to the weighting network used and sampling rates of the equipment because music and speech sounds occur in very short periods of time while also at levels consistent with ambient sounds. Therefore, the use of a plainly audible measurement by a person of normal sensitivities provides a reasonable way to determine if sounds can be heard at potentially disturbing levels by typical people. In order to measure sounds when they are in or near the ambient sound levels due to time and/or frequency averaging, an acoustical camera, multi-capsule microphone or binaural mannikin, sophisticated digital processing equipment, and other highly specialized methods would have to be used to achieve a similar measurement to the human ear.

10. **Sound Level Limits – Time of Day.** Consider reducing the number of hours that amplified music can be played outdoors in Special Entertainment Overlay Districts. This would reduce the cumulative daily acoustic impact of entertainment establishments on their residential neighbors. Reducing the outdoor amplified music, during the early morning hours could be tested for reductions in noise complaints.

11. **Sound Level Limits – Field Measurement Protocol.** Different measurement protocols are designated in the Code of Ordinances depending on the district or sound source.

Entertainment Overly Districts. Here, measurements are taken approximately 5-feet above the ground at a distance of 5-feet from the sound source property line. This strategy can be effectively used to ensure that the particular source of concern is being measured so long as there are not other sources in close proximity. Other drawbacks to this method include: (1) barriers at the source such as walls and fences will reduce the sound level at the designated measurement distance; (2) there may be clear lines of sound propagation over the barriers to noise sensitive receivers; (3) sound reflections from the ground in open air spaces and adjacent buildings can actually amplify sounds by reflecting the sounds back to noise sensitive receivers as the sound waves propagate away from the source. These effects cannot be measured under the current measurement protocol.

Measurement with multiple competing sources. In areas where multiple competing loud amplified music is present, consider measuring at the center of the venue being measured or close to an open door or window at the 5-foot distance noted in the Ordinance. Once the level has been determined, subtract 10 dB from the measurement to eliminate the contribution of other sound sources. If the actual measurement, minus 10 dB, is still over the sound level limit, then the venue is in violation.

Measure at Receivers. Consider allowing the measurement of amplified sound from Entertainment Overlay Districts at the receiver location when a complaint is made (possibly at the option of the complainant). Measurements could be taken at the window or balcony of the locations where a complaint is made (possibly at the option of the complainant). Acceptable levels need to be set for this measurement protocol, and should include the sound level limits outlined for residential occupancies.

Measure With Focus on Low Frequencies. Consider restricting the low frequency content of amplified sound when measuring 5-feet from the property line in Entertainment Overlay districts. A first phase of this strategy could be to use the C-weighted limits designated in the existing Code of Ordinances. Currently, C-weighted limits are 10 dB above A-weighted limits. A phase 2 aspect of this approach could be to reduce the A to C weighting difference to 5 dB subsequently reducing the allowable level of the low frequency sounds without reducing the A-weighted sound levels. As in other recommendations, this could be tested over the trial period of time prior to implementation in the Code of Ordinances.

Optional Measurement Protocol. One strategy that could be adopted is to allow for options for the measurement procedure either at 5 feet from the sources (current) or at receiver (metric and level to be set) with the choice given to the enforcement personal who can choose which protocol would best be representative of the situation or even conduct more than one measurement protocol prior to issuing a warning or citation. This option would involve taking measurements at balconies and other areas in private residences if adopted.

Sound Level Meters for Measurement. The sound level meters used by the city need to meet *ANSI S1.4-1983 or its successor publications* as designated in the Code of Ordinances. This would require a Type 1 meter (+/- 1.5 dB) or a Type 2 (+/- 2.3 dB). The City currently uses a Type 2 sound level meter that allows recording of the data and automatic reporting of LAFmax or LFCmax. It is recommended to consider using Type 1 sound level meters to ensure enforcement is as accurate as possible. If the meters could record audio files in .wav format, the measurements could be played back as evidence should a case go to court. All the data recorded should be in conformance with ANSI and ASTM standards.

Noise Measurement Training. Consider a noise measurement training program for code enforcement and other staff to include proper calibration of meters, strategies for ensuring measurements are not affected by extraneous noises, corrections for background sound levels, and procedures for downloading, storing, and interpreting the data recorded. Consider annual refresher courses to ensure officials are comfortable with the protocols.

12. **Sound Level Limits – Indoor**. The Code of Ordinances designates that "*Indoor sound level measurements shall be taken within the premises of the complainant*". The term 'premises' is not specifically limited to the indoor spaces of a dwelling and this should be clarified in the Code. Premises means structures that make up a parcel of property.

13. **Sound Level Limits – Globally.** Multiple sound level limits that reflect the differences among areas of the present and future urban area of Fort Lauderdale such as different zoning classifications, days of week, and hours of the day are currently used. These differing sound level limits and measurement procedures are not contained comprehensively in one accessible table. Rather, some indices are tabulated while others are defined in narrative paragraphs. Consider consolidating and simplifying the sound level limits and measurement procedures for ease of understanding by enforcement personnel, residents, entertainment venue operators and other stakeholders. This is shown in Tables 3 and 4 in this report.

14. **Sound Level Limits – Plainly audible clarification**. Plainly audible is the metric designated for assessing amplified sound in the Code of Ordinances (Section 17-7). The issue of this provision and its application in enforcement should be clarified in the noise ordinance. Consider adding verbiage such as "The plainly audible standard should be used for residential sources (such as a resident playing amplified

music outside their home) in residential areas. Consider adding the following table or similar to help clarify the intent of the residential areas amplified sound level limits and the plainly audible metric.

Table 9. Existing plainly audible use clarification and recommendation for application to SEOD at long distance.

Amplified Music Source	Receiver	Ordinance Standard
Automobile	Distance away	Plainly audible (25 ft)
Residential	Residential	Plainly audible (25ft and 50 ft)
Special Entertainment Overlay District	Residential, Mixed Use	Sound level limit (dBA and dBC) at source and receiver and/or plainly audible Plainly audible at 500ft or more from the Entertainment District
Commercial, mixed-use, or industrial uses		Sound level limit (dBA and dBC) at receiver and/or plainly audible

15. **Vehicular Noise Monitoring**. Using a device that automatically detects loud vehicles, such as Sorama Loud Vehicle Detection System or similar system may be desired to be tested in the City to determine if the product is suitable to detect loud vehicles and ultimately deter loud vehicles from entering the City. It is recommended that any product that is considered for this application be tested for a limited duration to determine if it's accuracy and performance meet the expectations of the City. This is a relatively new type of system that is still being developed and refined, and demoing the product first is strongly recommended.

https://sorama.eu/solutions/loud-vehicle-detection

CODE OF ORDINACE PROVISIONS

1. The current nuisance language and/or plainly audible language should be maintained in the residential areas. This should be clarified with Code Officials so that the plainly audible standard is used for sounds generated within residential areas by private residences. This may also be expanded to include for residential properties located more than 500 ft from the Entertainment District.
2. The measurement time period should be relatively short (15 -30 seconds) to capture the transient sounds that comprise amplified music sounds from passing cars loud mufflers from cars.
3. Measurements should be taken at the complainant's real property boundary, including on their balcony or other area that may be elevated.

4. **Definitions and Standards**
    a. Definitions from sources such as the American National Standards Institute (ANSI) and the American Society for Testing and Materials (ASTM) standards are preferred for technical acoustical issues.
    b. ANSI and ASTM standards should be referenced for meter type, filters, use of windscreens, measurement techniques, measurement and other technical requirements.
    c. Corrections for background noise levels should be made in accordance with ANSI and ASTM standards for all measurement data used for citation purposes.

d. Consider specifying a measurement duration and sampling period as appropriate to capture the nature of the disturbing sound.
e. A listing many of the specific standards that can be cited for specific issues is included in Appendix F in our report.
f. Consider developing standard operating procedures for City staff and enforcement personnel if the ordinance is modified.

5. **Other Provisions**
   a. **Time of day limits**. Consider limiting the times of that playing of amplified music and speech are permitted. Some cities consider a "Quiet Time" when sound levels from activities are reduced.
   b. **Muffler restrictions**. Consider including verbiage to limit any mufflers besides factory installed mufflers and exhaust systems. See Appendix H for example verbiage in the Florida State Statute 315.593.5a. – d.
   c. **Increase Fines and other deterrents**. Consider increasing fines for repeat offenses. Consider including other penalties as a potential deterrent for repeat offenses.
   d. **Planning and Zoning Approvals**. Consider implementing acoustical and noise-related requirements in planning and zoning applications for new construction and renovations of buildings in and near entertainment venues and other sources of sound. The requirements of the noise ordinance should be linked with planning and zoning submissions, building plans approval and Certificates of Occupancy for new and remodeled buildings.

6. **Trial Periods and Phasing**. For many of the recommendations, trial periods should be considered as a phased implementation strategy. For example, Phase 1 could be to monitor at new levels or protocols and document potential effects (4-6 months). Phase 2 could be to temporarily implement standards new with warnings to any violators (6-12 months). Phase 3 would be inclusion in the Code of Ordinances and with warnings and citations. This phased approach would allow residents, entertainment establishment owners and operators and city officials to gain first-hand experience with the requirements with the possibility of adjusting requirements and refining language before a formal ordinance is enacted.

LONG-TERM STRATEGIES FOR FORT LAUDERDALE'S SOUNDSCAPE

Items presented below are suggestions that could be implemented as part of Planning and Zoning efforts in Fort Lauderdale that are not necessarily included in the Noise Ordinance but could be included in other planning or zoning documents toward improving the balance of a vibrant entertainment scene, increasing mixed-use urban density, and the quality of the sonic environment.

Noise Study for Differing Zoned Uses. Planning efforts for new developments, especially those projects near Special Entertainment Districts, Regional Activity Centers, railroads, roadways, airports or in downtown areas could include a noise study to protect the soundscape of the existing city fabric and the new development.

1. **Noise Study Stipulation for Residential Developments Located Near Transportation and Industrial Sources of Sound**. Consider requiring any residential development that is within 1,000 feet of a major roadway or 3,000 ft from a rail line to provide adequate noise mitigation to the site, exterior areas and interior spaces to meet HUD, FTA, FAA and FHWA requirements at a minimum with options for Grade A, B and C housing to have stricter requirements. Any site that has an average Day Night Sound Level of 65 or higher would need to provide noise mitigation to the

building façade to meet interior sound levels of 45 dBA or lower. See Manatee County Requirements in Appendix H for example verbiage of this concept. Lower criterion levels should be set for "market" and "luxury" residential properties.

2. **Noise Study for Establishments with Indoor and Outdoor Amplified Music**. New and/or renovated establishments proposing amplified music and active social and gathering activities with indoor, outdoor or partially open to the outdoors should be required to demonstrate that they can meet the requirements of the Code of Ordinances for amplified sounds before a permit is issued. A *Site Noise Study or Environmental Acoustic Assessment* and *Noise Mitigation Plan* (if needed) should be prepared by an acoustical consultant who is a member of the Institute of Noise Control Engineers (INCE) and the National Council of Acoustical Consultants as a part of the permit process. Consideration should be given to a specific clause in the ordinance regarding outdoor amplified music because of the inherent difficulties presented by these establishments. Similar consideration should be given to Balcony and Rooftop venues. Mixed use projects with retail spaces that could become restaurants or night clubs or other establishments with amplified entertainment and/or groups of people actively socializing in a building with office, other retail, residential and other different occupancies should also be included in this category.

3. **Noise Enforcement Training Program**. Consider formal training of police and/or code enforcement officers to take measurements for noise ordinance enforcement. This should include the correct use of sound level meters, proper documentation, measurements in compliance with noise ordinance requirements and national standards, and background sound correction as needed.

4. **Building façade requirements**. Considerations could include zoning or plans approval requirements for the Noise Level Reduction (NLR) and/or the Sound Transmission Class (STC) or Outdoor-Indoor Transmission Class (OITC) ratings for the building facades of entertainment venues, restaurants, bars, night clubs, social gathering spaces, office, retail, hotels and residences to limit the propagation of sounds from Special Entertainment Districts, Regional Activity Centers or planned indoor and outdoor entertainment activities into sleeping and living areas and buffering of outdoor activity areas from adjacent existing or future projects.

   Similarly, off-site sounds such as from rail lines, road traffic, aircraft flyovers, commercial, industrial and entertainment sounds could be considered during planning phases of projects so that requirements for NLR/STC/OITC ratings of the exterior skin of new buildings can reduce existing sounds to reasonable interior sound levels for the specific occupancy being planned.

5. **Sound Isolation for Mixed-Use Guidelines**. In mixed-use buildings consideration could be given to requirements for sound separations between mixed-use activities within a single building as well as within a complex of buildings. For example, having requirements for sound isolation systems for residential occupancies and hotel sleeping rooms in buildings with restaurants and nighttime amplified sounds on lower floors, rooftops or mid- level amenity spaces could be enacted.

6. **Receiver Oriented Standards.** Establish requirements to limit sounds produced inside or outside venues to the confines of those venues. Alternately, venues must meet noise ordinance sound level limits at the property boundaries of receivers/complainants as per the appropriate zoning district. This would help control potential off-site noise impacts from future renovated and new facilities.

7. **Mechanical Equipment Noise Control Requirements**. Building mechanical equipment or central plant equipment; loading activities at commercial buildings, indoor and outdoor dining; entertainment; animal facilities and any other potentially noisy building types of activities could all be considered for control.

8. **Self-Contained Activated Mixed-Use Areas**. Create activated areas that are self-contained, such as mixed-use areas with restaurants and outdoor seating on lower levels, intermediate buffer levels, and residential upper levels. Interior courtyards with surrounding properties, rooftop venues with direct sound paths to adjacent or nearby buildings. The concept shown in Figure 41 includes the use of the building shape itself to act as a buffer from some outside sounds coming in, and provides an acoustic barrier for the sound created on the lower level dining and outdoor seating areas. The inner windows would have higher OITC rated windows and potentially smaller window areas to reduce cost but provide access to the inner, activated courtyard.

    a. Require acoustic ratings of windows for residences within with high noise exposure.
    b. Require isolated construction of restaurants/nightclubs and or buffer spaces between restaurant, nightclub and residential.
    c. Set low frequency sound level limits for residential spaces in mixed-use venues.
    d. Limit sound levels played at outdoor restaurants or activated areas in the core.
    e. Require all lessees and/or purchasers to acknowledge they are in an activated area and noise levels may be higher than in a suburban or rural residential area.

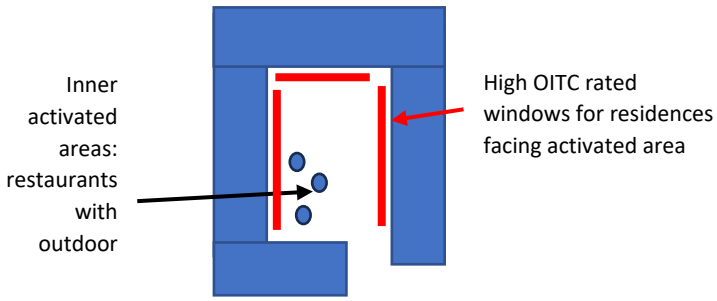


Figure 41. Conceptual plan diagram of a self-contained mixed-use open area as an activated inner core with high OITC rated windows and walls, and possible sound diffusing and absorbing elements on the building.

9. **Vertical Zoning**. Consider formalizing requirements for mixed-use buildings to provide buffer spaces in addition to sound isolation systems between noisy occupancies and acoustically sensitive occupancies such as residential units. Noise producing spaces may also have requirements sound isolating construction. The concept in Figure 42 shows the noisier activities located on the ground floor, which might include restaurants, nightclubs and gyms. These would ideally be built as a box-in-box construction that is structurally isolated from the rest of the building. Above the noise generating spaces, buffer spaces in the form of parking or offices could be located. This would help to further isolate the noise producing spaces from the residential. Above the buffer spaces, the residential levels would be located, providing at least one floor of buffer space between the noise producing spaces and residential spaces.

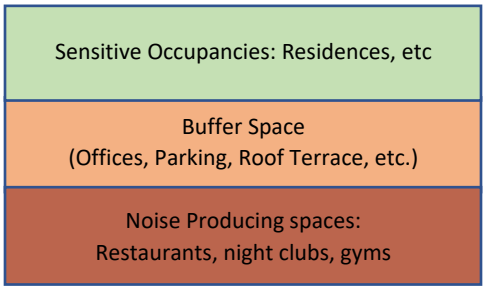


Figure 42. Conceptual diagram of vertical zoning strategy that could be applied in mixed-use buildings that requires a buffer space to help shield residential or other sensitive occupancies from loud noise producing spaces on grade.

Acoustical Planning for Future Development

Planning inherently implies a strategic effort to organize growth, incentivize investment, establish standards for improved living, and to protect the investments of the citizenry in their urban infrastructure. The soundscape is a critically important element of urban planning as cities densify, use mixes become more complex, and people, especially in temperate climates, want to enjoy the out of doors. Beyond the noise ordinance, the primary tool for avoiding or limiting localized disturbances, other aspects of the municipal code such as planning and zoning and the building code, should also be engaged toward improving the sonic landscape of a city.

One of the first steps in a process that could involve acoustical planning for future development in areas with either known existing or possible future predicted sound levels would be to understand the necessary sound reduction properties that the exterior building envelope for new and renovated buildings would be required to be to meet desired interior sound levels. This is often evaluated by an outside to inside Noise Level Reduction (NLR) which is the difference between the existing or possible future exterior sound level and the desired interior sound level. Table 10 presents NLR's required for different exterior sound levels to reach different interior sound levels based on analysis conducted using the HUD STraCAT analysis tool.

Inside-Out Approach to Building Standards

If the standard for quality urban living begins inside a dwelling such as a condominium or apartment as part of a multi-family and perhaps mixed-use mid-rise or high rise, or even a low-rise single use residential multi-family structure in a dense urban environment, how quiet should that dwelling be? U.S. Federal Department of Housing and Urban Development (HUD 24 CFR 51.B) require interior sound levels to be 45 dBA or less inside federally funded housing as a Day-Night Average Sound Level or LDN. Individual events such as aircraft flyovers can be 20 dB or more higher than the 45 dBA using this metric. Forty-five dBA is a relatively high ambient sound level for a residence. HUD + was established with a 5 dB reduction in interior sound levels (to 40 dBA) that would be perceived as noticeably quieter by people of normal sensitivities. The American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) uses a criterion of 35 dBA as the maximum sound level from building equipment sounds in residences.

Exterior sounds would have to be less than this for the combined level to reach 35 dBA. Ambient sound levels of 35 dBA would be heard as ½ as loud as the 45 dBA HUD standard by people of normal sensitivities.

The International Standards Organization (ISO) standard 19488 provides a ranking of buildings by class based on acoustical criteria for exterior and interior noise sources. ISO classes A, B and C are shown in the table with their corresponding interior sound levels. Additionally, many luxury residences in south Florida have interior sound levels of 25 dBA or less. Some are at 20 dBA and less. These interior sound levels are found in many buildings and can be realistic to achieve in new and renovated residences in south Florida.

Establishing acoustic zoning guidelines and building standards for the locations and quality of construction – just as developers must meet designated wind forces – for buildings expected in urban areas, with corresponding targets for interior sound levels, could avert a significant amount of noise related complaints and litigation. And, perhaps allow entertainment venues to expand. The following section discusses the relative impact of setting interior sound level targets, the precedents for those levels, and the impact that would have on construction to meet given indoor ambient sound level standards.

Background Sound Levels

The desired interior ambient sound levels are provided in 5 dB increments for simplicity with a citation of the source of the background sound level. U.S. Federal Department of Housing and Urban Development (HUD) and the Code of Federal Regulations 24 CFR 51.B require interior sound levels to be 45 dBA or less inside federally funded housing as a Day-Night Average Sound Level or LDN. Individual events such as aircraft flyovers can be 20 dB or more higher than the 45 dBA using this metric. Forty five dBA is a relatively high ambient sound level for a residence.

The interior sound level noted as HUD + is meant to be an improvement or reduction in interior sound level compared to HUD that represents improved performance inside the residence, i.e., a reduction in sound level. The 5 dB reduction in interior sound level from HUD would be heard as noticeably quieter by people of normal sensitivities.

The American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) uses a criterion of 35 dBA as the maximum sound level from building equipment sounds in residences. Exterior sounds would have to be less than this for the combined level to reach 35 dBA. The 35 dBA would be heard as ½ as loud as the 45 dBA of HUD by people of normal sensitivities.

The International Standards Organization (ISO) standard 19488 provides a ranking of buildings by class based on acoustical criteria for exterior and interior noise sources. ISO classes A, B and C are shown in the table with their corresponding interior sound levels of 20, 25 and 30 dBA respectively. Additionally, many luxury residences in south Florida have interior sound levels of 25 dBA or less. Some are at 20 dBA and less. These interior sound levels are found in many buildings and can be realistic to achieve in new and renovated residences in south Florida.

Outside-Inside Transmission Class and other Sound Reduction Criteria

The sound reduction metric would be the OITC which is the Outside to Inside Transmission Class of the exterior assembly if other criteria such as the Facility Guidelines Institute (FGI) which provides acoustical regulations for health care occupancies or the United Facilities Code (UFC) which provides criteria for military facilities are used. The Outside to Inside Transmission Class is a weighted single number rating of the sound reduction of the exterior building assembly measured in accordance with ASTM E 966 and

ASTM E 1332 using a transportation noise source that has low frequency content. The OITC ratings in the FGI and UFC are based on either maximum hour exterior sound levels or Day-Night Average Sound Levels or LDN's and could be 0 to -3 dB less than the NLR values in Table 10.

Sometimes the sound reduction of exterior building assemblies is given as Sound Transmission Class or STC ratings. The STC is a weighted average of the sound reduction, usually of interior partitions, measured in accordance with ASTM E90 and ASTM E413. It was originally developed as a rating applied to the reduction of speech sounds, which are primarily mid and higher frequency sounds, attenuated by gypsum board partitions. The STC rating of an assembly is usually lower than the OITC of the same assembly because of the lower frequency sounds included in the source used in the OITC measurement and the lower sound reduction of most building assemblies for lower frequency sounds.

Effects of Transient Sounds on Potential Disturbance

Since the focus of the current study has been on amplified music and loud vehicle sounds in Fort Lauderdale, the Noise Level Reductions (NLR) are presented as those reductions required to reduce short-term sounds to at or below the range of the interior sound levels that might be selected. The NLR's could also be applied to longer-term average sound levels. The rationale for this is that if one is engaged in thoughtful work in an office or residence, reading, relaxing, or sleeping in their home, or doing other activities that usually involve relative quiet, the intermittent increases in sound levels associated with the beats of amplified music or pass-bys of louder vehicles could be disturbing. Therefore, intermittent, potentially disturbing sounds could be reduced to a specified maximum interior sound level using the NLR's in the table. Averaging sounds that occur for several minutes or hours over a longer period of time does not reflect the potential sleep disturbance, interference with communication, or break in the train of thought. Nor does averaging the sounds mitigate other potential health effects of the sounds affecting people in their homes, offices or other occupancies.

Measurement Time

Since the focus of the current study has been on amplified music and loud vehicle sounds in Fort Lauderdale, the Noise Level Reductions are presented as reductions required to reduce short term sounds to the noted interior sound levels. They could also be applied to longer term average sound levels. The rationale for this is that if one is engaged in thoughtful work in an office or residence, reading or relaxing or sleeping in their home, or other activities that usually involve relative quiet, the intermittent increases in sound levels associated with the beats of amplified music or pass-bys of louder vehicles could be disturbing. Therefore, intermittent, potentially disturbing sounds could be reduced to a specified maximum interior sound level using the NLR's in the table. Averaging sounds that occur for several minutes or hours over a longer period of time does not reflect the potential sleep disturbance, interference with communication or break in the train of thought; nor does it mitigate other potential health effects of the sounds affecting people in their homes, offices or other occupancies.

Table 10. Noise Reduction Levels (NLR) required to meet standards for interior sound levels in dBA for given exterior sound levels in dBA.

	Interior Sound Level (dBA)					
	HUD	**HUD+**	**ASHRAE**	**ISO C**	**ISO B +Typ. Luxury**	**ISO A**
	45	**40**	**35**	**30**	**25**	**20**
Exterior Sound Level (dBA)	**Noise Level Reduction (NLR) in dB to Reach Interior Sound Level**					
90	48	53	58	63	68	73
85	43	48	53	58	63	68
80	38	43	48	53	58	63
75	33	38	43	48	53	58
70	28	33	38	43	48	53
65	23	28	33	38	43	48
60	18	23	28	33	38	43
55	13	18	23	28	33	38
50	8	13	18	23	28	33

Notes:
Readily achievable NLR with typical "hurricane glass"
NLR attained with upgraded glass
Special acoustical construction; difficult to achieve

NLR numbers (dB), based on HUD's online STrCAT Tool analysis, could be 0 to -3 dB if other criteria are applied: such as FGI, UFC and other standards.

In addition to the NLR of the exterior assembly, the assembly's sound reduction in the lower frequencies is important to consider where the sources of sound are large trucks on a highway, railroads with diesel engines, amplified music or other sound sources with low frequency content. This is an especially important criterion in buildings with large areas of windows, sliding glass doors or other glazed openings because glass has relatively low sound reductions in the low frequencies even with laminated glass with multiple panes. NLR's for buildings subject to sounds produced by any of these sources should be selected based on the NLR of the low frequency sound level present at the site of the project.

The area shaded in grey in Table 10 are NLR's that can be practically achieved using typical impact or hurricane glass for windows and sliding doors and typical exterior wall, door and roof assemblies used in south Florida residences. To achieve the NLR's shaded in yellow in the high 30's to lower 40's acoustical upgrades to the glazing and other exterior assemblies are required. To achieve the NLR's shaded in blue in the mid to upper 40's and higher, special acoustical construction with significant cost increases are required compared to more typical building construction and these NLR's can still be very difficult to achieve.

Possible Applications of Noise Level Reduction (NLR) Standards

The table can be used in several ways. The first would be for the City to consider what exterior sound levels could be permitted in areas where present and future mixed use development was anticipated or desired. If one knows the existing exterior sound level, one can find the appropriate NLR of the exterior assemblies of the building required to reach the desired interior sound level for a given project. For example, sounds of an entertainment venue located on the ground floor of a new mixed use building would have to be limited for specific background sound levels to be reached inside residences or offices on upper floors.

The second would be for consideration in the revision of exterior sound level limits in the noise ordinance. Exterior sound levels would have to be limited to levels that could be reduced to the desired interior level given a known or established NLR construction standard for a district in the City. If new and renovated occupancies are anticipated in areas where there are current or future plans for mixed use development, the exterior sound levels could be limited to NLR's that are practical to achieve in the building types envisioned for the area.

The third application of the data would be to inform potential developers and residents that if they move to new, renovated or existing buildings in areas of the City with known sound levels, what they could expect to experience inside their homes by subtracting the known exterior sound level from the NLR of the exterior assemblies of the building they are thinking of moving in to.

The fourth application would be to inform present and future entertainment venue owners or operators what plausible sound levels may be to operate at given the construction assemblies of buildings in the vicinity of a prospective club site before they receive complaints from those in near-by buildings.

UF Student Soundscape Project Proposals Summary

Students from the University of Florida School of architecture participated in developing architectural and planning strategies that respond to the soundscape at locations of interest that were identified as part of the larger soundscape study with Siebien Acoustic and the UF School of Architecture.

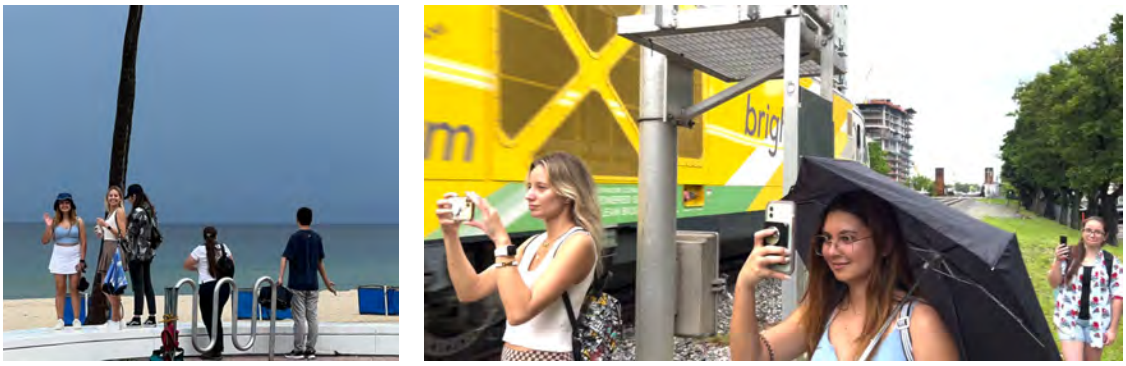


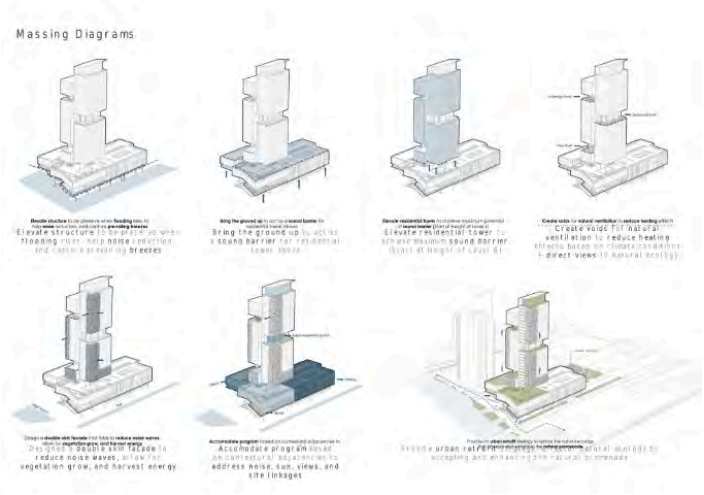
Figure 43. Students taking measurements and recording acoustic events in the city of Ft. Lauderdale.

The work included in Appendix E represents student visits to the selected locations, participation in sound walks, personal observations, photo documentation, precedent studies, and then, coalescing that information and generating schematic design proposals seek to provide strategies to improve urban density, mixed-use, and an improved soundscape.

The work includes 11 student projects spanning two academic semesters including Fall 2022 and Spring 2023 in two different courses: Advanced Graduate Design Studio 3 (Fall 2022), and the graduate seminar Energy, Ecology, and Architecture (Spring 2022).

Summary of findings

1. Vertical distance can be an effective sound abatement strategy general street noise including traffic, sidewalk cafes, and unamplified events in the streets. This strategy could be implemented through requiring residential high-rise construction to limit residences in the lower floors – vertical zoning.
2. In addition to Item 1, sound level limits at the windows or balconies of these units could be established as a more nuanced implementation of property line standards.
3. Building envelope systems (walls, doors, windows) could be required that, as a system, would limit the amount of sound that is transmitted through them. This could be achieved by material layers, heavier construction or buffer spaces between the outside and inside spaces.
4. Buildings themselves could absorb and diffuse the sounds striking them rather than reflecting and subsequently amplifying the sounds or focusing the sounds in particular areas. Absorption and diffusion can be achieved through material selections and articulation on the building skin or a combination of both.
5. Strategic zoning could incentivize designs, along arterial corridors that fill the sites and provide acoustic barriers to the residential neighborhoods behind them. This strategy would also benefit from Item 4 above. Care should be taken to keep noisy program elements on the arterial corridor side of the building.
6. Sound locks or buffer spaces between noisy interior programs such as loud clubs or manufacturing could be implemented to control intermittent loud sounds from emanating from a building.
7. Rooftop and elevated terraces, that allow residents to find peaceful spaces within their larger buildings could offer times respite and relief from urban bustle while enjoying the outdoors.



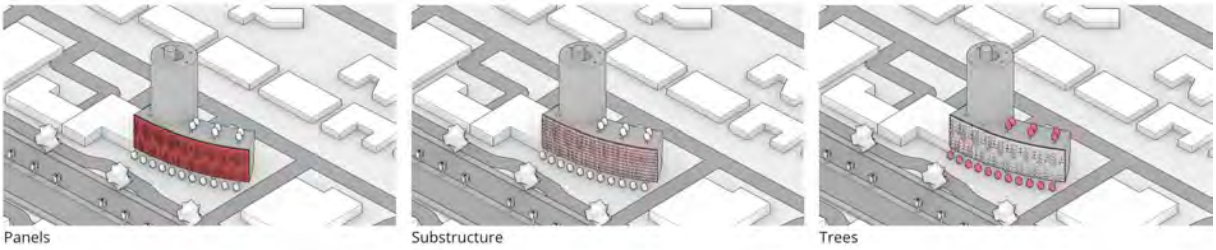


Figure 44. Soundscape driven program, massing, and materials studies to insulate residential spaces, diffuse urban sounds, and absorb urban sounds toward a quieter urban environment.

Strategies and Recommendations Priority Summary

Table 11 presents the concepts that have been outlined in the report and organizes them into potential action items for the immediate, near term and far term with notes to clarify the intent of the item.

Table 11. Summary of Acoustic Strategies and Recommendations

Item	Recommendation	Priority			Notes
		Immediate	Near-Term	Long-Term	
1	Trial Periods and Phasing	X			Establish an interim trial period protocol for perhaps 4, 6, and 12 month study periods depending on the exected impact of abatement strategy.
2	Metrics - adopt LAFmax and LCFmax as sound level metrics	X			This metric is not explicit in the code yet meets the general definition of LMAX given there. Revise the code to specify LAFmax and LCF max during next revision.
3	Sound Level Meters	X			Use ANSI standard Type 1 sound level meters with accuracy of +/- 1.5 dB to enforce the published sound level limits. Or, revise the code to specify Type 2 meters (+/- 2.3 dB) are acceptable to enforce the published sound levels.
4	Entertainment Overlay Districts - measure using the C-weighted Ordinance limits	X			This should be viable with the City's new sound level meters.
5	Himmershee District - enforce existing entertainment district overlay sound level limits	X			Measurements of 111 dBC were measured on multiple occaisons at 5 feet from a number of venues. Meeting the current noise level limits would reduce the perceived sound by 3 to 6 times -- 3 - 6 times quieter.
6	Himmarshee District - measure at 5-feet from venue opening or center of venue on the street using C-weighting and subtract 10 dB from the measurement. If still over the set limit, issue warning or citation.	X			Subtracting 10dB mathematically eliminates the contribution of adjacent sources at similar sound levels. This could be introduced with warnings perhaps for a period of 2-4 months and tested for efficacy. If the need for enforcement persists, consider purchasing acoustic cameras or other sophisticated measurement systems to isolate individual contributors to the sound levels at given locations as a longer term solution.
7	Himmarshee District - enforce closing of doors and windows after 12:00 am	X			This could be applied for venues open to the street or open at the rear of the venues to significantly reduce off site noise.
8	Noise enforcement training program for officers	X			Training on new sound level meters, measurement techniques, documentation, and interpreting the data could improve enforcement and follow-up litigation.
9	Entertainment Overlay District - Self-Limiting with in-venue monitoring	X			Venues could adopt these systems voluntarily. Self monitoring would provide a basis for venues to show they are in compliance if adjacent venues are not.
10	Entertainment Overlay Districts - limit levels set relative to ambient for area.		X		Consider reducing allowable sound levels emanating into the public domain from venues during the early mornging hours to no more than 5 dB above the ambient at the current 5-foot measurement designation. This could be studied for a test period immediately and then designated for code implementation if proving effective.
11	Nonresidential to Residential Areas - noise level detection devices.		X		Consider noise level detection devices for any nonresidential establishment from which amplified musical entertainment, whether live or recorded, emanates to residential areas to alert the owners of the commercial establishment that the sound is exceeding the set limits.

12	Vehicular Noise Monitoring		X		Deploy automatic detection systems such as Sorama Loud Vehicle Detection System. This would require testing and enforcement protocols to be added to the muicipal code of ordinances.
13	Planning and Zoning		X		Consider implementing acoustical and noise-related requirements in planning and zoning applications for new construction and renovations of buildings in and near entertainment venues and other sources of sound.
14	Receiver Oriented Standards		X		Establish requirements to limit sounds produced inside or outside venues to the confines of those venues.
15	Mechanical Equipment Noise Control		X		Building mechanical equipment or central plant equipment; loading activities at commercial buildings, indoor and outdoor dining; entertainment; animal facilities and any other potentially noisy building types and related activities could all be considered/studied for the establishment of noise control protocol.
16	Entertainment Overlay Districts - Measuremenet Protocols		X		Consiter adjusting the measurement protocols for these districts to include measurement options at receiver locations and that meet the allowable limits for those locations. Also, consider flexibility for officers to choose among two or more measurement protocols to employ the one most effective for the situation.
17	Compliance Improvement - graduate fine increases		X		Consider a graduated scale for increasing fines as multiple offences accumulate.
18	Revise sound level limits in Regional Activity Centers to correspond to nominal ambient levels.		X		This would genarally be an increase of the level limits as ambient sounds in many areas are nominally above the 50dBA sound level limit for adjacent residential areas. This would only apply to areas of the City with ambient sound levels > 50 dBA.
19	Noise study requirements for new entertainment venues		X		Require an environmental noise study or noise mitigation plan that includes sound management strategies as part of the application and approval process for permitting the use.
20	Entertainment Overlay Districts - consider reducing allowable low frequency sound levels using the same measurement procudures currently in place.		X		This could be applied to A-weighted and/or C-weighted. For example, lowering the C-weighted levels to 5 dB above dBA rather than the current 10 dB above the dBA levels would significanly reduce low frequency sound propagation from venues.
21	Plainly Audible Metric for Evaluating Violations		X		Consider using this metric for sounds propagating out of Entertainment Overly Districts at distances of 500 ft or more from the district - will require code change and may be controversial by limiting outdoor entertainment.
22	Indoor Sound Level Limits		X		Clarify the definition of the term 'Premises' in the code to mean inside the residence.
23	Vehicular Noise Monitoring		X		Consider language in the noise section of the code that requires factory installed exhaust and mufflers on all vehicles.
24	Urban Residential Areas - raise sound level limit		X		Consider raising sound level limits in residential areas to 55 dBA or even 60 dBA where the currrent ambient sounds (breezes, cars, etc.) are regularly above the current limits. Limits should not be below the ambient of normal sounds in the neighborhood.
25	Develop Noise Level Reduction (NLR) criteria for new and renovated construction.			X	This would be applied through building plans review and permitting to ensure the building assembly met a designated acoustic standard - similar to the way hurricane and fire rating standards are required. Guide lines to be developed and provided to developers as they initiate planning for new projects.

26	Vertical Zoning criteria for new construction			X	Establish vertical buffer spaces. For example, residential units in mixed use must be 100' - 150' feet from the street level.
27	Noise Study for Differing Zoned Uses			X	Planning efforts for new developments, especially those projects near Special Entertainment Districts, Regional Activity Centers, railroads, roadways, airports or in downtown areas could include a sound managemnt plan based on a site specific sound study requirement to protect the soundscape of the existing city fabric and the new development.
28	Noise Study for Residential Developments			X	Consider requiring any residential development that is within 1,000 feet of a major roadway or 3,000 feet from a rail line to provide adequate noise mitigation to the site, exterior areas, and interior spaces to meet HUD, FTA, FAA and FHWA requirements at a minimum with options for Grade A, B, and C housing to have stricter requirements.
29	Noise Study for Indoor or Outdoor Amplified Music			X	New establishments proposing amplified music with outdoor or partially open to the outdoors should be required to demonstrate that they can meet the requirements of the Code of Ordinances for amplified sounds before a permit is issued. This would require a sound management study.
30	Building Façade Requirements			X	Establish approval requirements that include Sound Tansmission Class (STC) or Outdoor-Indoor Transmission Class (OITC) ratings for the building facades of hotels and residences to limit the propagation of sounds from Special Entertainment Districts, Regional Activity Centers or planned indoor and outdoor entertainment activities into sleeping and living areas.
31	Sound Isolation for Mixed-Use			X	In mixed-use buildings consideration could be given to establish minimum requirements for sound separations between mixed-use activities within a single building as well as within a complex of adjoined buildings.
32	Self-Contained Activated Mixed-Use Areas			X	Consider zoning for future outdoor amplified music venues to use site planning strategies that wrap the activity spaces to diffuse, absorb, and act as acoustic barriers to sound transmission.
33	Planning and Developmnet Noise Study Requirements			X	Include sound management study requirements for venues with amplified music to determine the likely impact and/or mitigation needed to maintain ambient sound conditions in the surrounding area.
34	Planning and Developmnet Noise Study Requirements			X	Require a sound managament and noise mitigation plan showing measures to be taken that will comply with the noise ordinance.
36	Planning and Developmnet Noise Study Requirements			X	Consider requiring new residential development located within 1,000 feet of an Entertainment District or amplified music venue or transportation noise source to require a sound management study that shows it will comply with HUD interior noise levels, at a minimum, to protect its future occupants.

CONCLUSIONS

Ft. Lauderdale is a highly livable, mixed use urban soundscape with a diversity of uses and vitality. The City, its residents, business owners, and visitors are very respectful of each other and the current regulations. As a result, the soundscape of Ft. Lauderdale is well managed by many citizens at this time and only relatively minor "tweaking" of sound-related regulations are recommended.

With the many vertical residential towers that populate the city skyline come some challenges in effectively managing the soundscape at these upper levels, where the sounds from grade level reflect up the vertical landscape off the reflective buildings and direct sounds to the many residences. This presents a challenging ecosystem to attempt to control and collaboration between the varying user groups is necessary to effectively deal with this unique sonic flow that only densely populated urban areas experience. By illuminating some of the acoustic phenomenon that take place in this area, by showing how these phenomena can be measured and modeled, it is our hope that the city will be able to use these tools to help guide the design of any new construction or renovation of buildings. By understanding how the sound level limits, time of day limits, weighting limits and other limits put in place work together in creating the soundscape that is Ft. Lauderdale, it is possible to creatively and collaboratively address these issues, to allow for a thriving and lively economy that is also sensitive to the surrounding adjacencies.

A common-sense approach to incremental changes in sound and noise policies can be enacted as the City grows to preserve the desirable qualities of the City while optimizing opportunities for growth. Preserving and enhancing the "personality" of Fort Lauderdale is essential to the high quality, urban life style that residents enjoy and that has allowed the City to thrive.

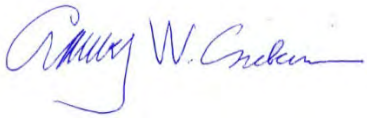
Some of the recommendations described in this report could possibly help Ft. Lauderdale in maintaining the balance between vibrant urban life and high quality living environments for residents and visitors as the City grows and enjoys its prosperous and vibrant life.

Please do not hesitate to call us if you have any questions in this regard.

Sincerely,

SIEBEIN ASSOCIATES, INC.

Keely M. Siebein, ASA, INCE, LEED AP BD+C
Associate Principal Consultant



Gary W. Siebein, FAIA, FASA, INCE,
Senior Principal Consultant

Martin Gold, FAIA
Associate Professor | Architect

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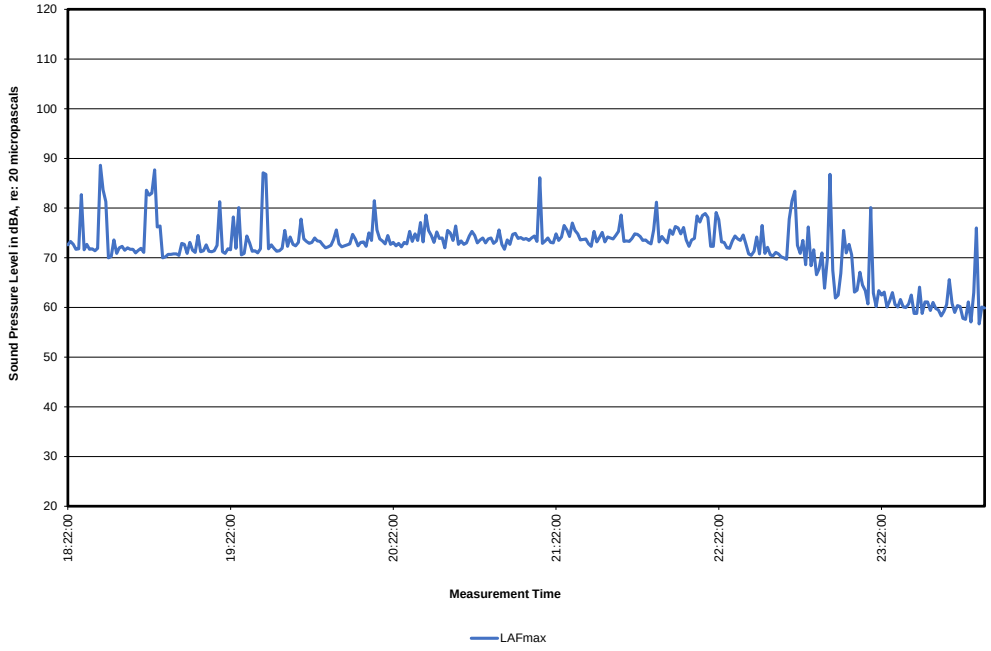
APPENDIX A-1:
GRAPHS OF LONG-TERM ACOUSTICAL DATA
TRIP 1

Fort Lauderdale Soundscape Study
The Wharf
Rion 7
Thursday - February 16 to February 17, 2023



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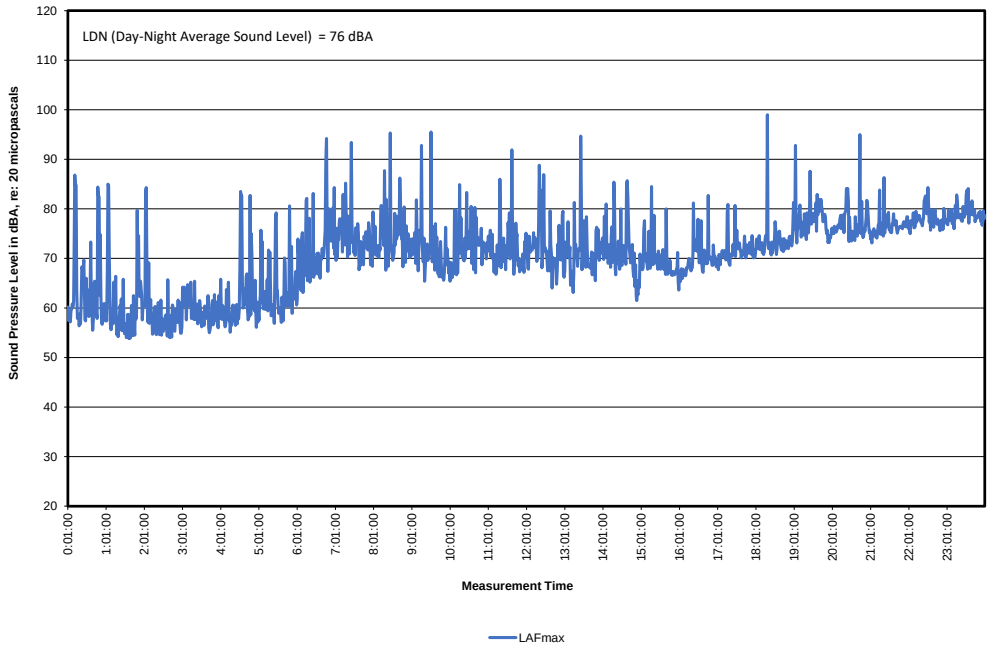

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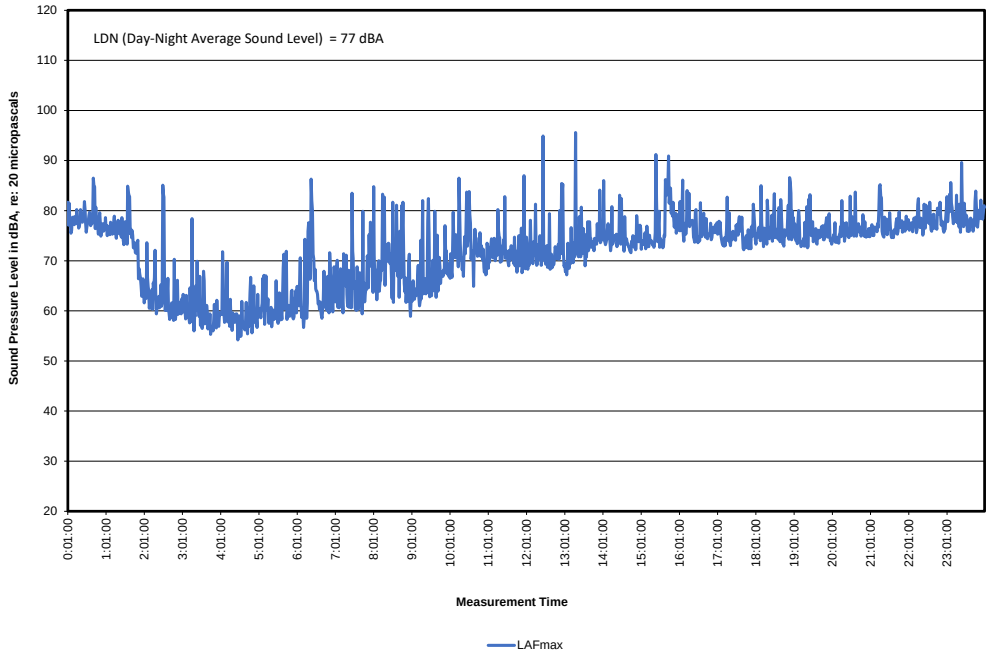

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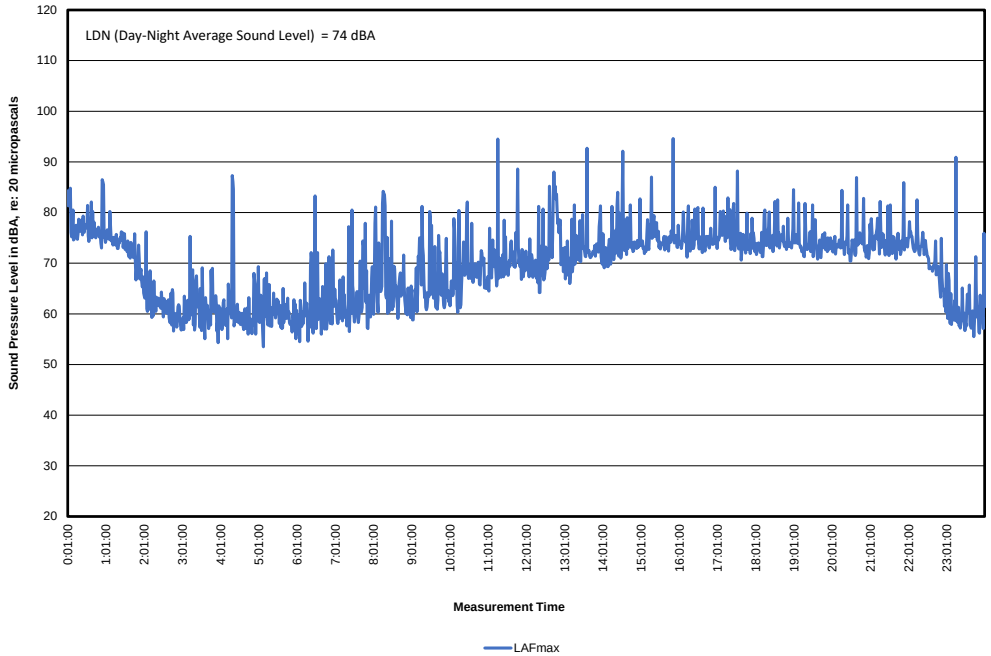

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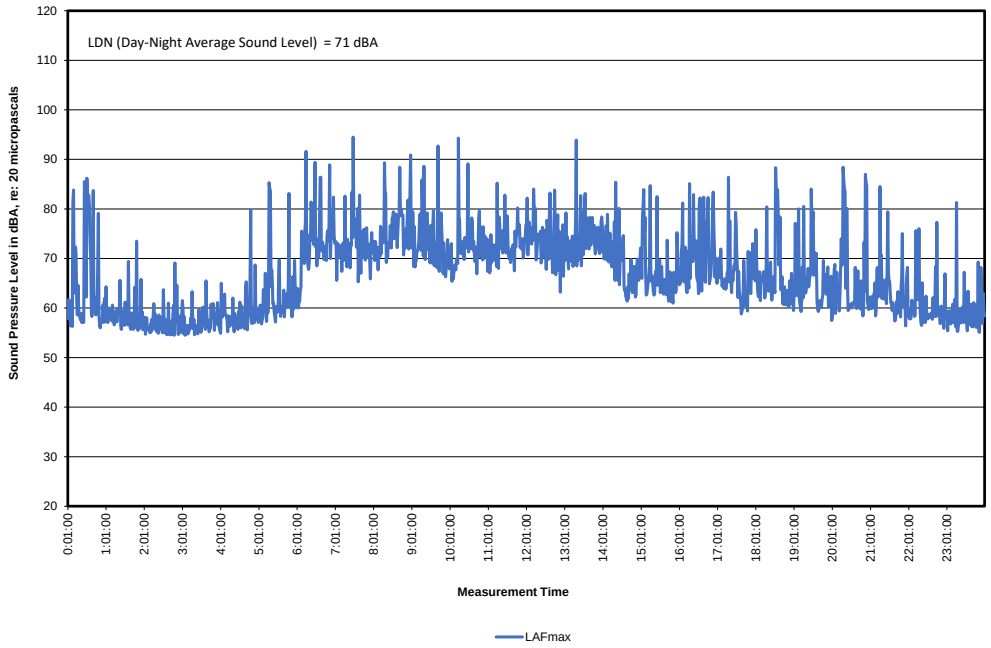

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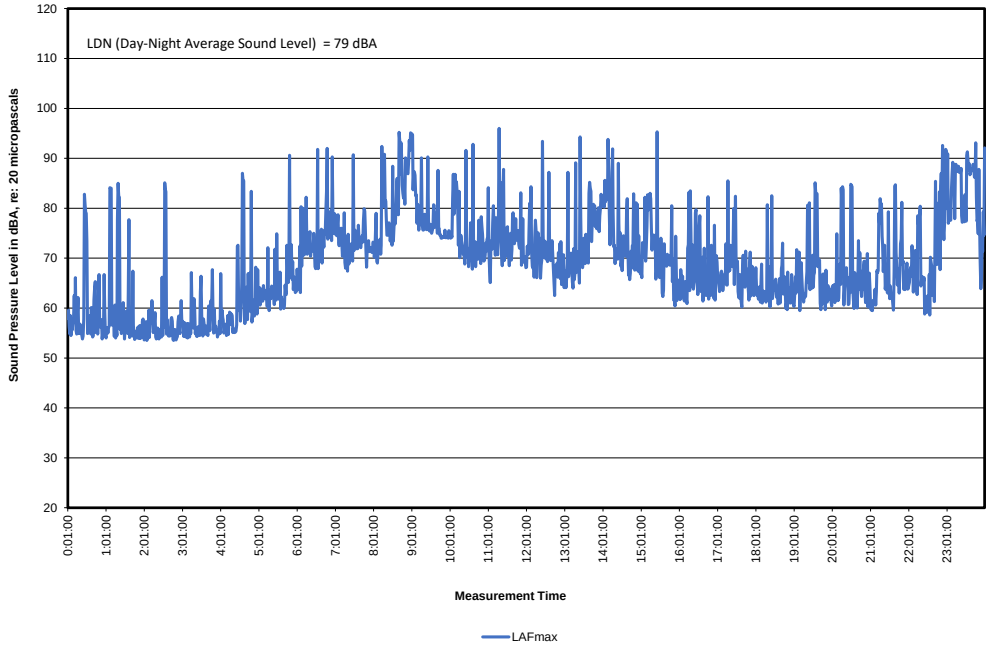

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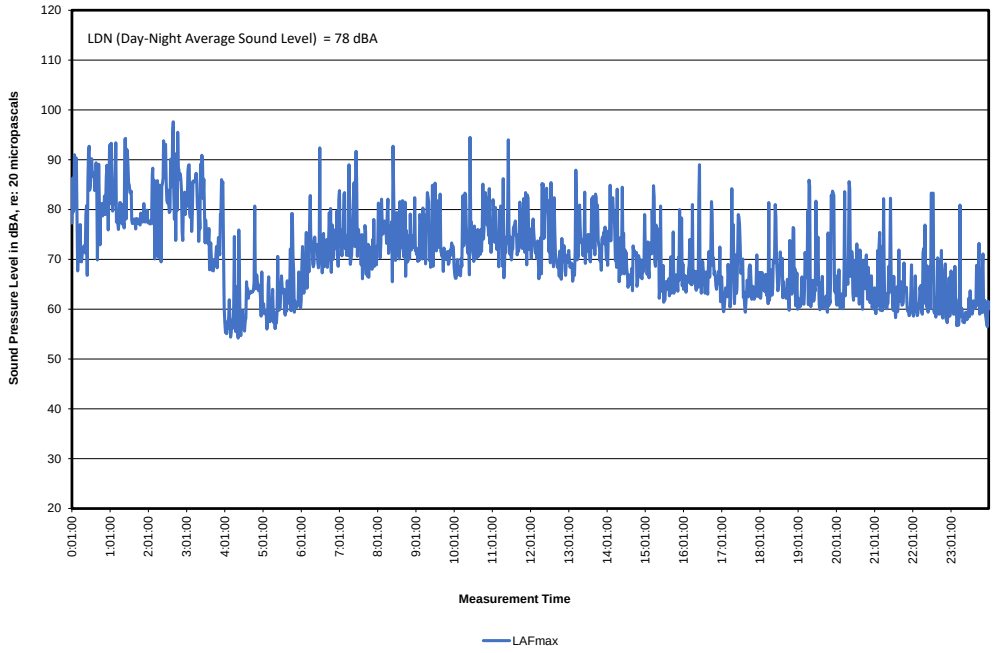

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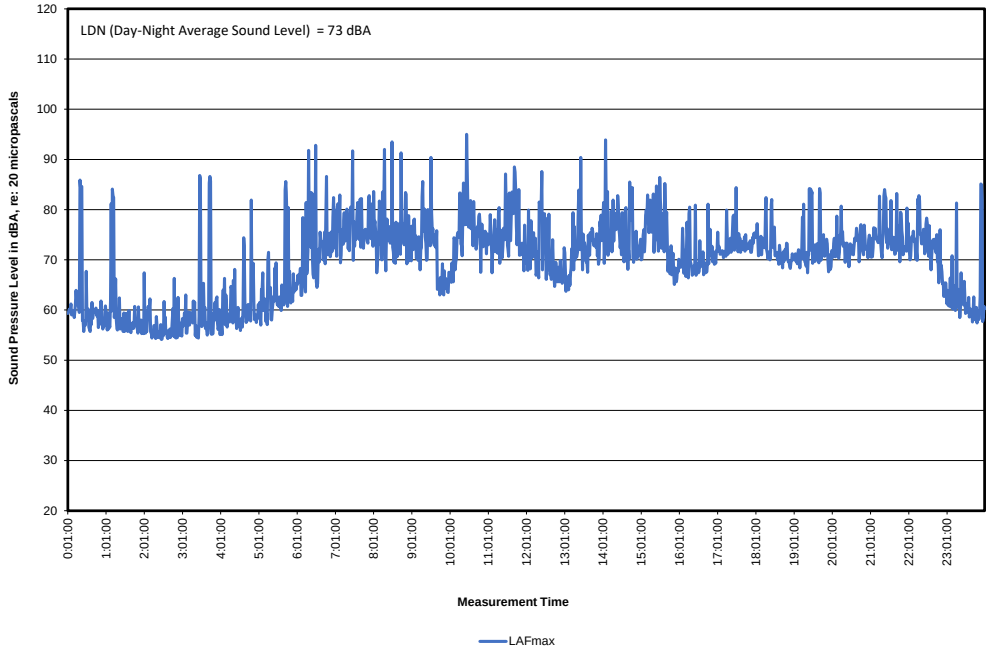

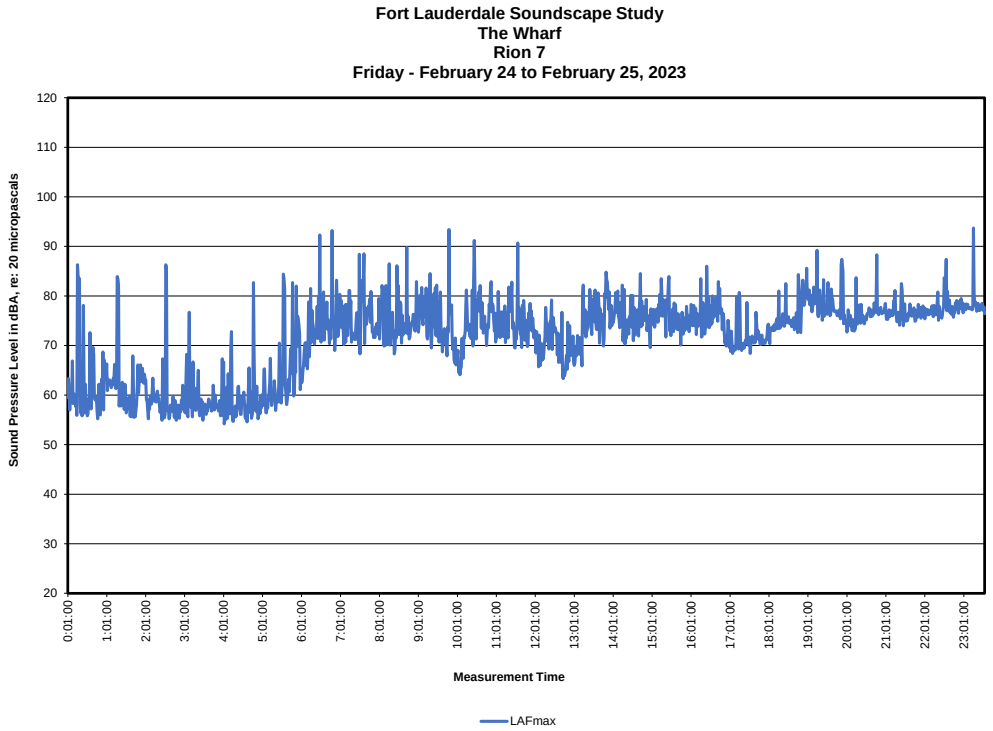
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The Wharf
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Friday - February 24 to February 25, 2023
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120
110
100
90
80
70
60
50
40
30
20
0:01:00
1:01:00
2:01:00
3:01:00
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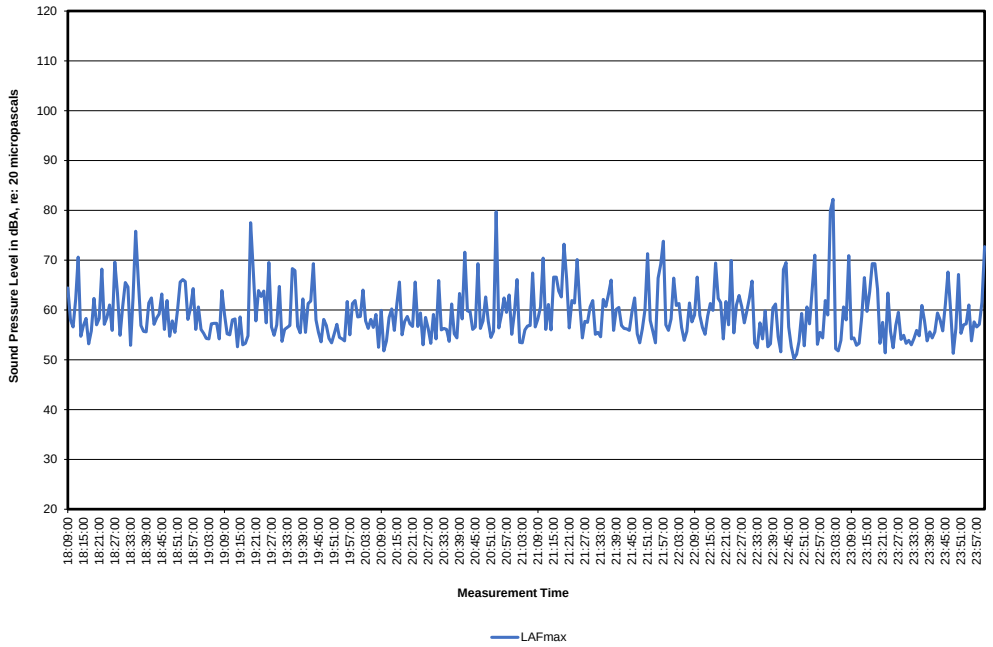
LAFmax

Fort Lauderdale Soundscape Study
Esplanade Park
Rion 8
Thursday - February 16 to February 17, 2023



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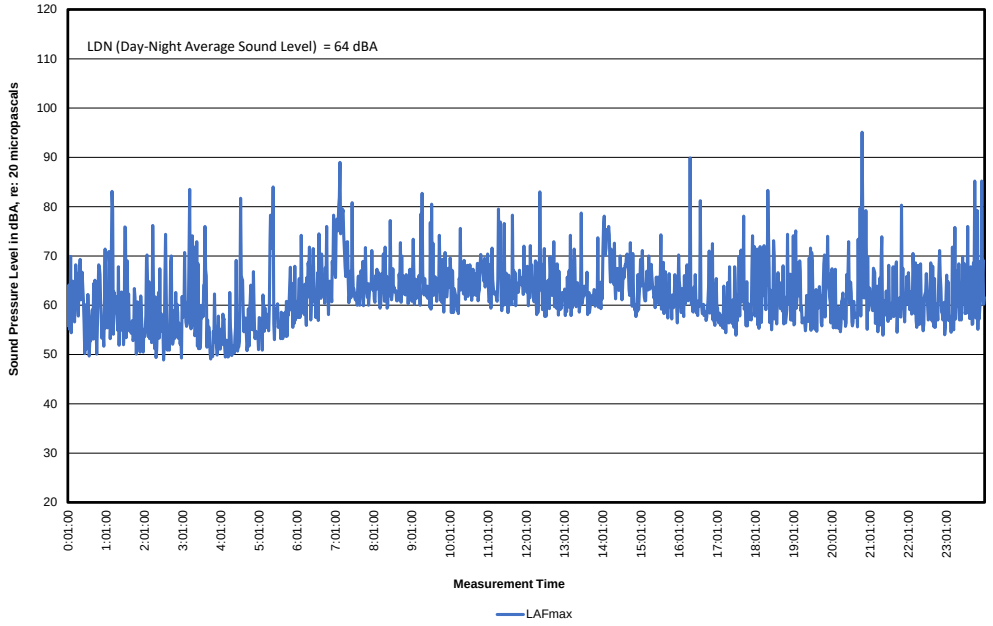

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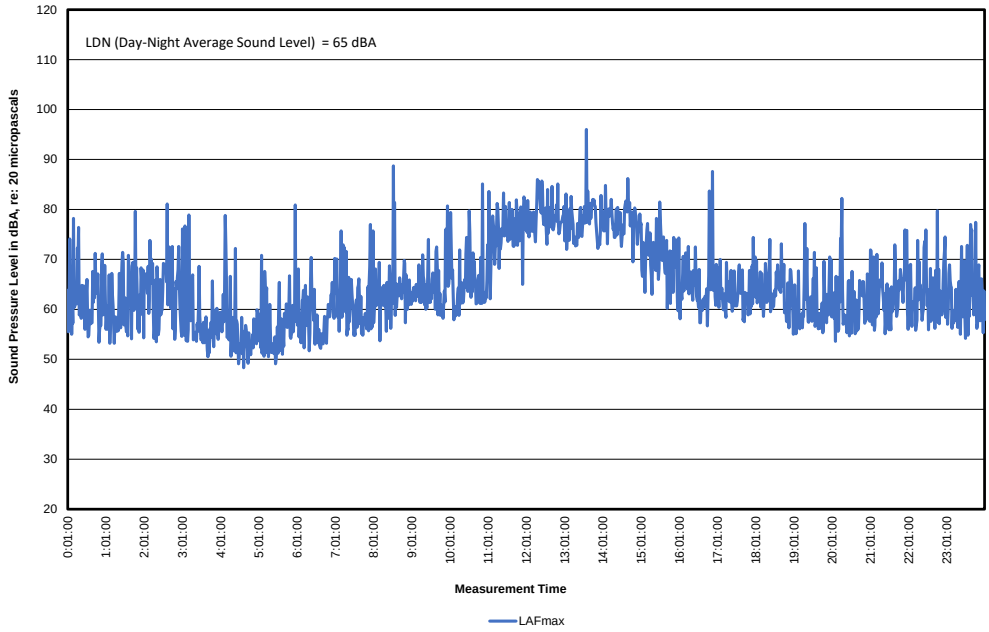

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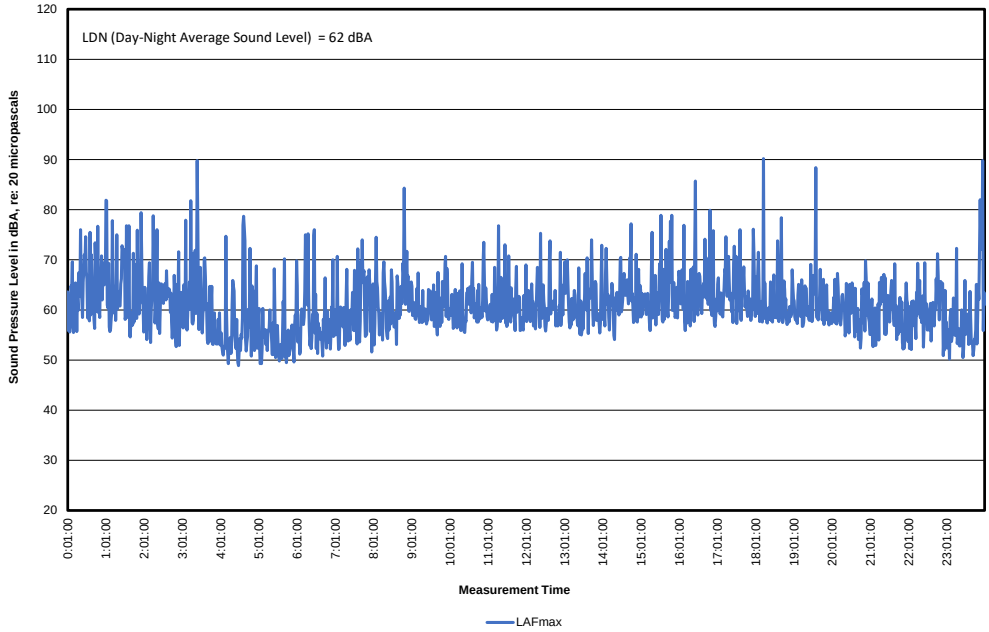

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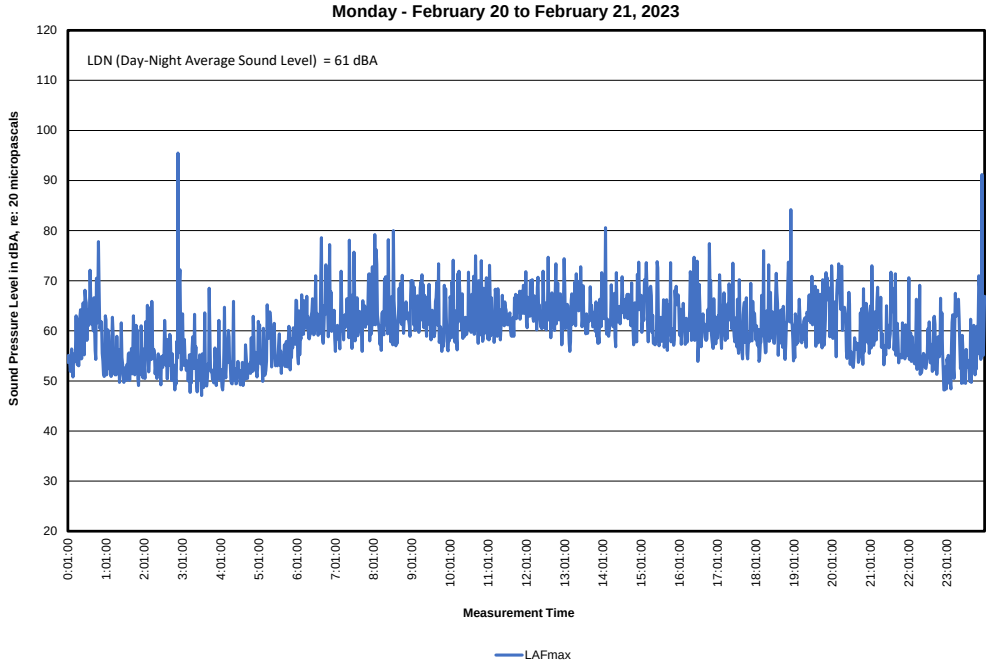

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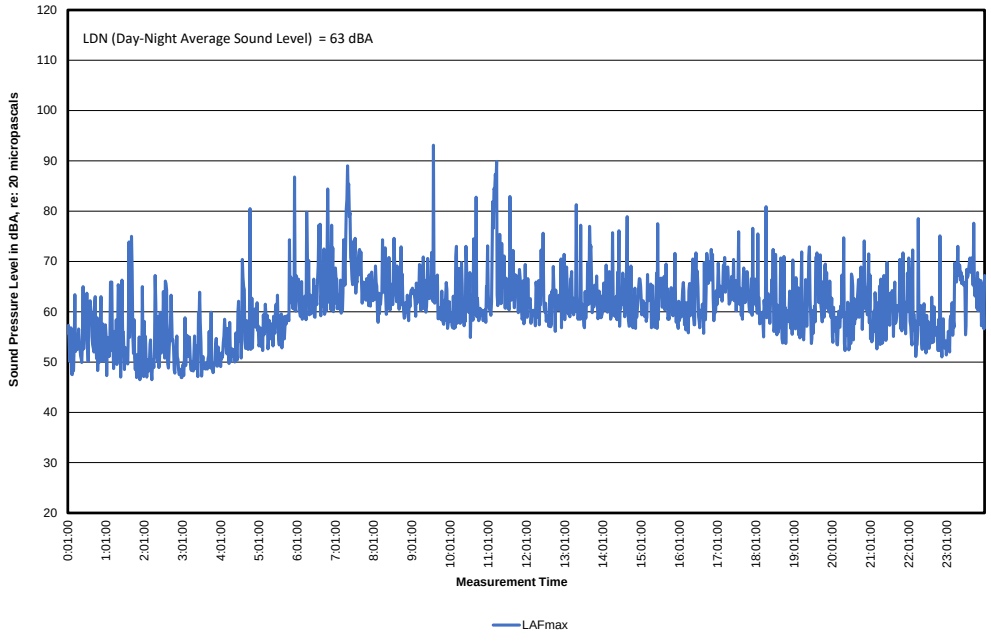

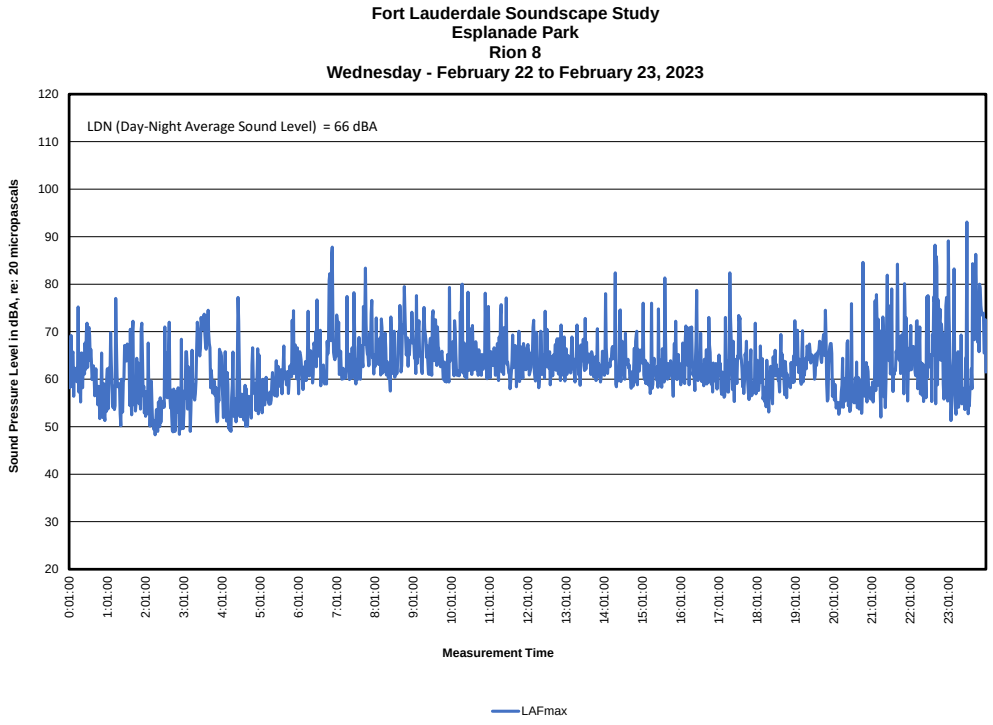
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Esplanade Park
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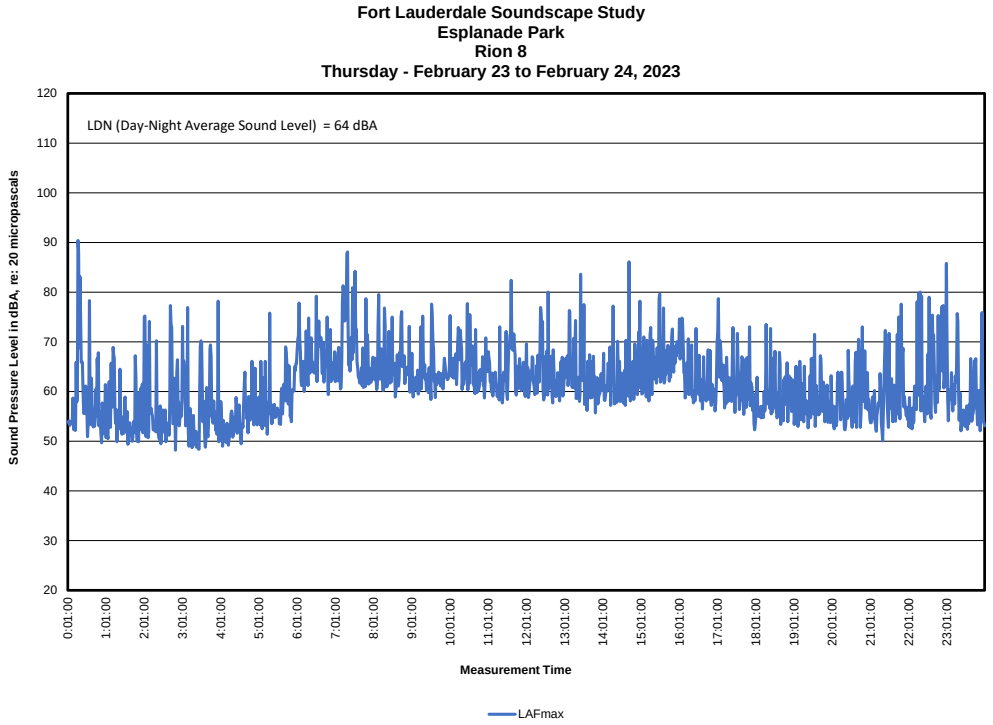
Measurement Time
LAFmax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Esplanade Park
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Sound Pressure Level in dBA, re: 20 micropascals
Measurement Time
LAFmax

Fort Lauderdale Soundscape Study
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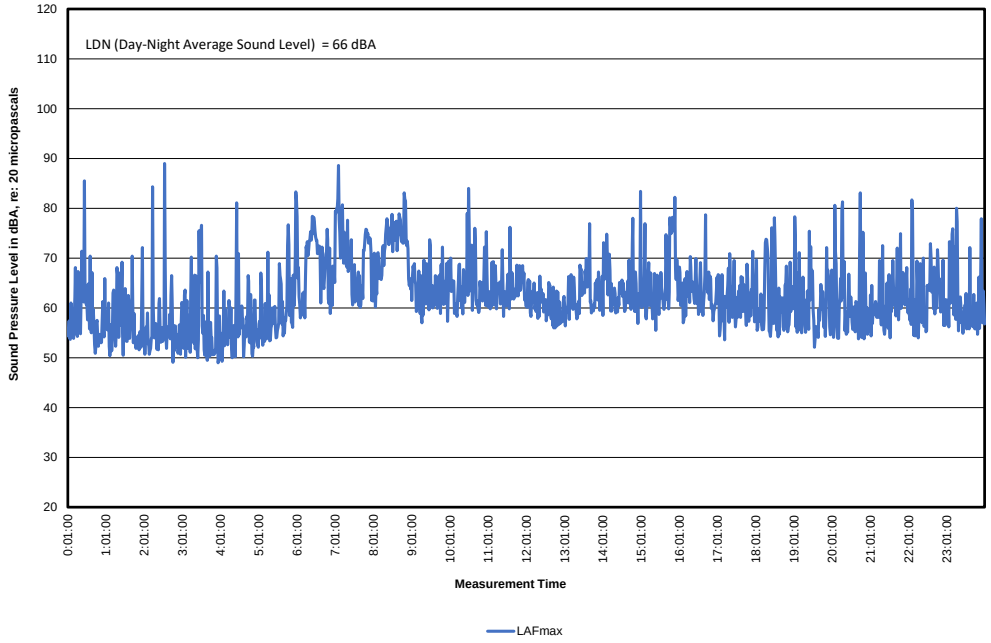

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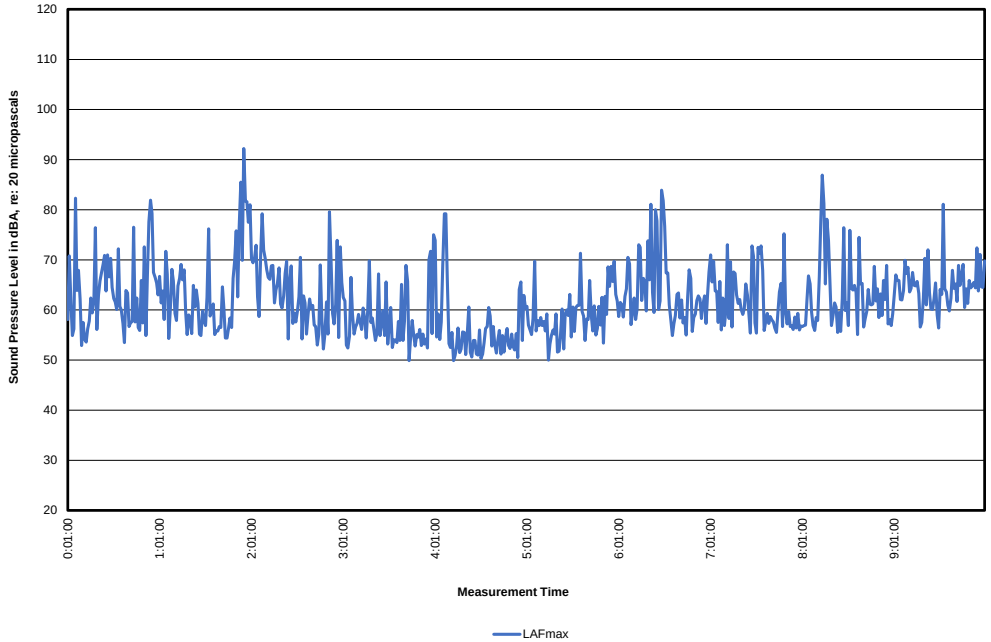

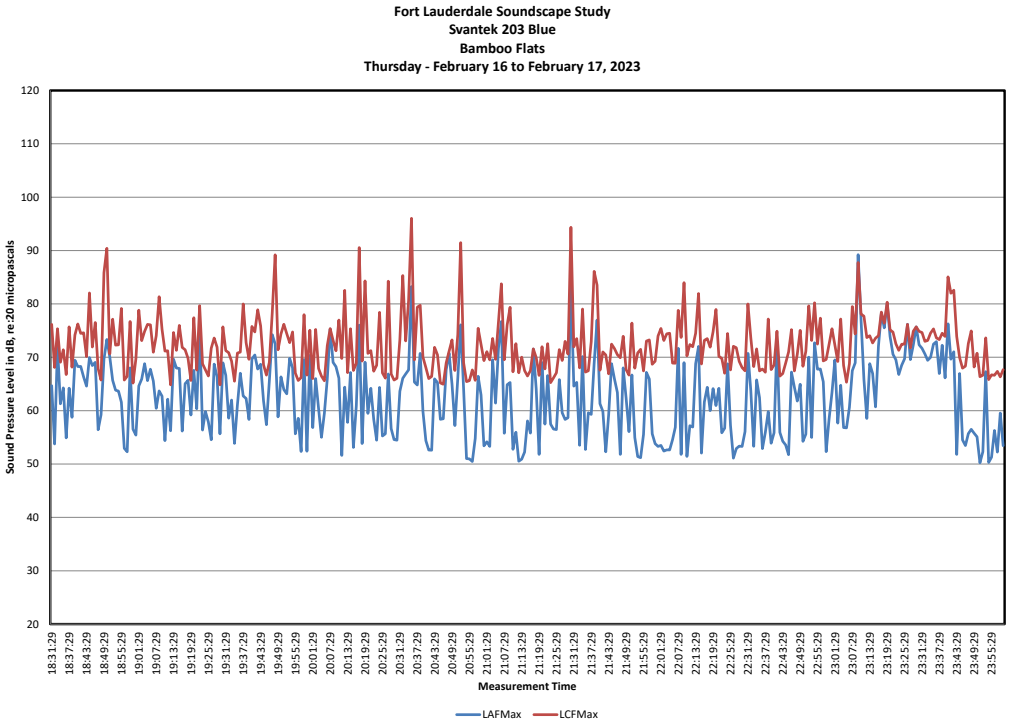
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Bamboo Flats
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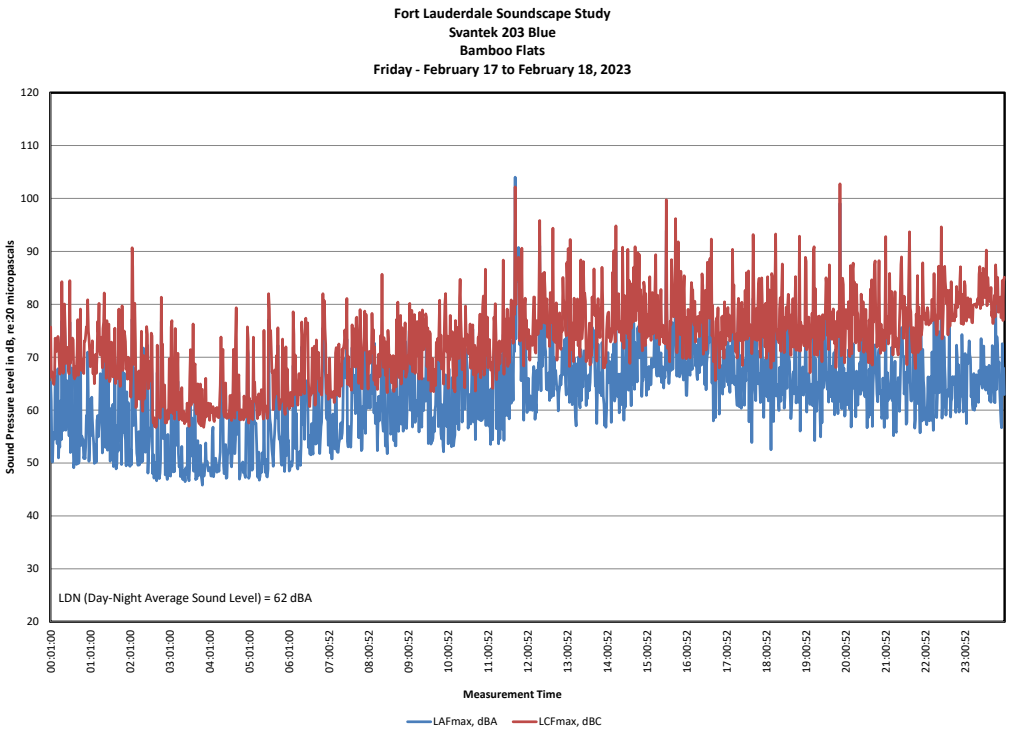
Measurement Time
LAFMax
LCFMax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Bamboo Flats
Friday - February 17 to February 18, 2023
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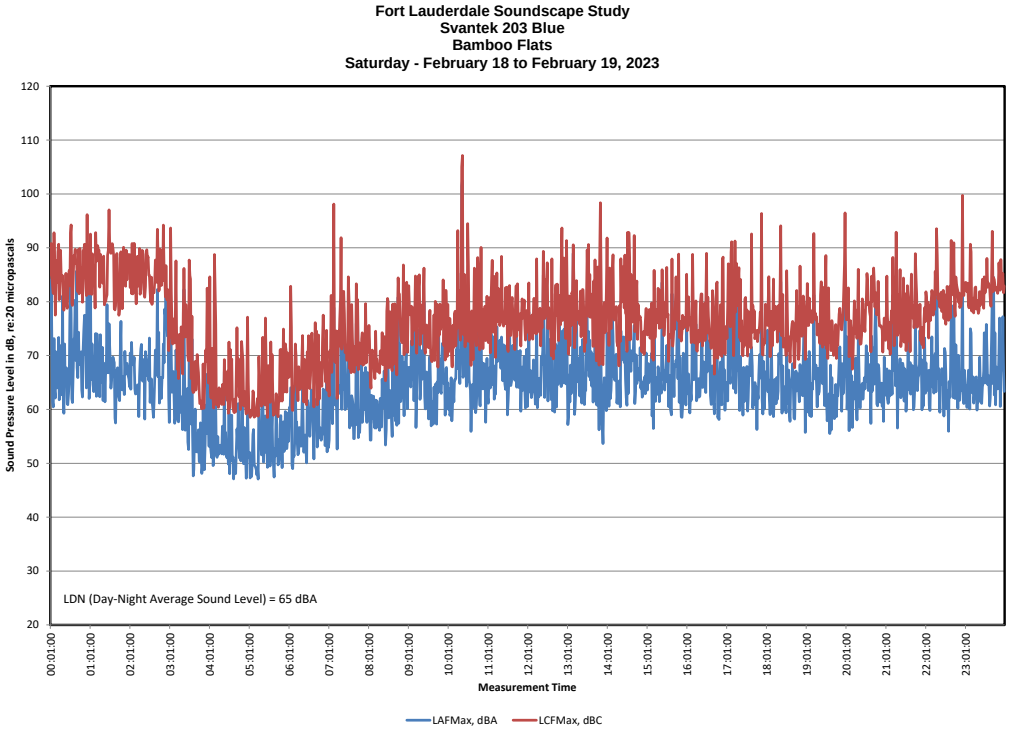
Measurement Time
LAFmax, dBA
LCFmax, dBC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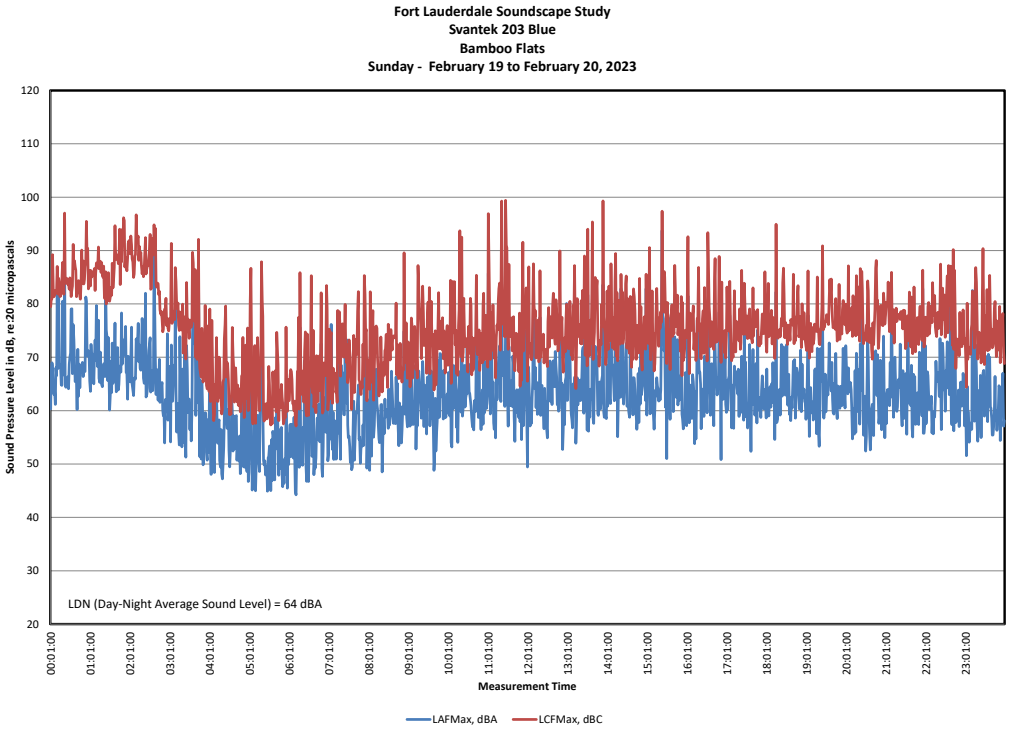
Measurement Time
LAFMax, dBA
LCFMax, dBC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Bamboo Flats
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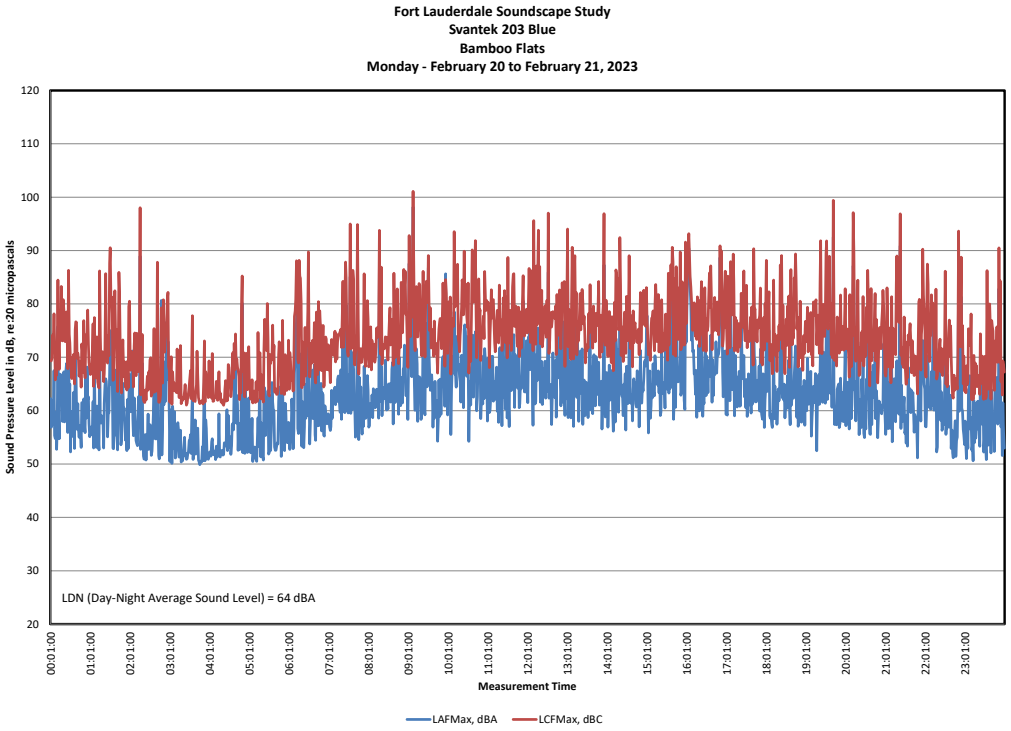
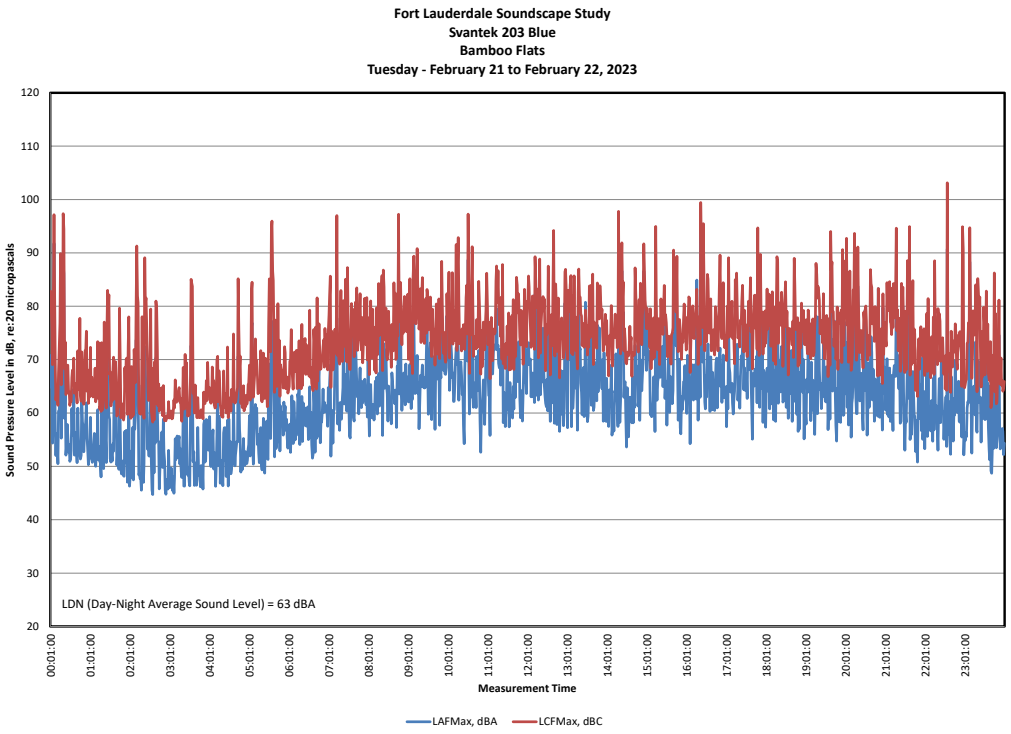
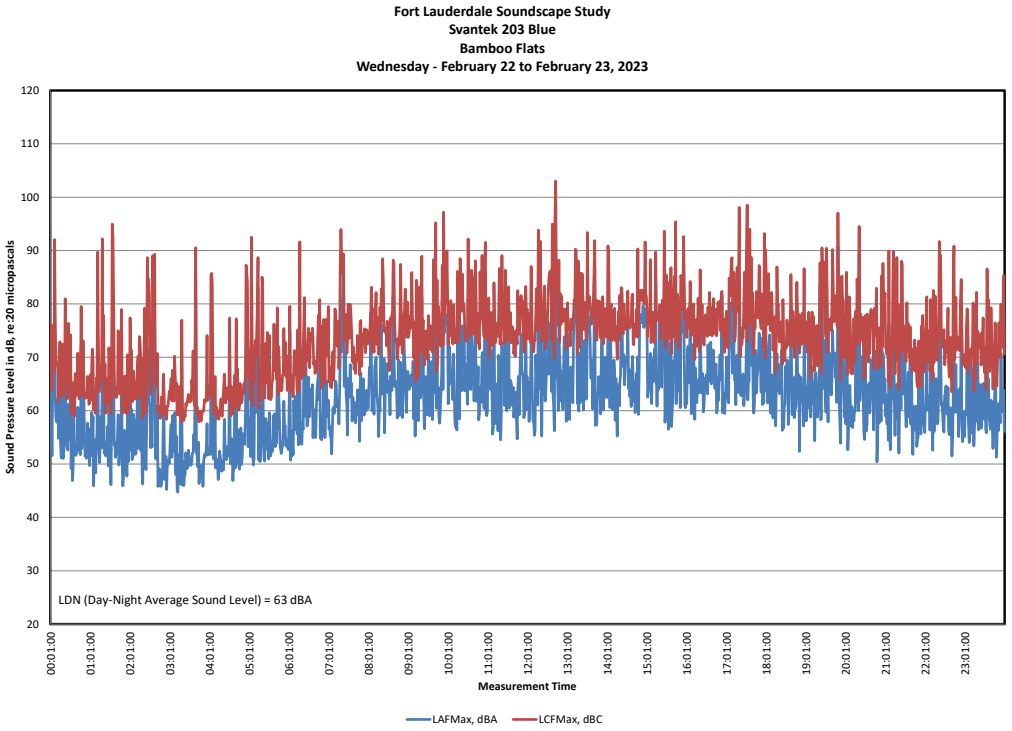
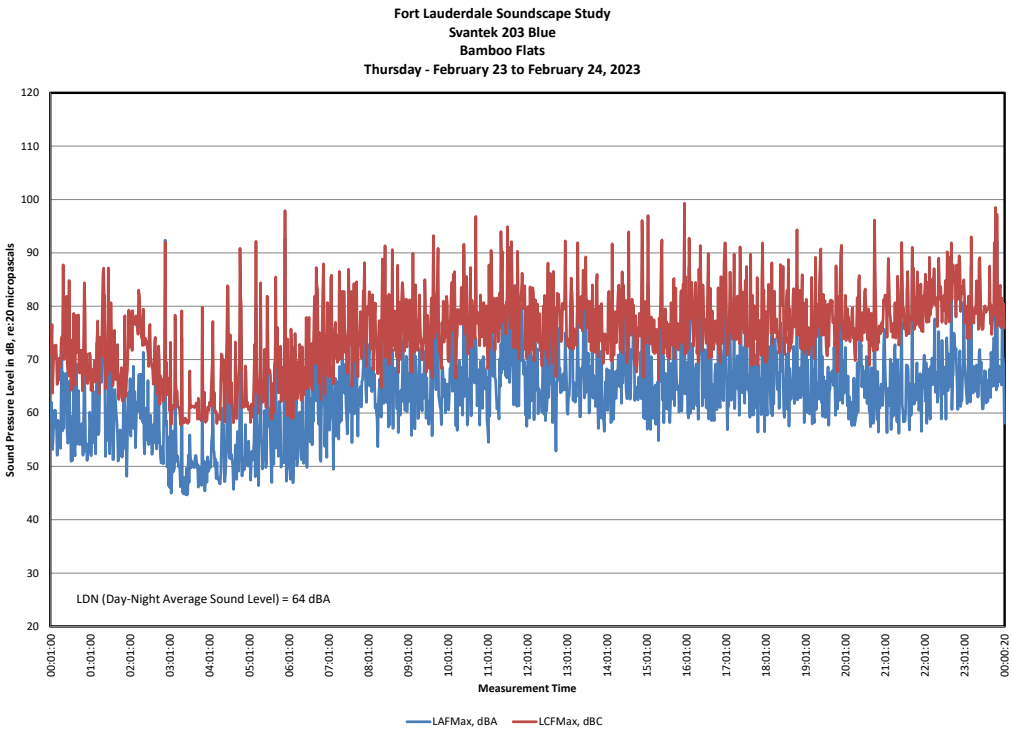
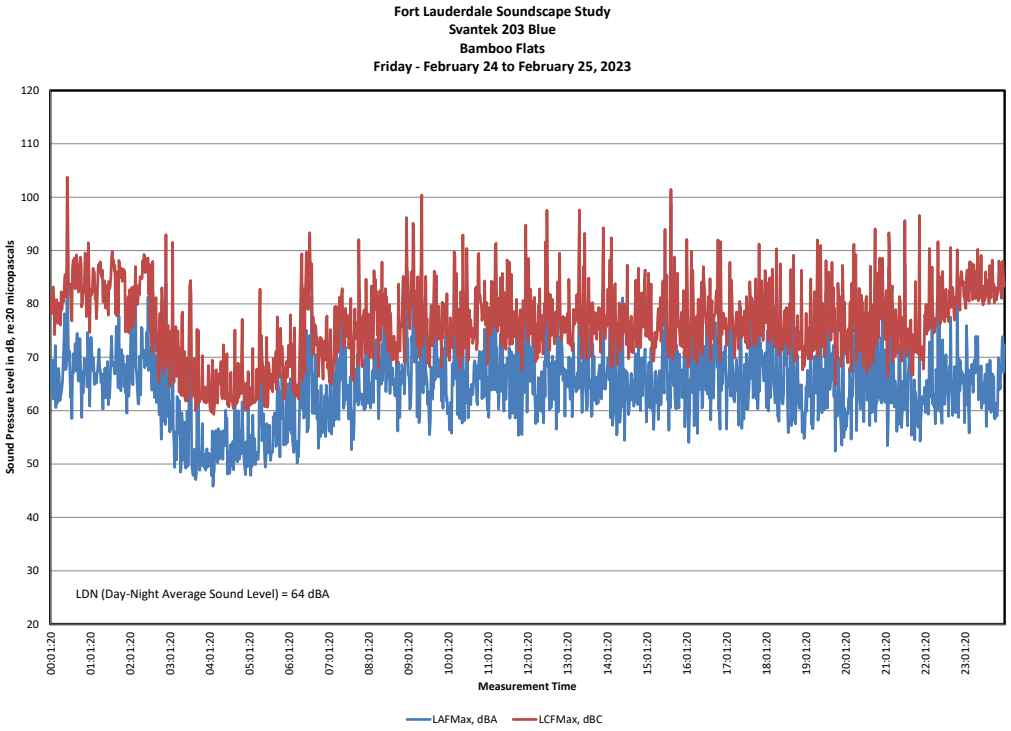
Measurement Time
LAFMax, dBA
LCFMax, dBC

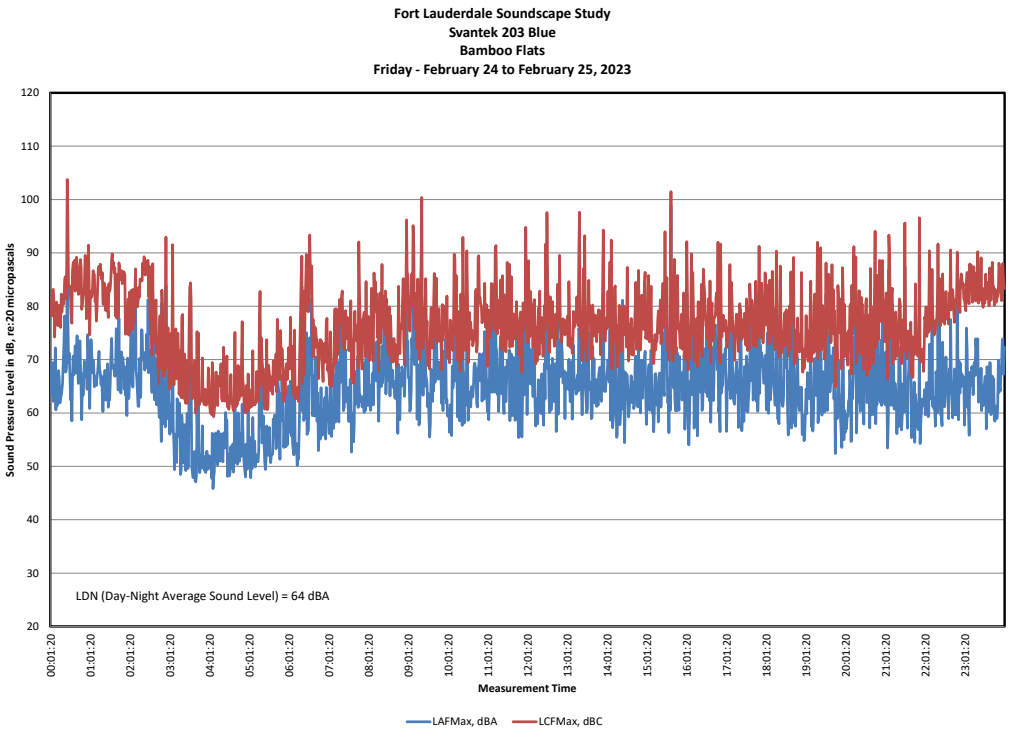

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Bamboo Flats
Monday - February 20 to February 21, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 64 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

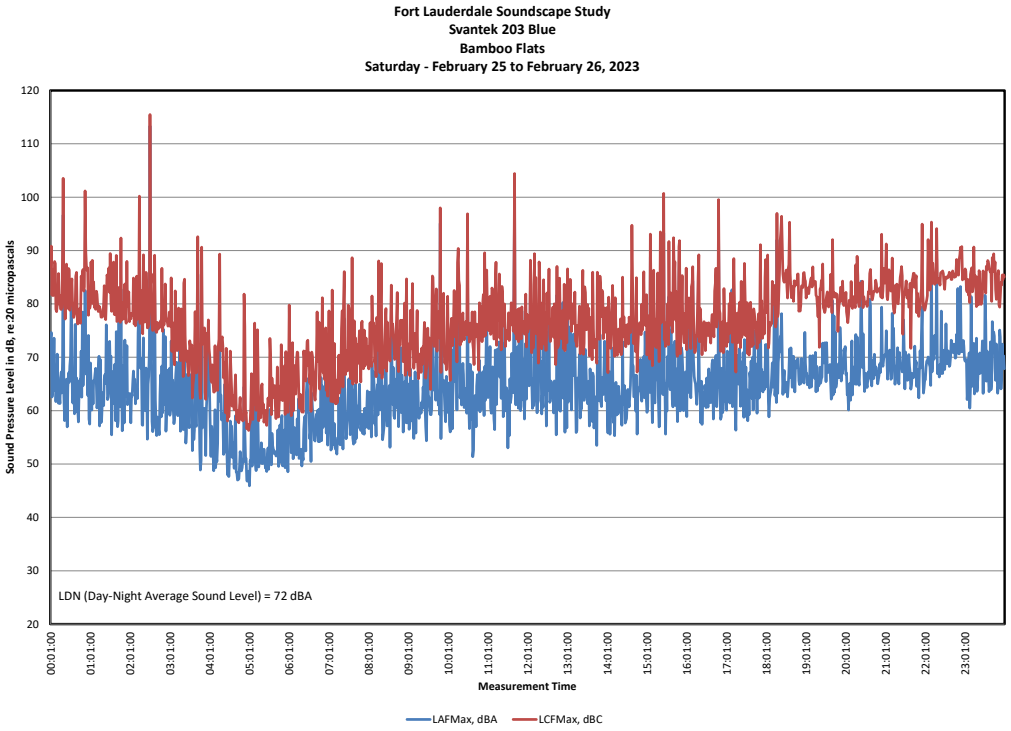

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Bamboo Flats
Tuesday - February 21 to February 22, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 63 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

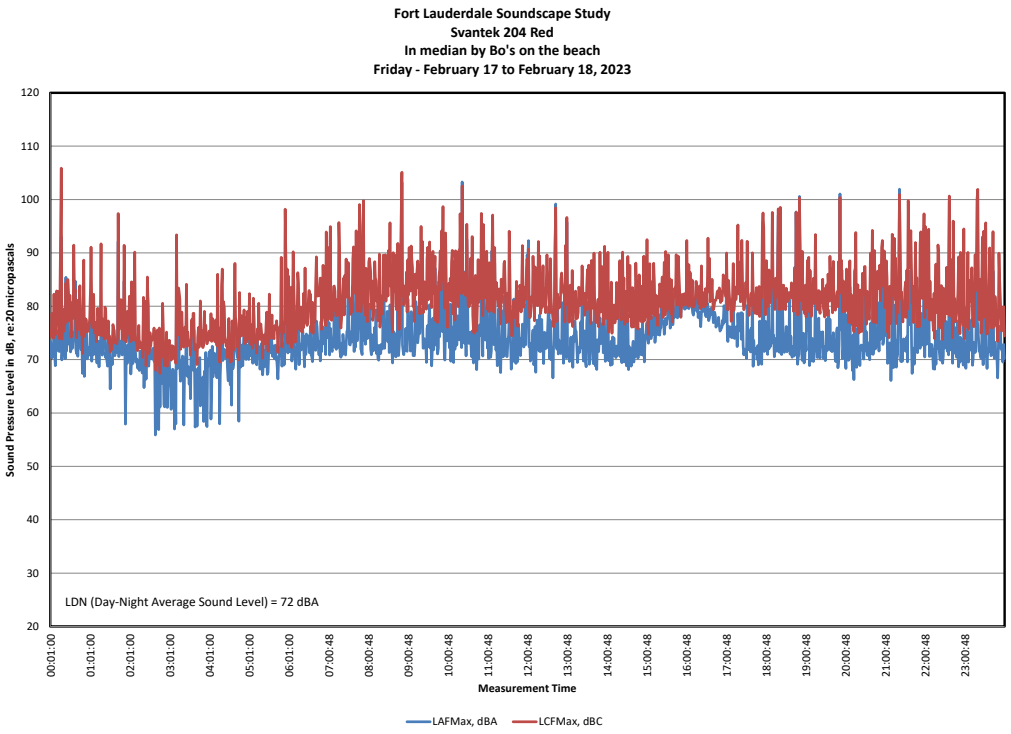

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Bamboo Flats
Wednesday - February 22 to February 23, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 63 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

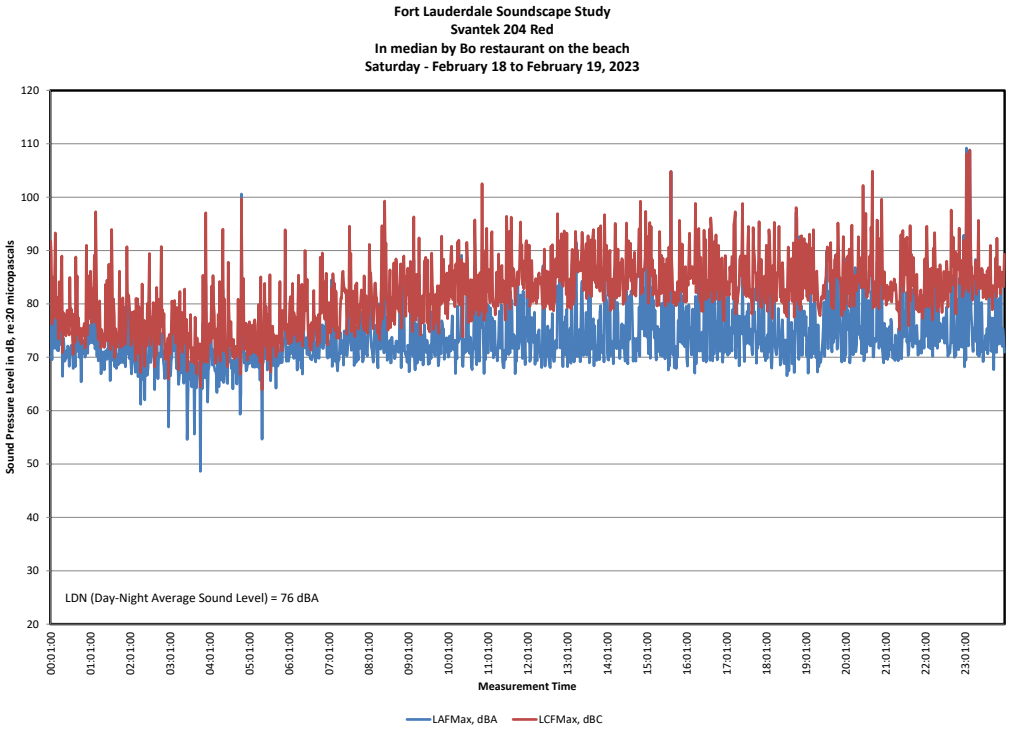

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Bamboo Flats
Thursday - February 23 to February 24, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 64 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

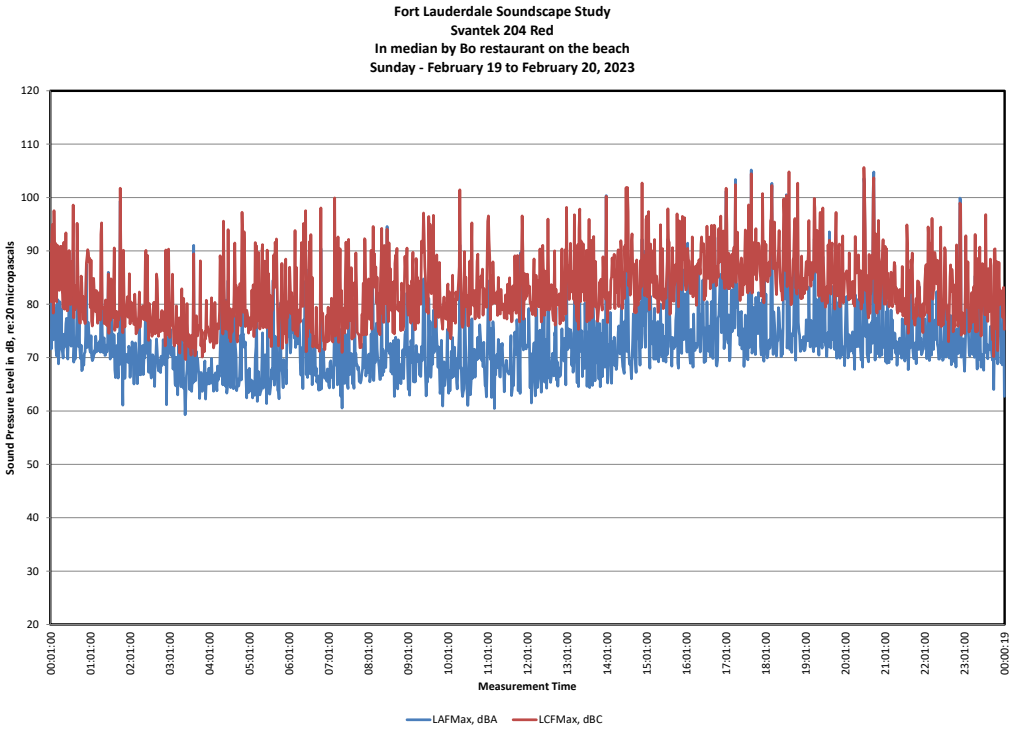

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Bamboo Flats
Friday - February 24 to February 25, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 64 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

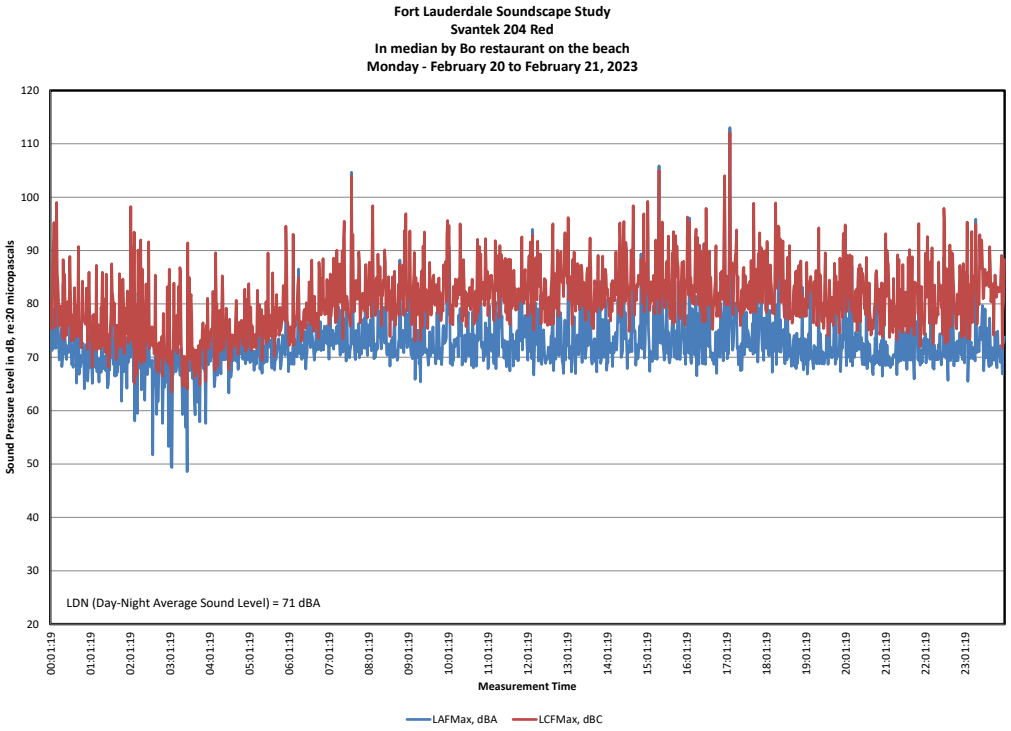

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Bamboo Flats
Friday - February 24 to February 25, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 64 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

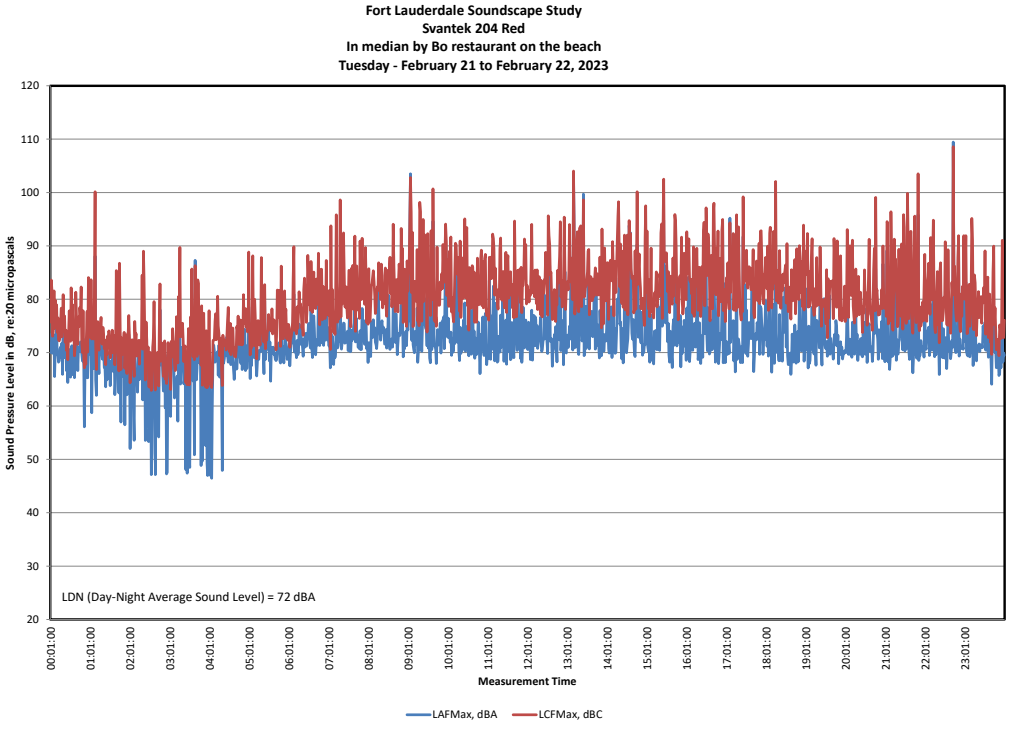

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Bamboo Flats
Saturday - February 25 to February 26, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 72 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

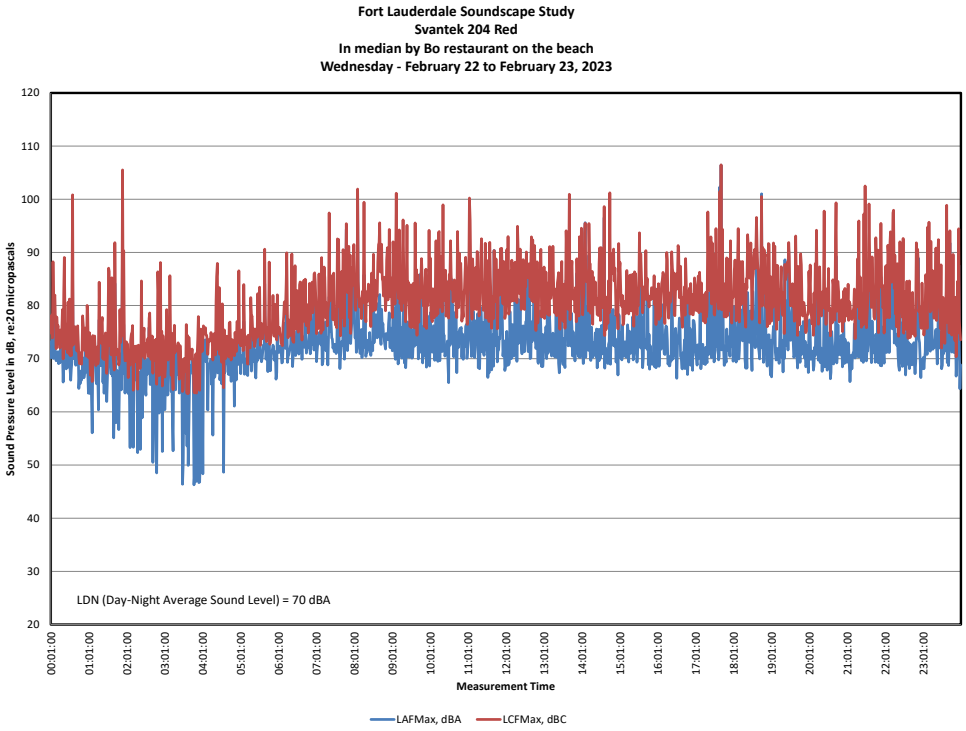

Fort Lauderdale Soundscape Study
Svantek 204 Red
In median by Bo's on the beach
Friday - February 17 to February 18, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 72 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

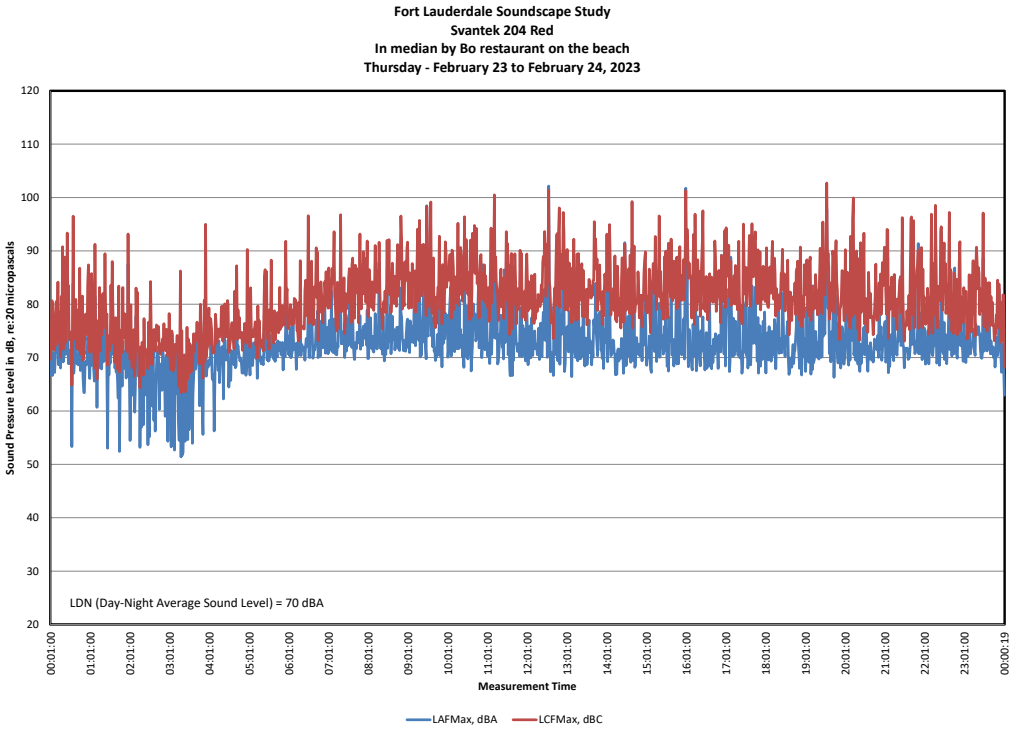

Fort Lauderdale Soundscape Study
Svantek 204 Red
In median by Bo restaurant on the beach
Saturday - February 18 to February 19, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 76 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

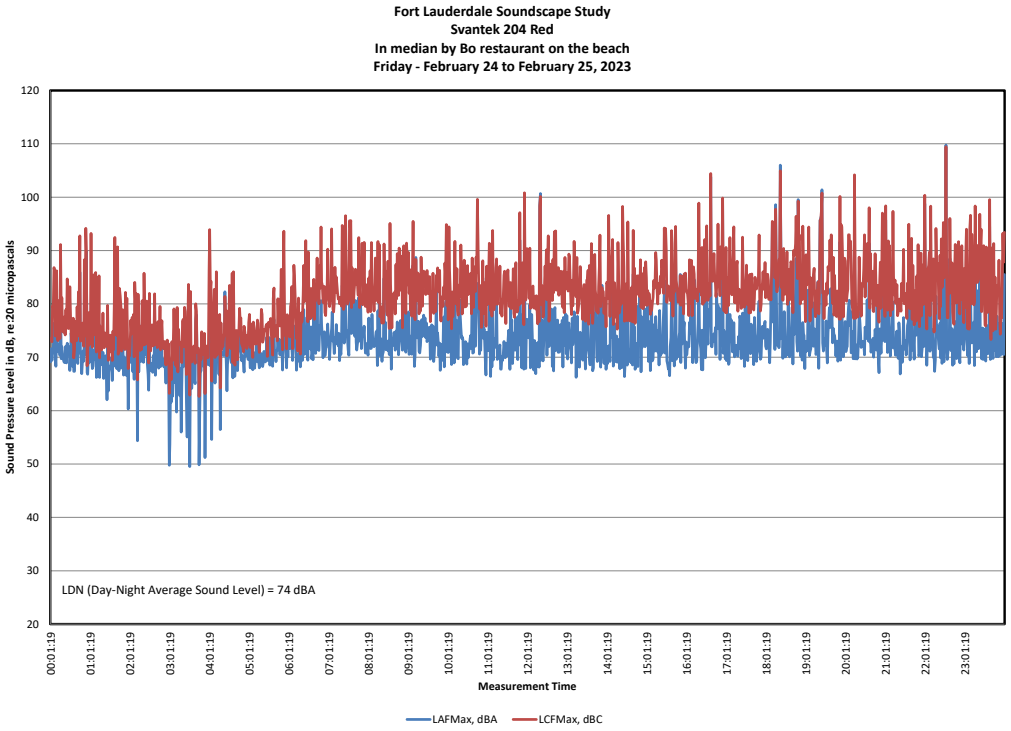

Fort Lauderdale Soundscape Study
Svantek 204 Red
In median by Bo restaurant on the beach
Sunday - February 19 to February 20, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFMax, dBA
LCFMax, dBC

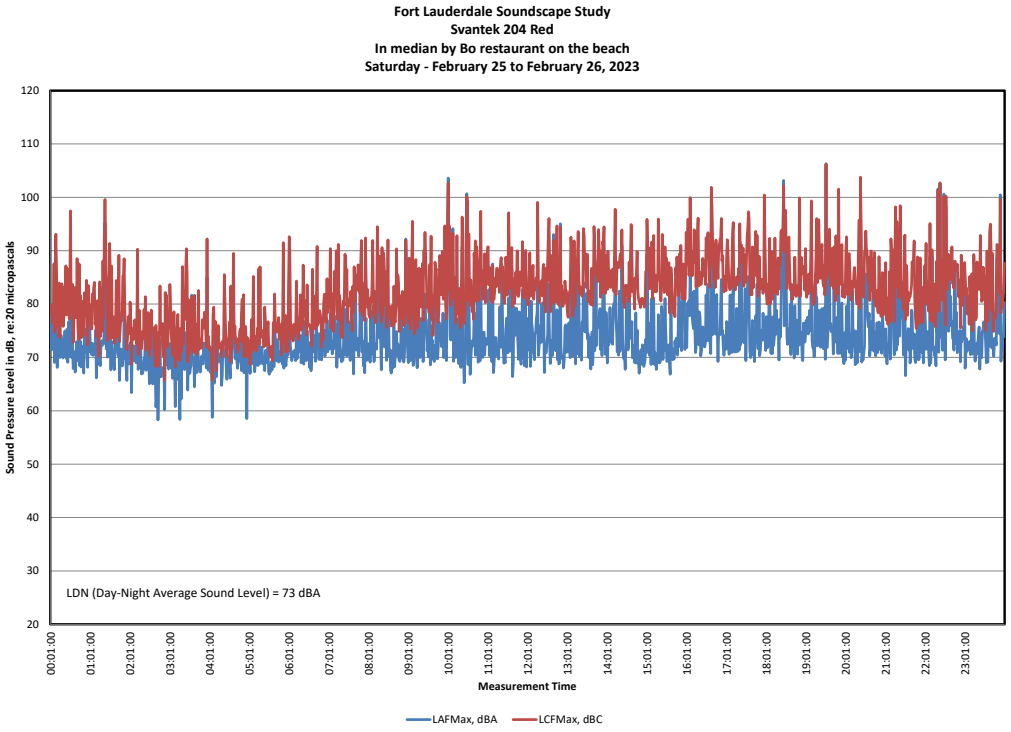

Fort Lauderdale Soundscape Study
Svantek 204 Red
In median by Bo restaurant on the beach
Monday - February 20 to February 21, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 71 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

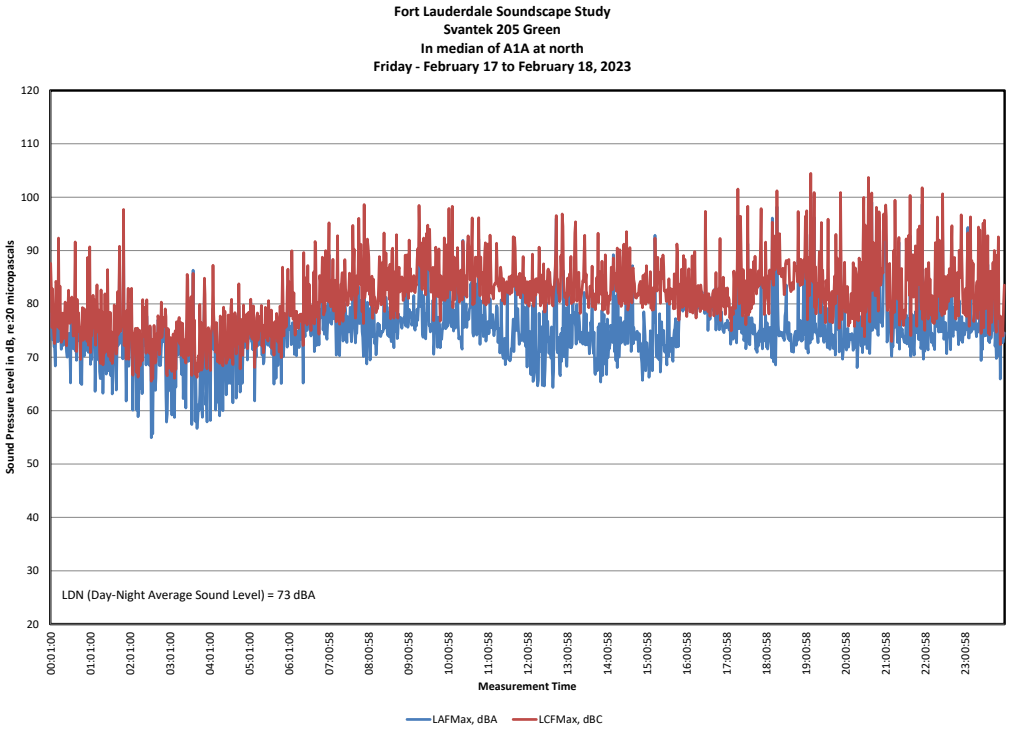

Fort Lauderdale Soundscape Study
Svantek 204 Red
In median by Bo restaurant on the beach
Tuesday - February 21 to February 22, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 72 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

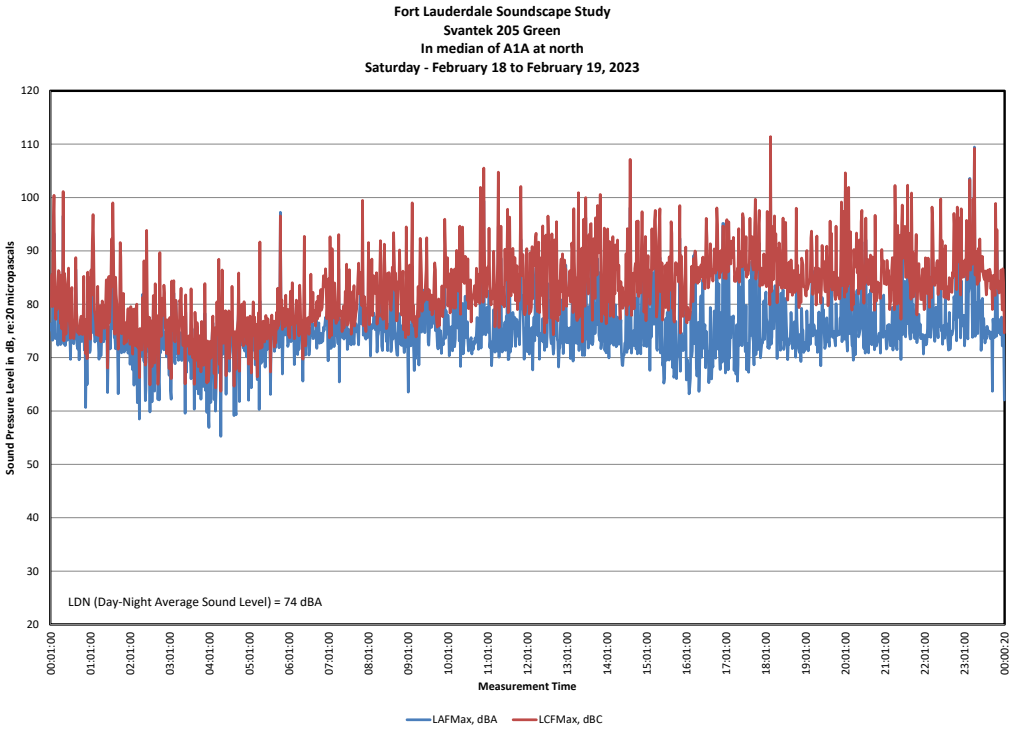

Fort Lauderdale Soundscape Study
Svantek 204 Red
In median by Bo restaurant on the beach
Wednesday - February 22 to February 23, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 70 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

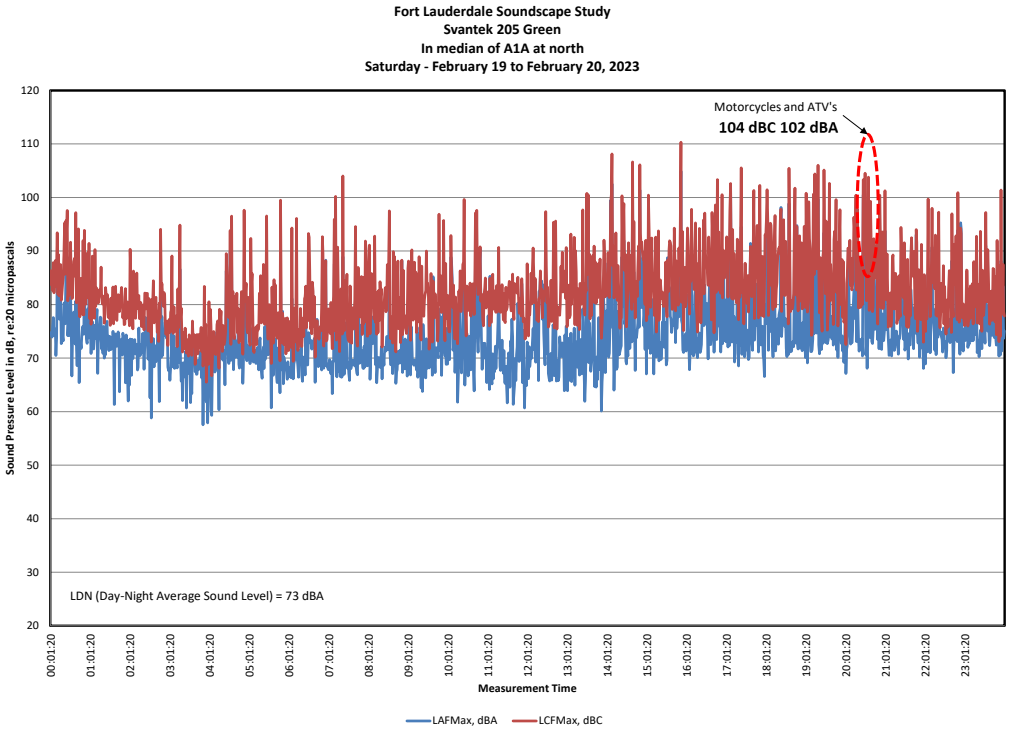

Fort Lauderdale Soundscape Study
Svantek 204 Red
In median by Bo restaurant on the beach
Thursday - February 23 to February 24, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 70 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

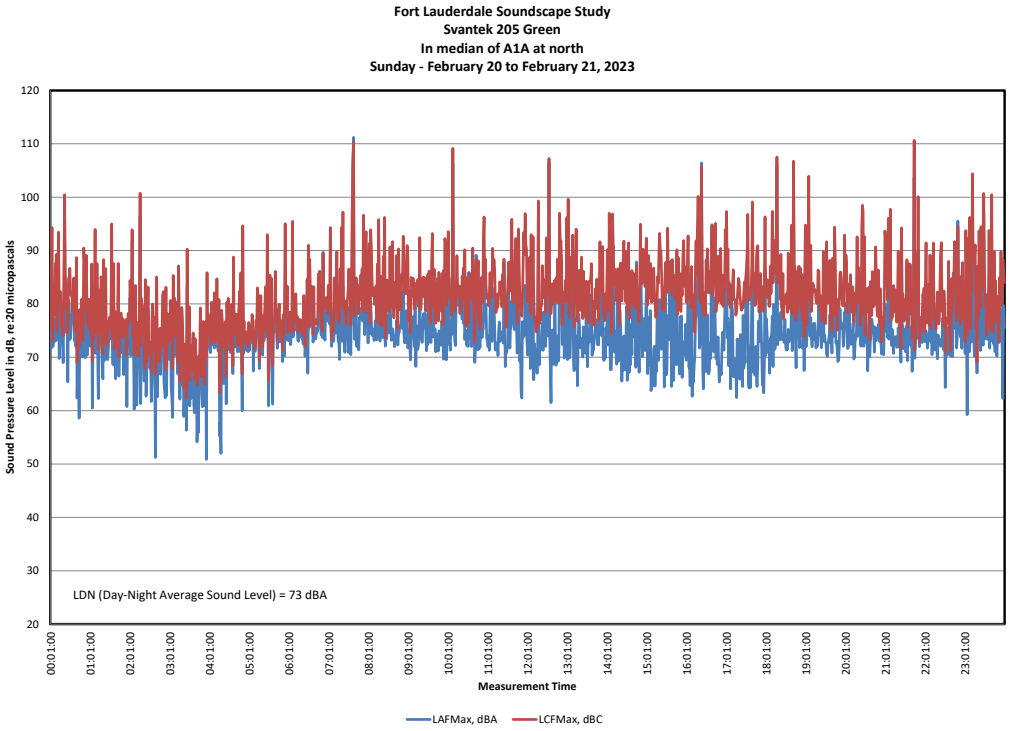

Fort Lauderdale Soundscape Study
Svantek 204 Red
In median by Bo restaurant on the beach
Friday - February 24 to February 25, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 74 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC


Fort Lauderdale Soundscape Study
Svantek 204 Red
In median by Bo restaurant on the beach
Saturday - February 25 to February 26, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 73 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

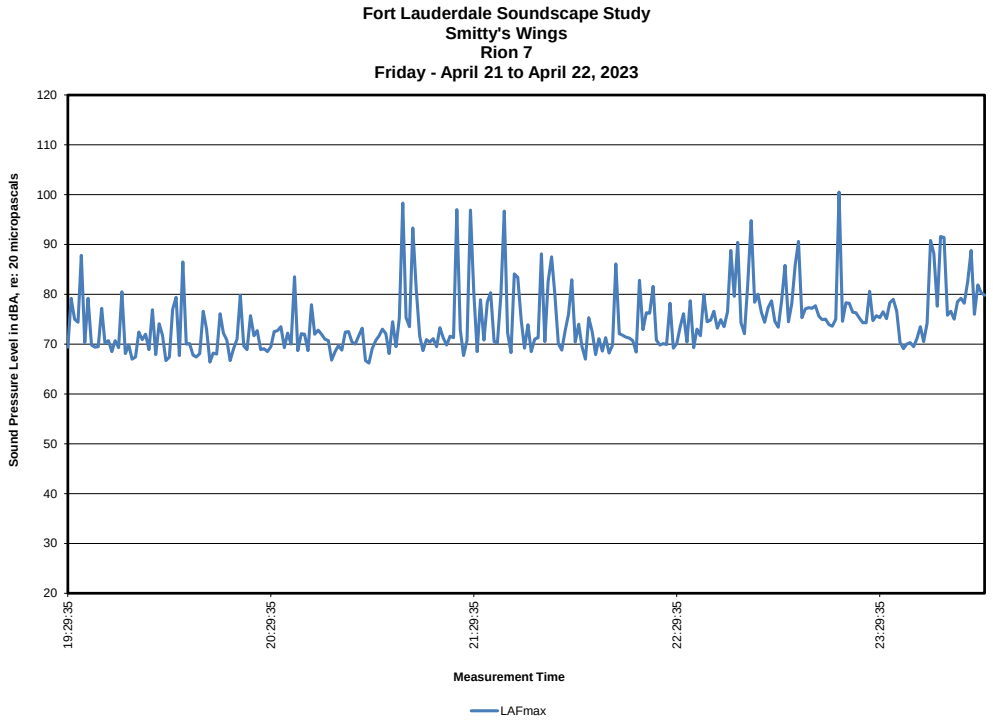

Fort Lauderdale Soundscape Study
Svantek 205 Green
In median of A1A at north
Friday - February 17 to February 18, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 73 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

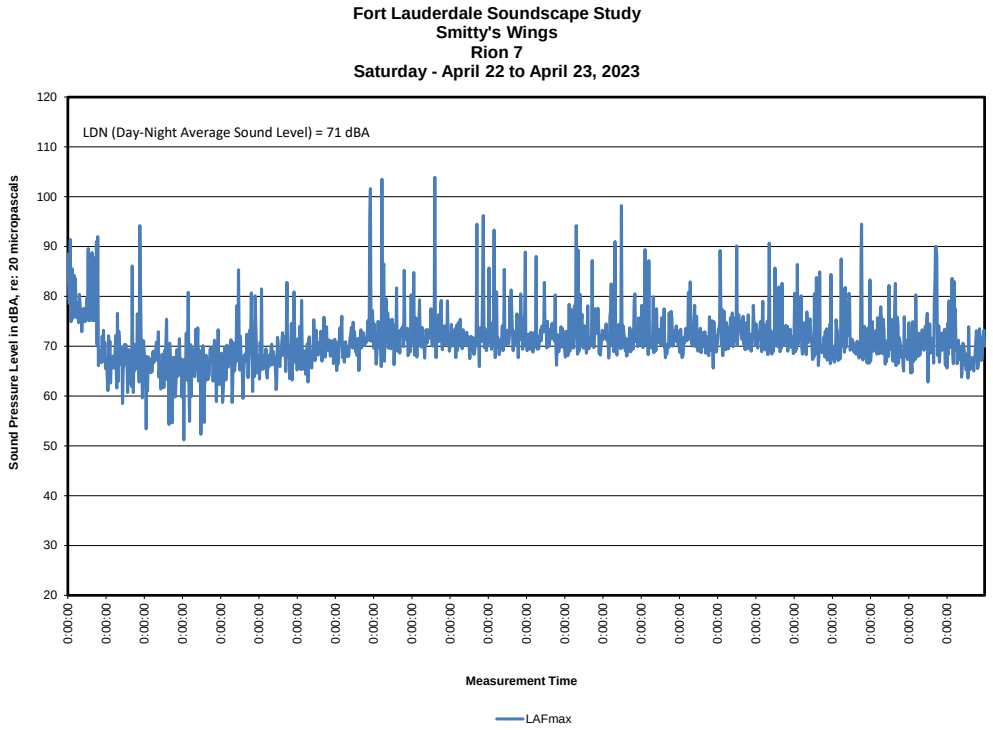

Fort Lauderdale Soundscape Study
Svantek 205 Green
In median of A1A at north
Saturday - February 18 to February 19, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 74 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC


Fort Lauderdale Soundscape Study
Svantek 205 Green
In median of A1A at north
Saturday - February 19 to February 20, 2023
Motorcycles and ATV's
104 dBC 102 dBA
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 73 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

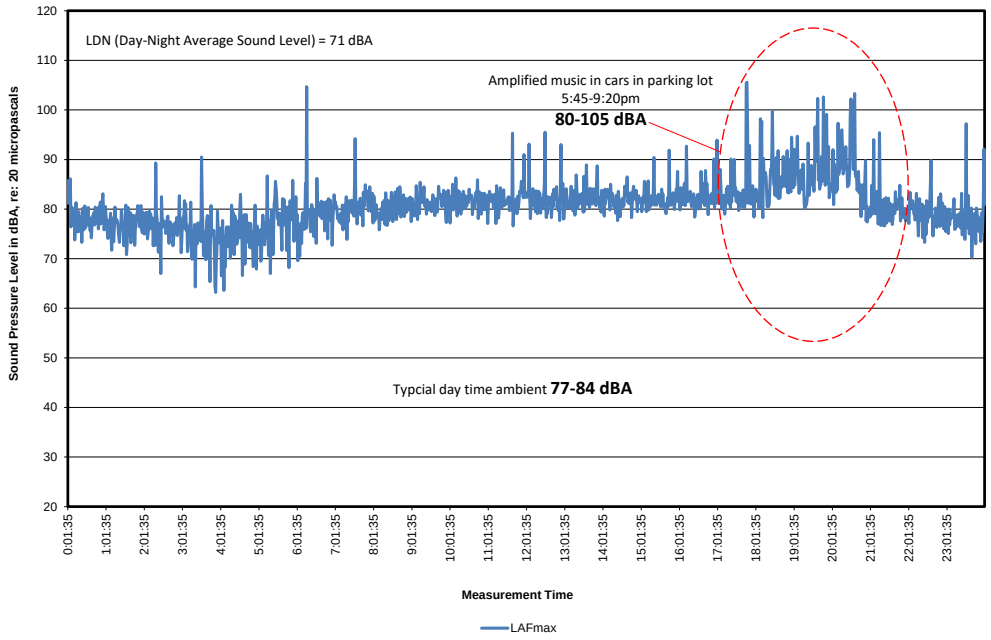

Fort Lauderdale Soundscape Study
Svantek 205 Green
In median of A1A at north
Sunday - February 20 to February 21, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 73 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

APPENDIX A-2:
SUMMARY GRAPHS OF LONG-TERM ACOUSTICAL DATA
TRIP 2

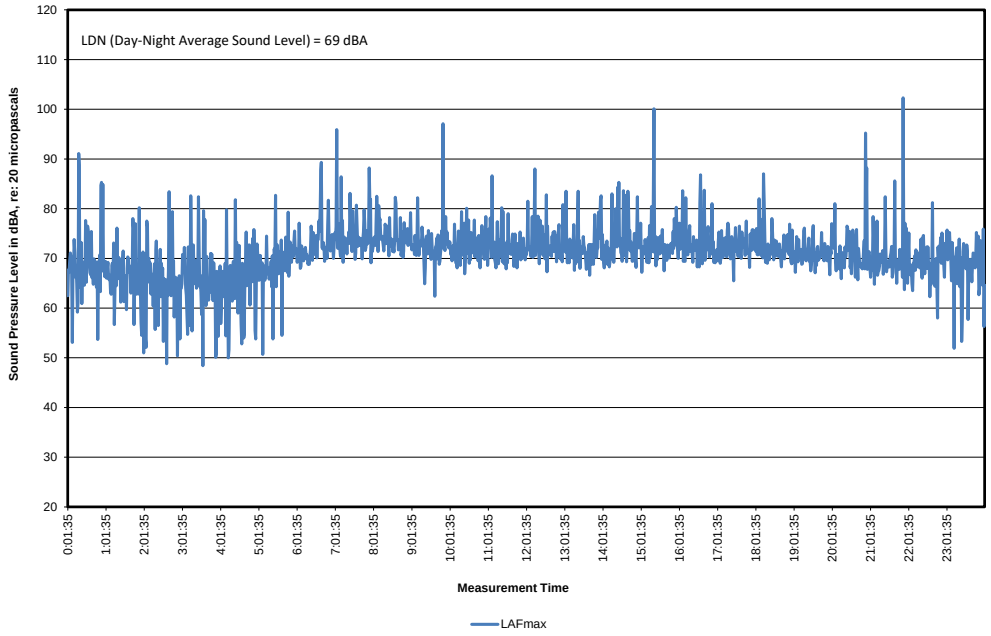

Fort Lauderdale Soundscape Study
Smitty's Wings
Rion 7
Friday - April 21 to April 22, 2023
Sound Pressure Level in dBA, re: 20 micropascals
120
110
100
90
80
70
60
50
40
30
20
19:29:35
20:29:35
21:29:35
22:29:35
23:29:35
Measurement Time
LAFmax

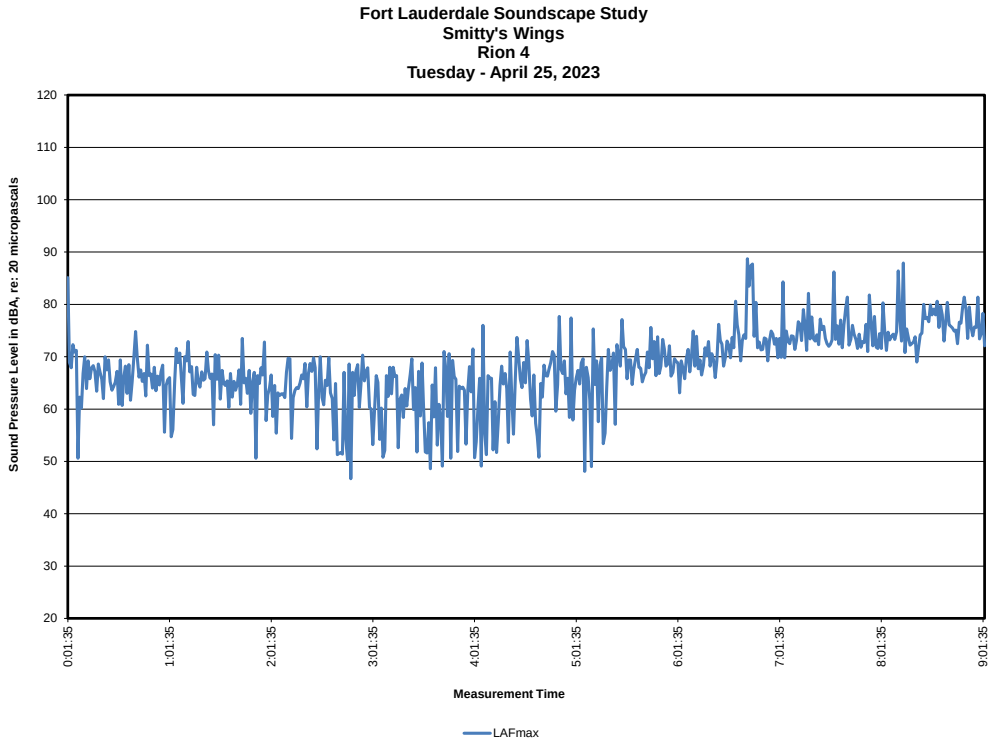

Fort Lauderdale Soundscape Study
Smitty's Wings
Rion 7
Saturday - April 22 to April 23, 2023
LDN (Day-Night Average Sound Level) = 71 dBA
Sound Pressure Level in dBA, re: 20 micropascals
120
110
100
90
80
70
60
50
40
30
20
0:00:00
Measurement Time
LAFmax

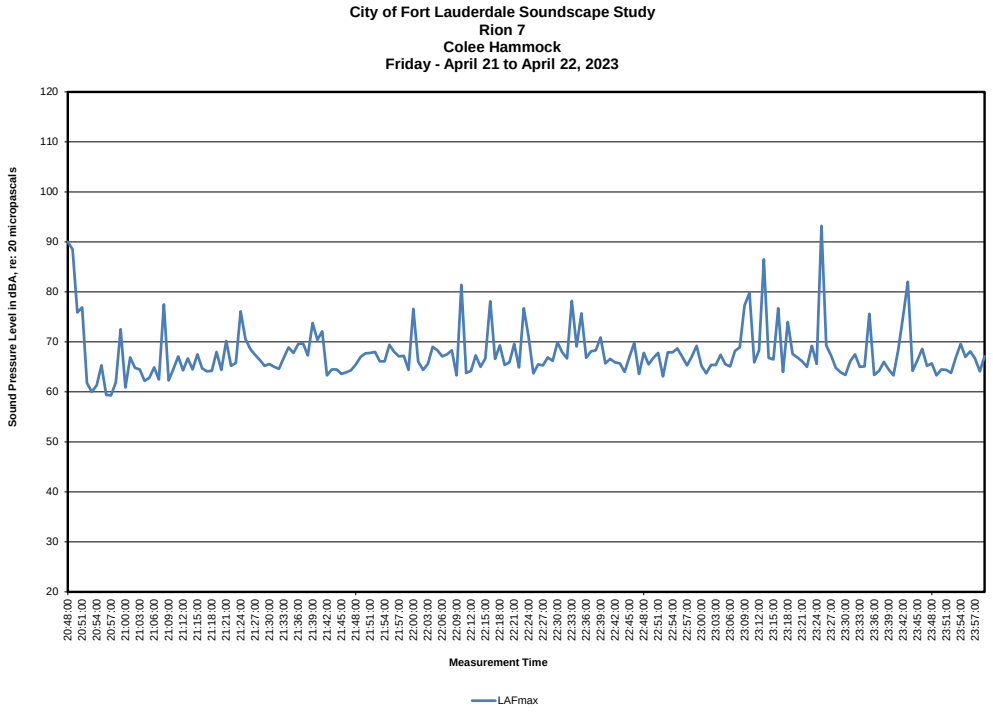
Fort Lauderdale Soundscape Study
Smitty's Wings
Rion 7
Sunday - April 23 to April 24, 2023

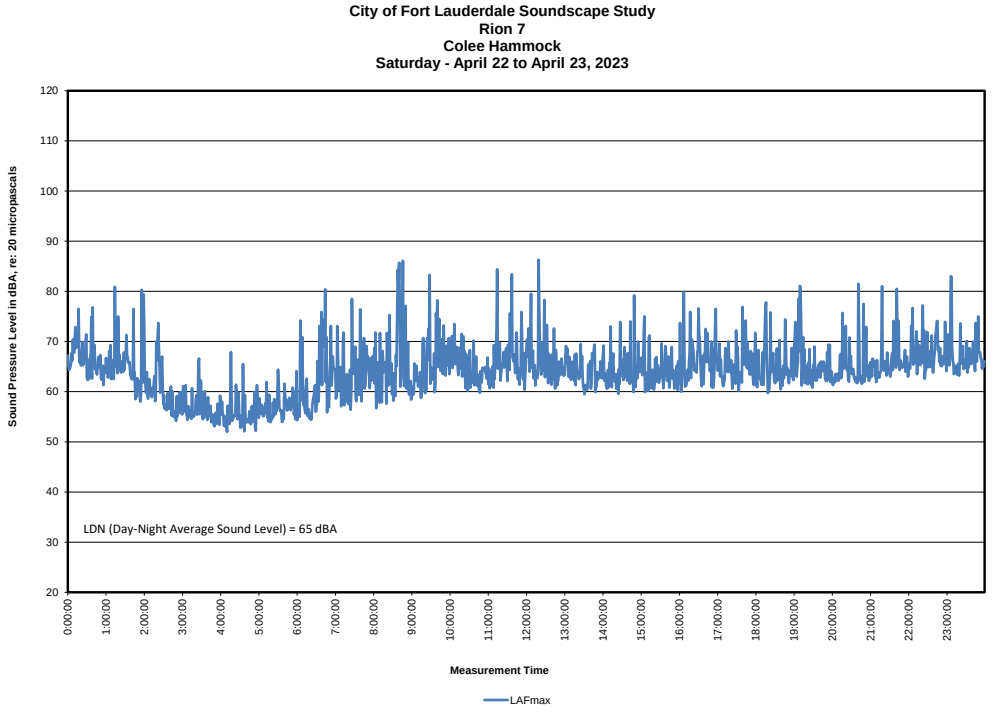


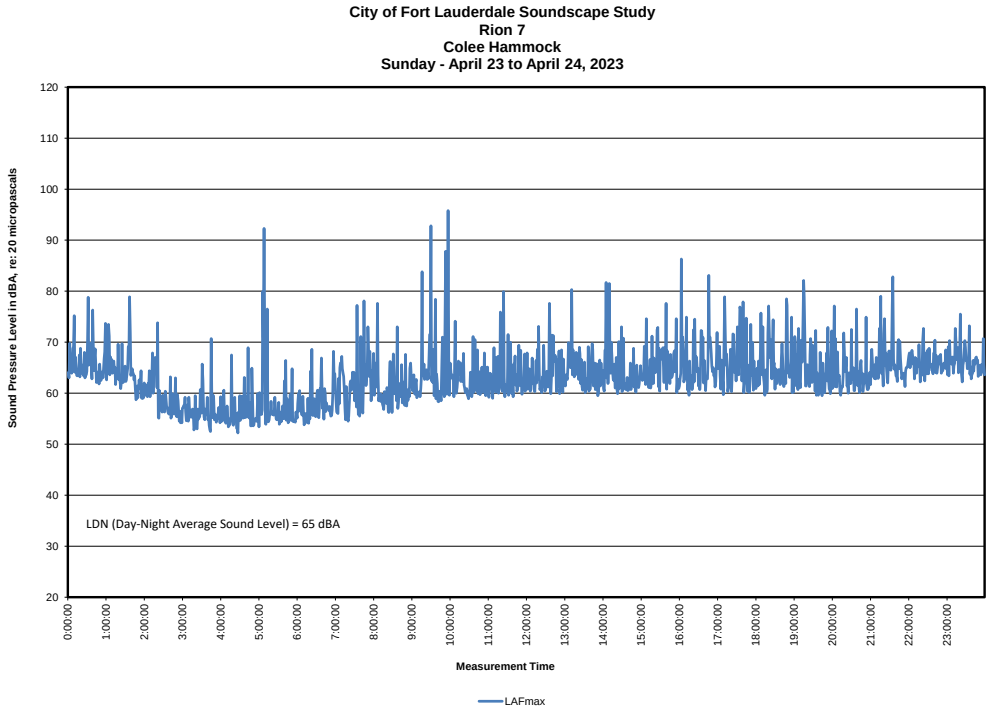
Fort Lauderdale Soundscape Study
Smitty's Wings
Rion 4
Monday - April 24 to April 25, 2023

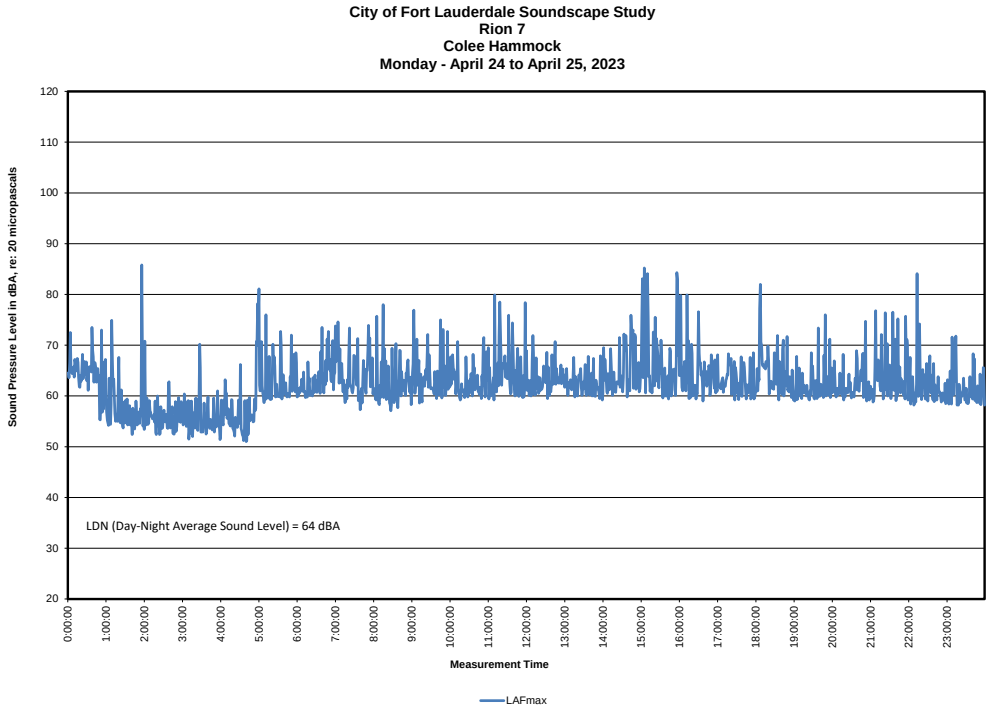


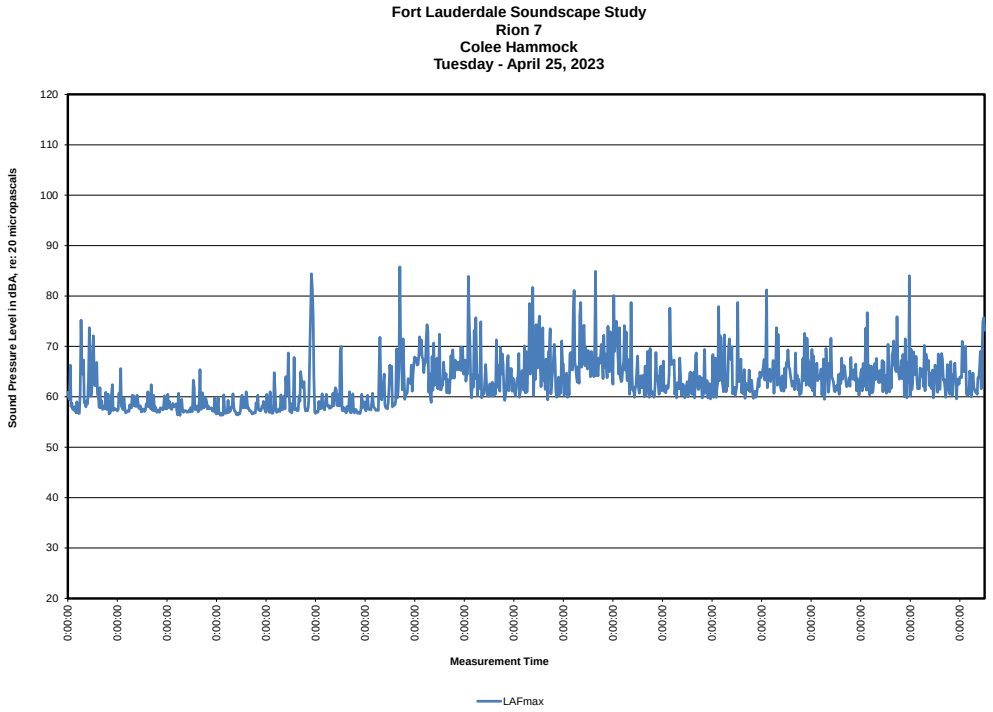

Fort Lauderdale Soundscape Study
Smitty's Wings
Rion 4
Tuesday - April 25, 2023
Sound Pressure Level in dBA, re: 20 micropascals
120
110
100
90
80
70
60
50
40
30
20
0:01:35
1:01:35
2:01:35
3:01:35
4:01:35
5:01:35
6:01:35
7:01:35
8:01:35
9:01:35
Measurement Time
LAFmax

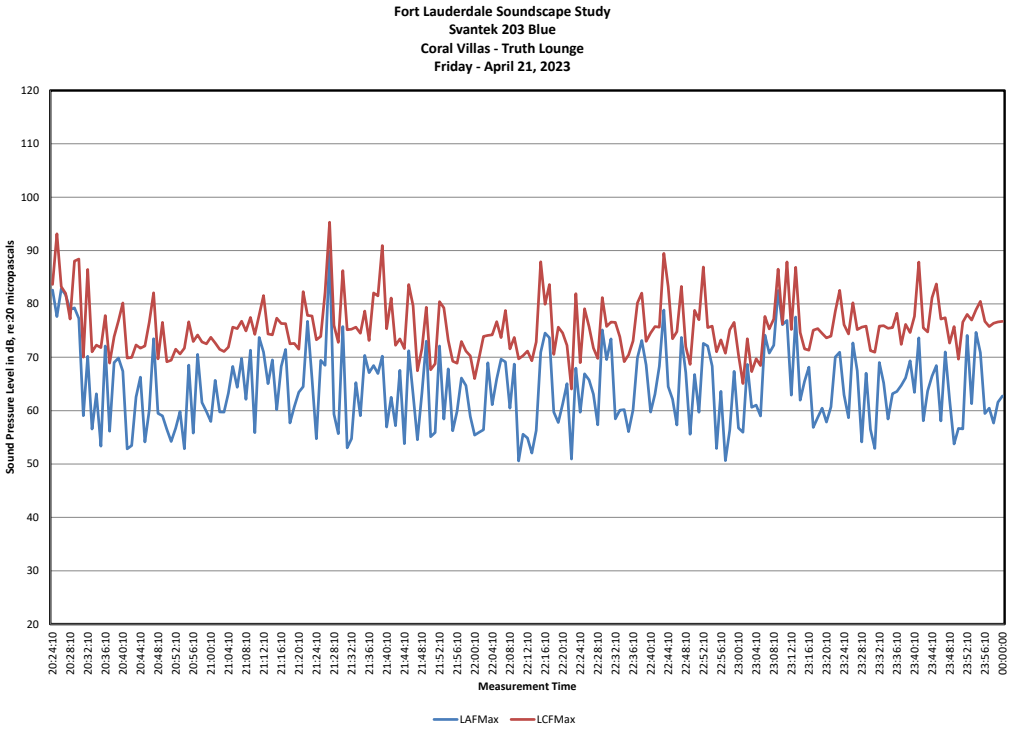

City of Fort Lauderdale Soundscape Study
Rion 7
Colee Hammock
Friday - April 21 to April 22, 2023
Sound Pressure Level in dBA, re: 20 micropascals
Measurement Time
LAFmax

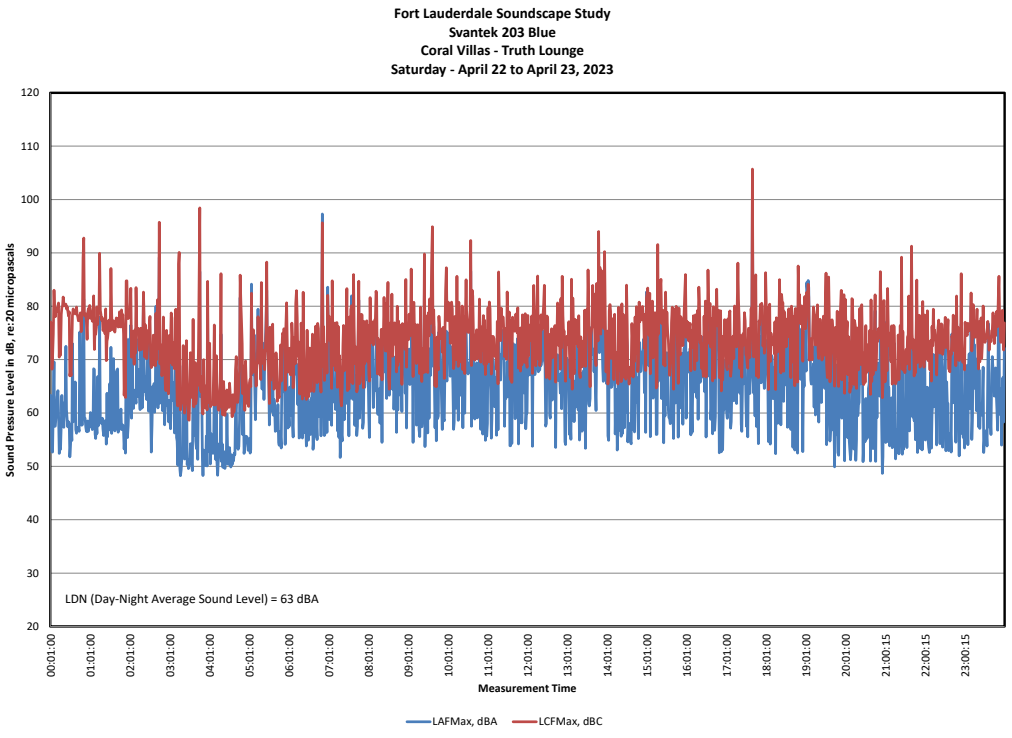

City of Fort Lauderdale Soundscape Study
Rion 7
Colee Hammock
Saturday - April 22 to April 23, 2023
Sound Pressure Level in dBA, re: 20 micropascals
LDN (Day-Night Average Sound Level) = 65 dBA
Measurement Time
LAFmax

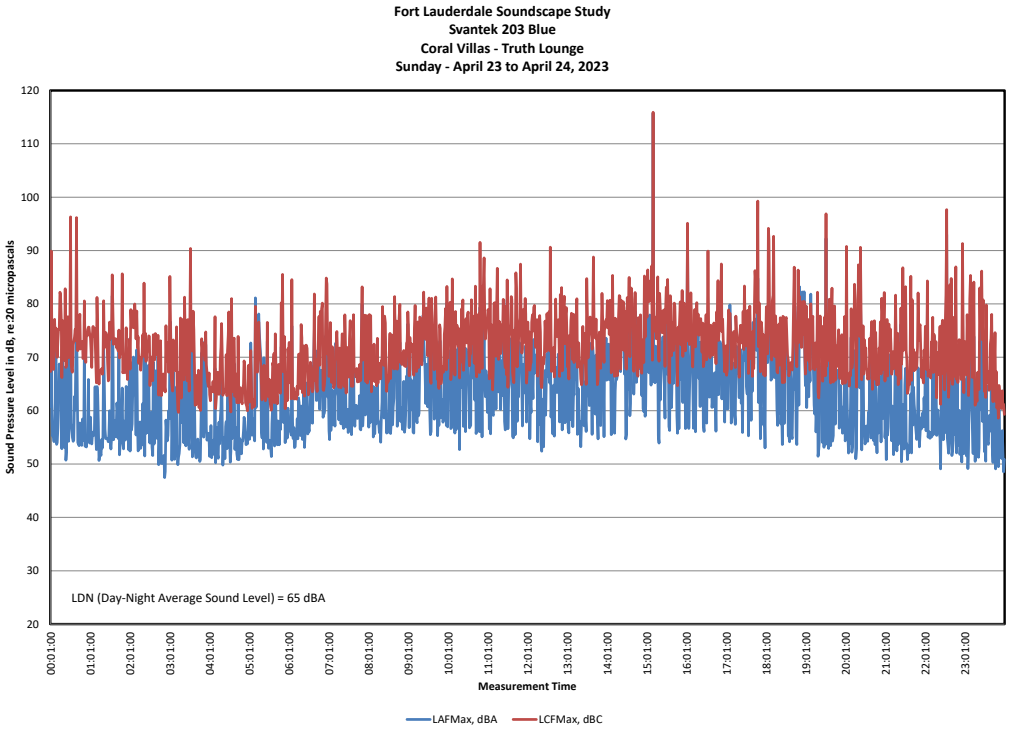

City of Fort Lauderdale Soundscape Study
Rion 7
Colee Hammock
Sunday - April 23 to April 24, 2023
Sound Pressure Level in dBA, re: 20 micropascals
LDN (Day-Night Average Sound Level) = 65 dBA
Measurement Time
LAFmax

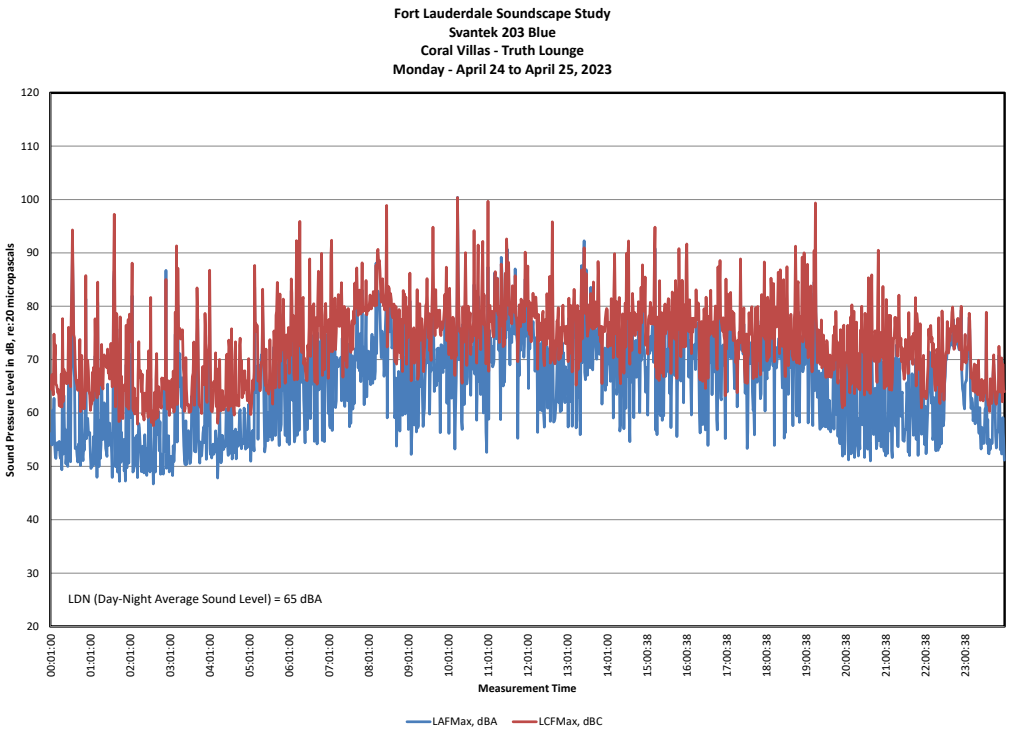

City of Fort Lauderdale Soundscape Study
Rion 7
Colee Hammock
Monday - April 24 to April 25, 2023
Sound Pressure Level in dBA, re: 20 micropascals
LDN (Day-Night Average Sound Level) = 64 dBA
Measurement Time
LAFmax

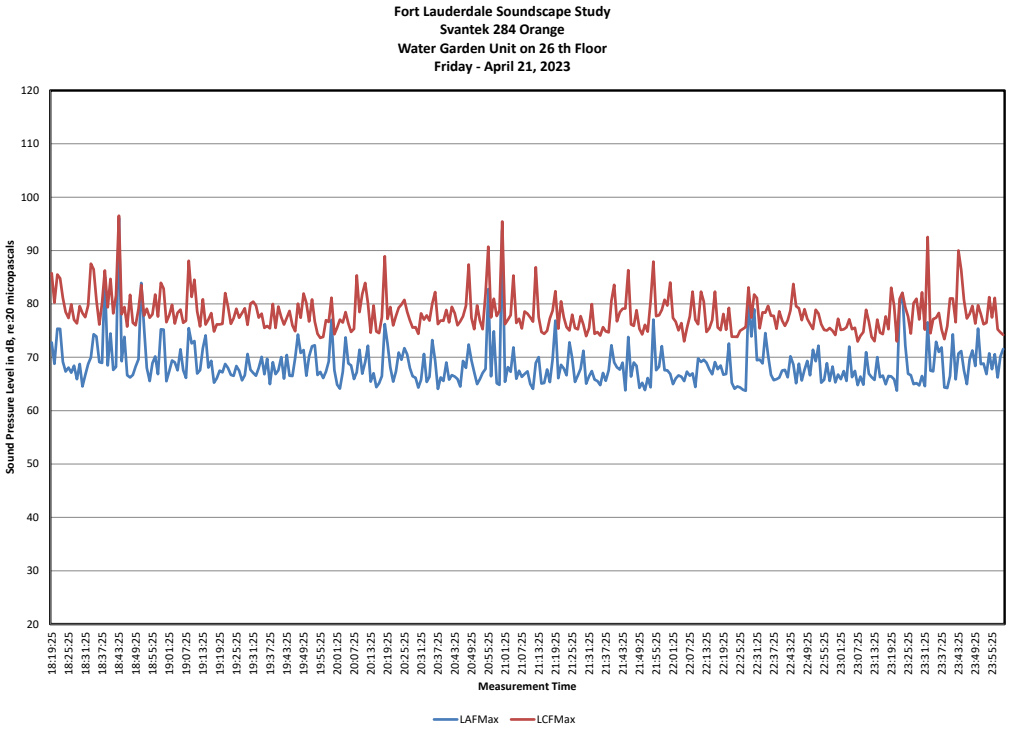

Fort Lauderdale Soundscape Study
Rion 7
Colee Hammock
Tuesday - April 25, 2023
Sound Pressure Level in dBA, re: 20 micropascals
120
110
100
90
80
70
60
50
40
30
20
0:00:00
Measurement Time
LAFmax

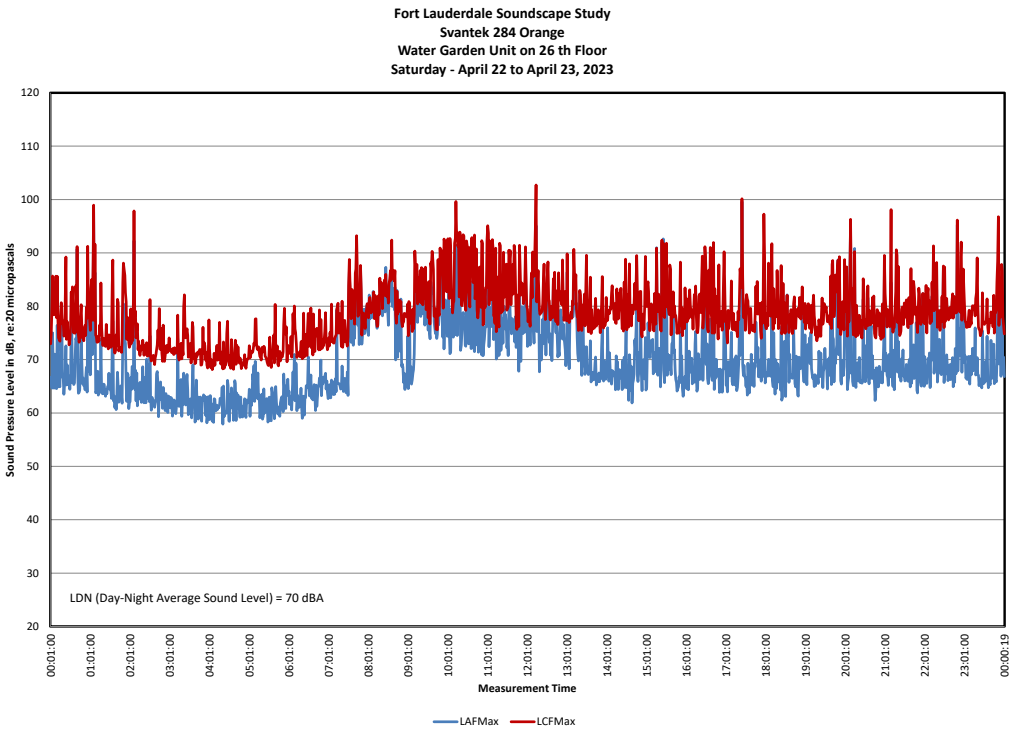

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Coral Villas - Truth Lounge
Friday - April 21, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFMax
LCFMax

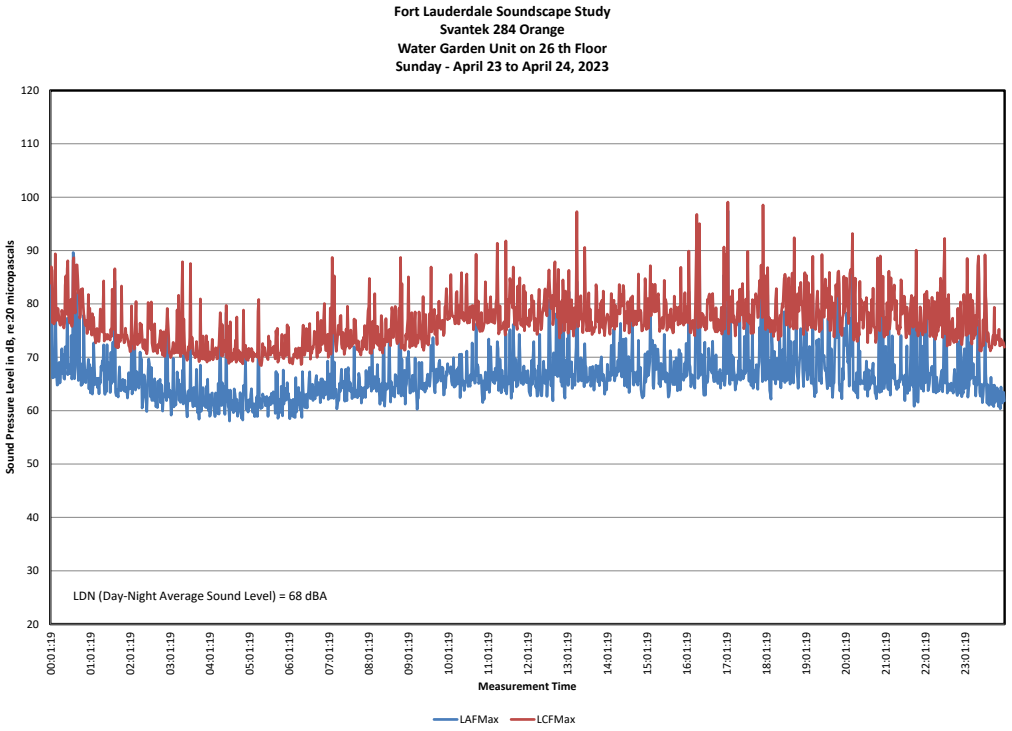

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Coral Villas - Truth Lounge
Saturday - April 22 to April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 63 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

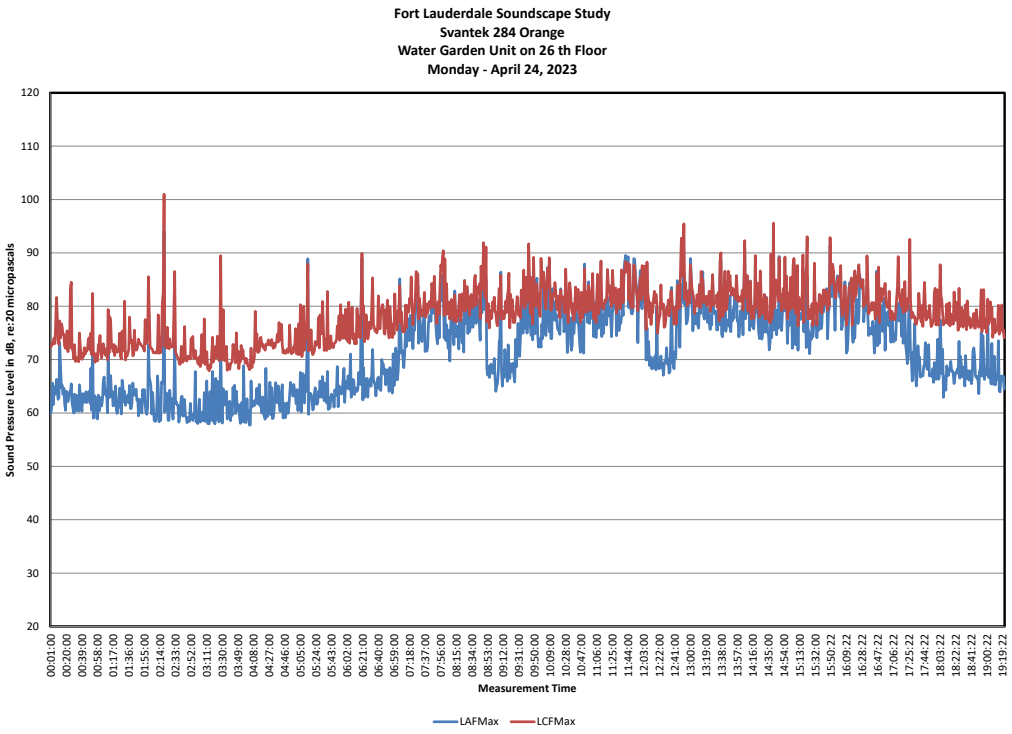

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Coral Villas - Truth Lounge
Sunday - April 23 to April 24, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 65 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

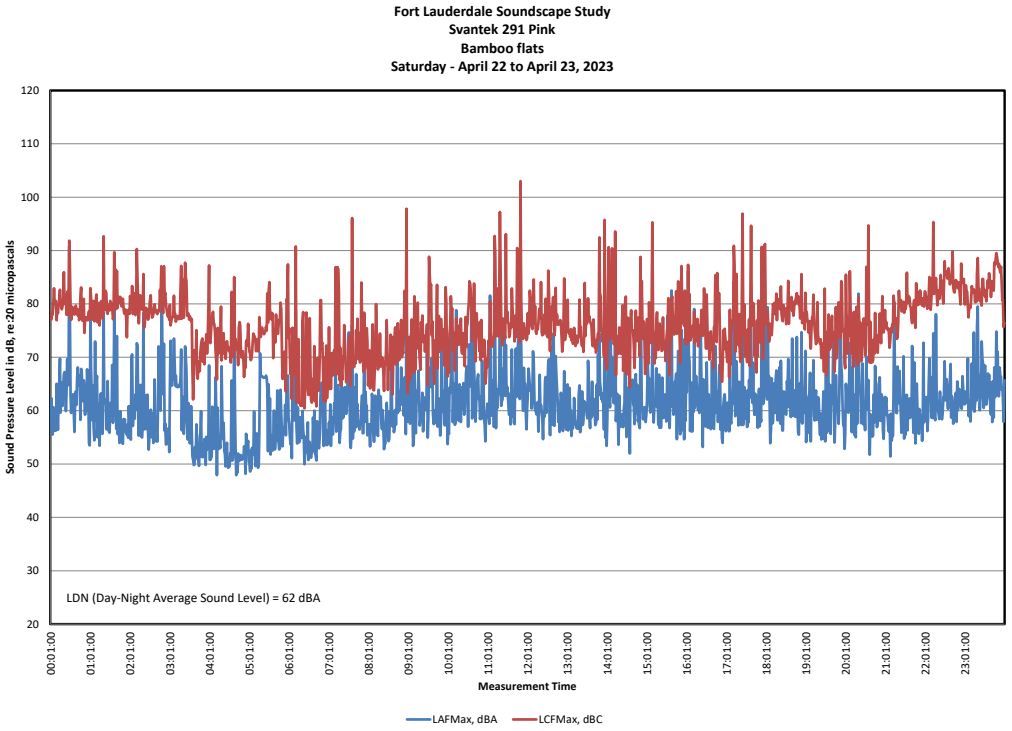

Fort Lauderdale Soundscape Study
Svantek 203 Blue
Coral Villas - Truth Lounge
Monday - April 24 to April 25, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 65 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

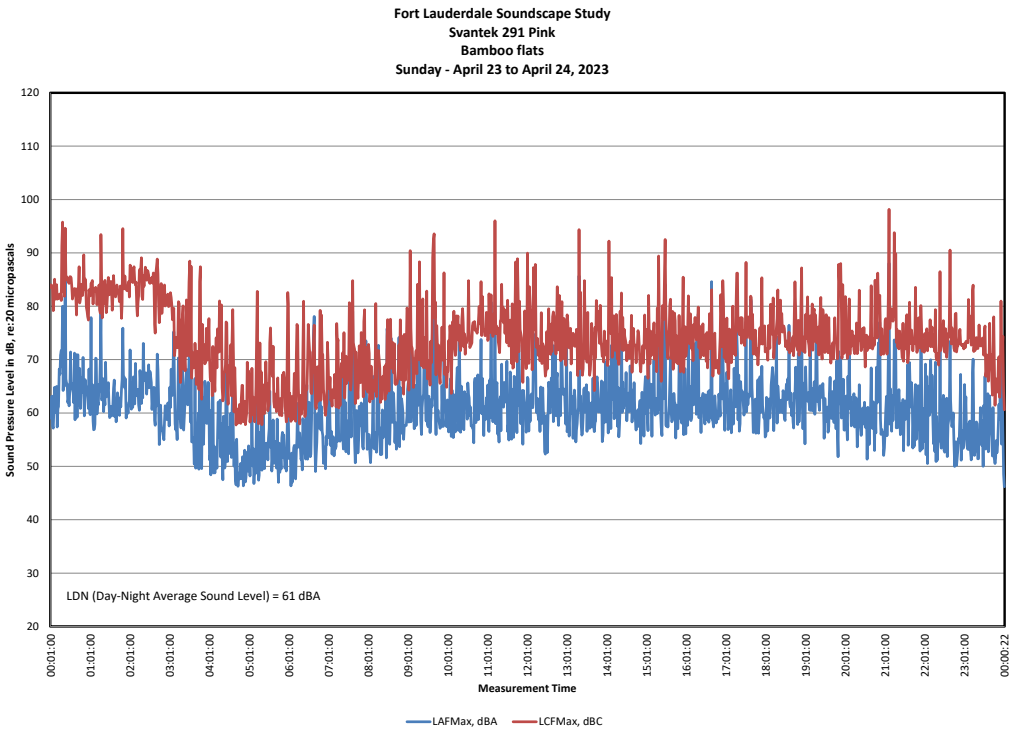

Fort Lauderdale Soundscape Study
Svantek 284 Orange
Water Garden Unit on 26 th Floor
Friday - April 21, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFMax
LCFMax

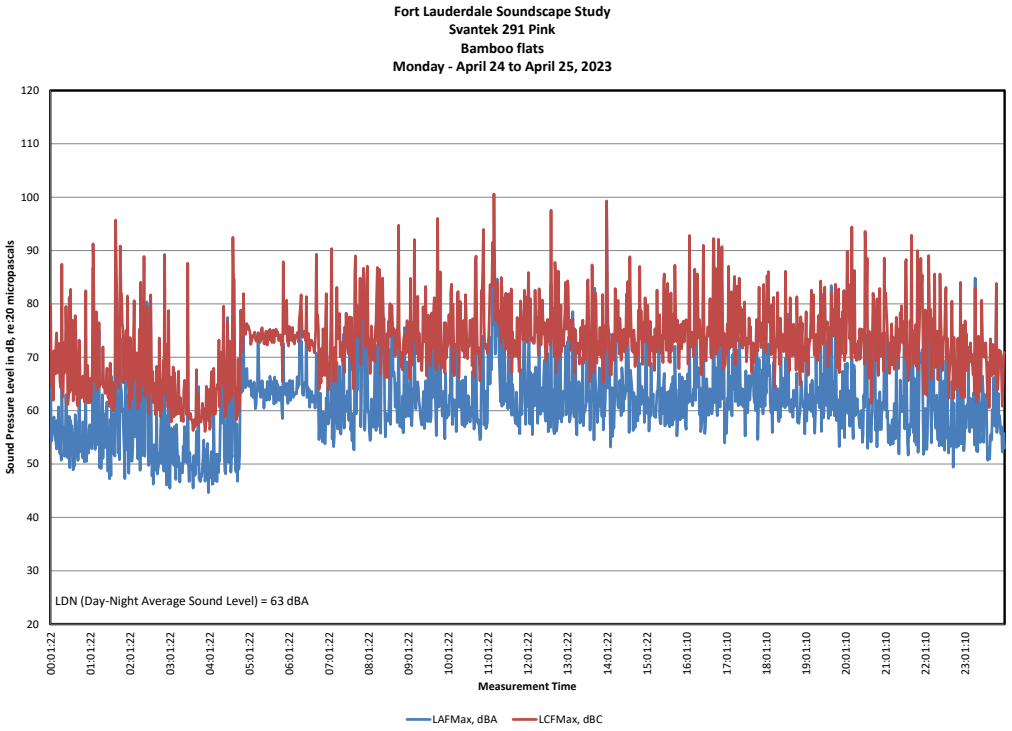

Fort Lauderdale Soundscape Study
Svantek 284 Orange
Water Garden Unit on 26 th Floor
Saturday - April 22 to April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 70 dBA
Measurement Time
LAFMax
LCFMax

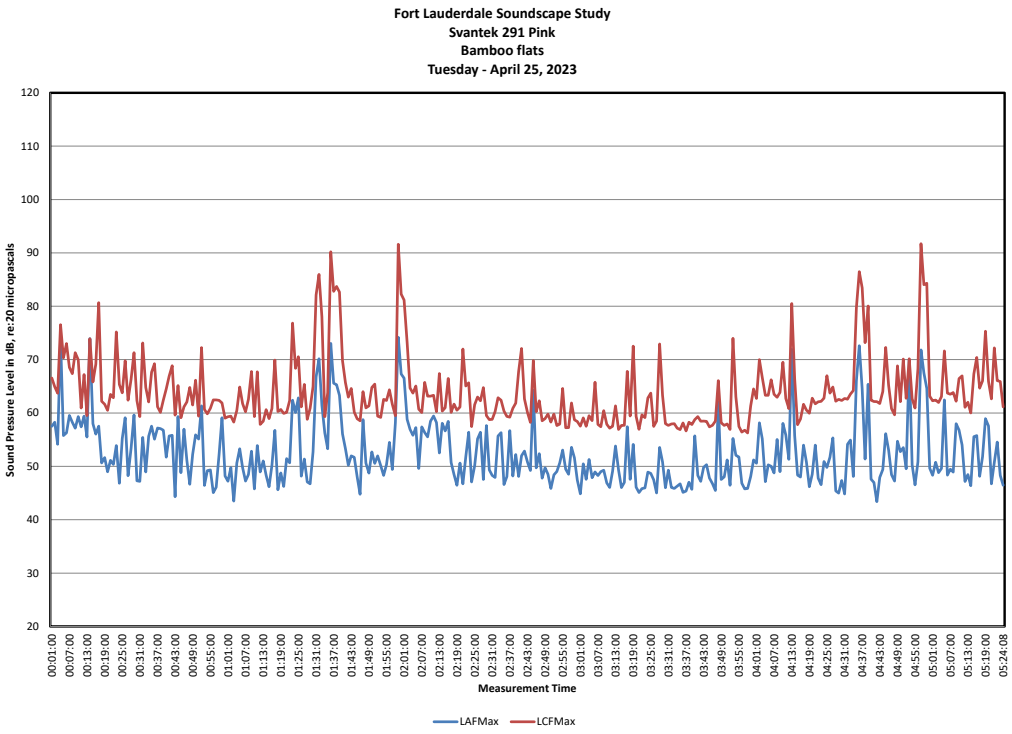

Fort Lauderdale Soundscape Study
Svantek 284 Orange
Water Garden Unit on 26 th Floor
Sunday - April 23 to April 24, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 68 dBA
Measurement Time
LAFMax
LCFMax

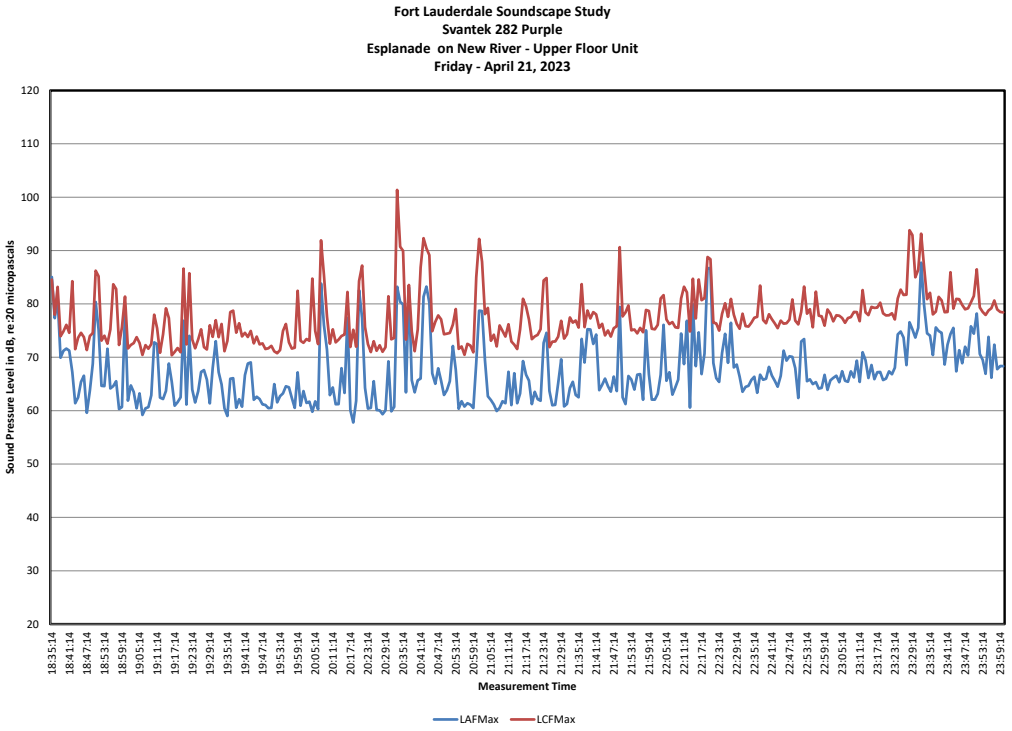

Fort Lauderdale Soundscape Study
Svantek 284 Orange
Water Garden Unit on 26 th Floor
Monday - April 24, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFMax
LCFMax

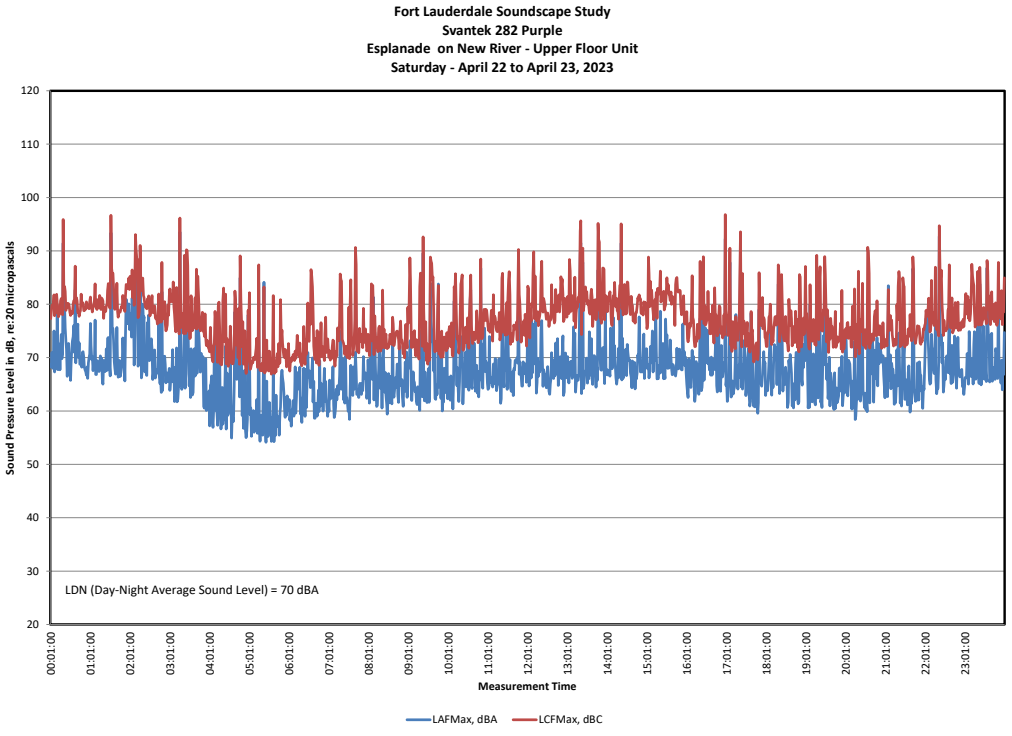

Fort Lauderdale Soundscape Study
Svantek 291 Pink
Bamboo flats
Saturday - April 22 to April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 62 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

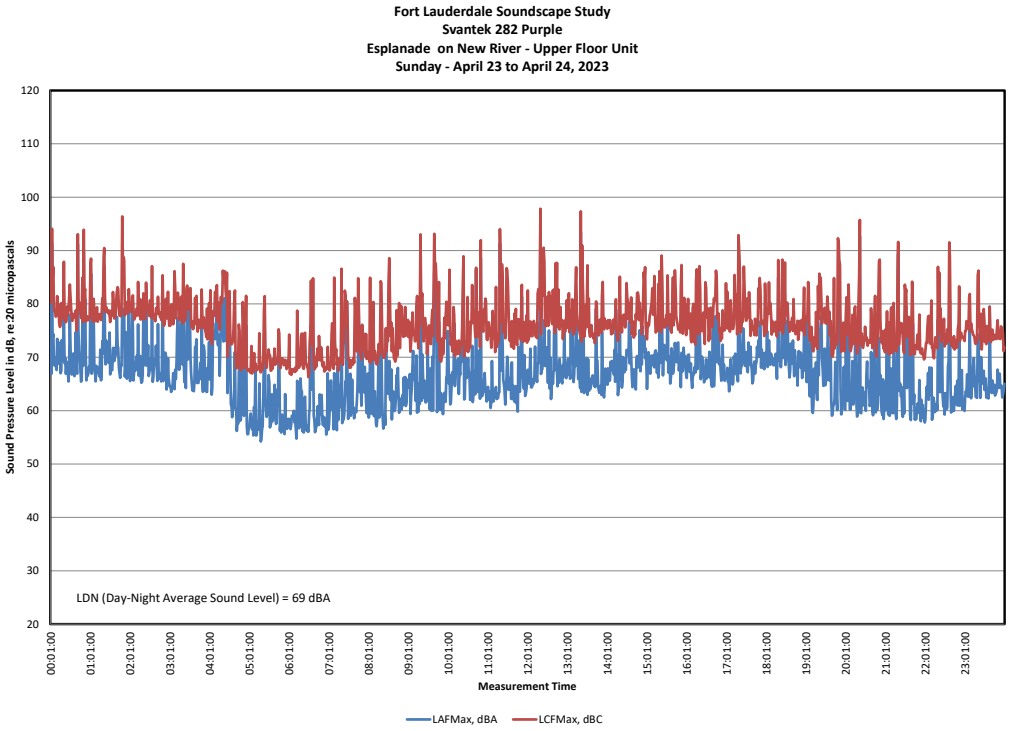

Fort Lauderdale Soundscape Study
Svantek 291 Pink
Bamboo flats
Sunday - April 23 to April 24, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 61 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

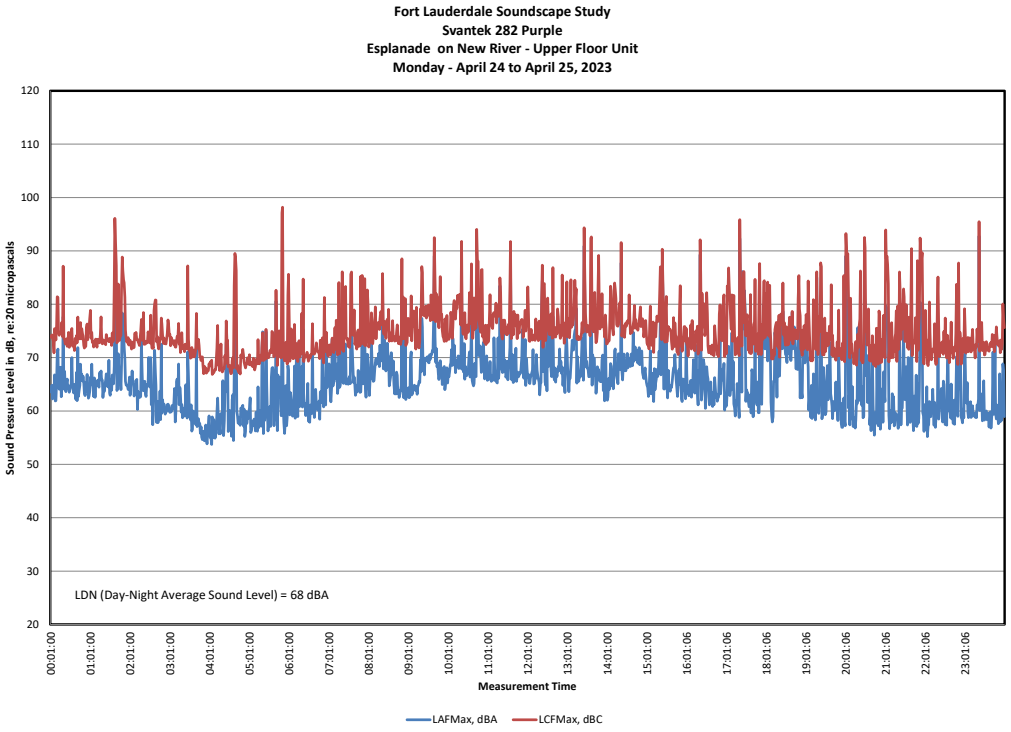

Fort Lauderdale Soundscape Study
Svantek 291 Pink
Bamboo flats
Monday - April 24 to April 25, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 63 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

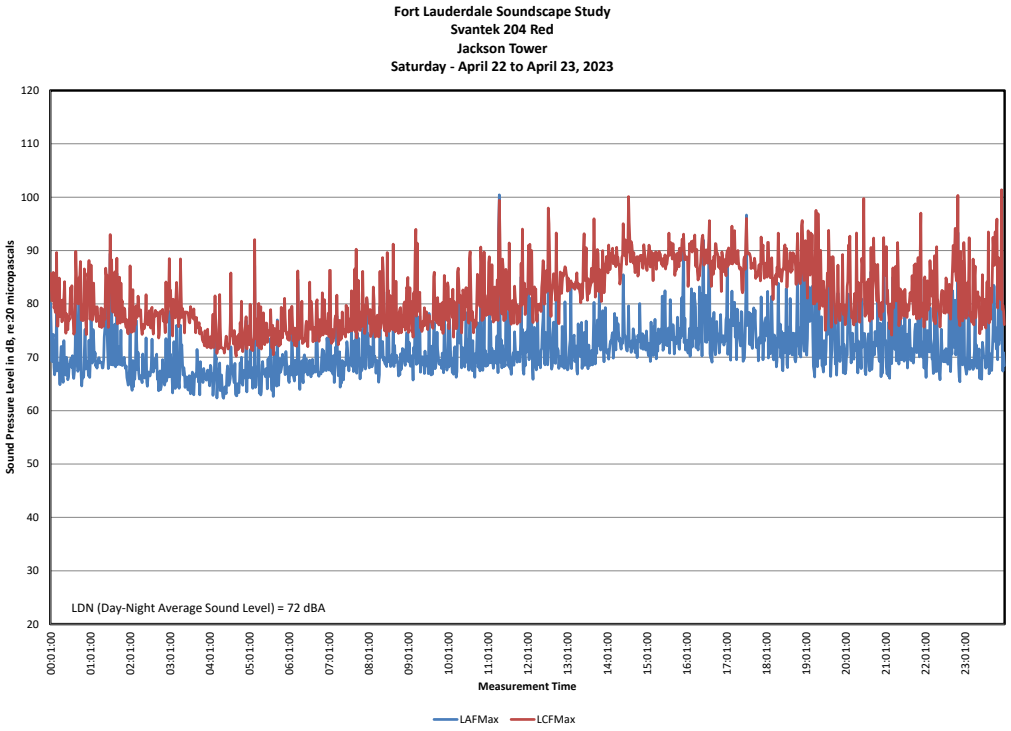

Fort Lauderdale Soundscape Study
Svantek 291 Pink
Bamboo flats
Tuesday - April 25, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFMax
LCFMax

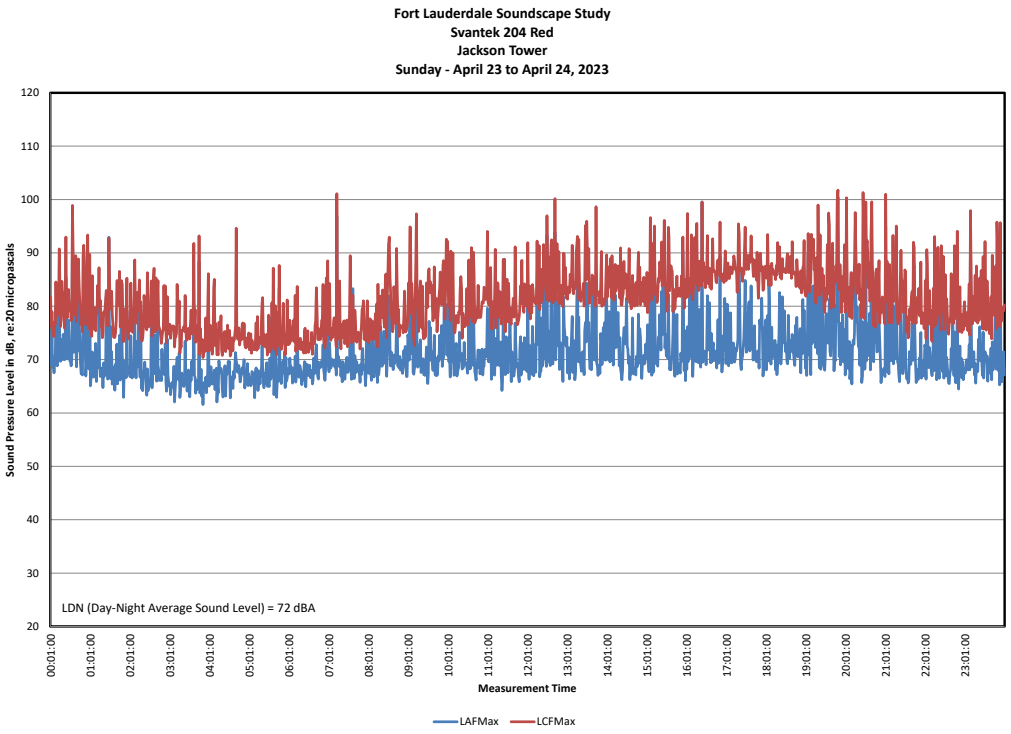

Fort Lauderdale Soundscape Study
Svantek 282 Purple
Esplanade on New River - Upper Floor Unit
Friday - April 21, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFMax
LCFMax

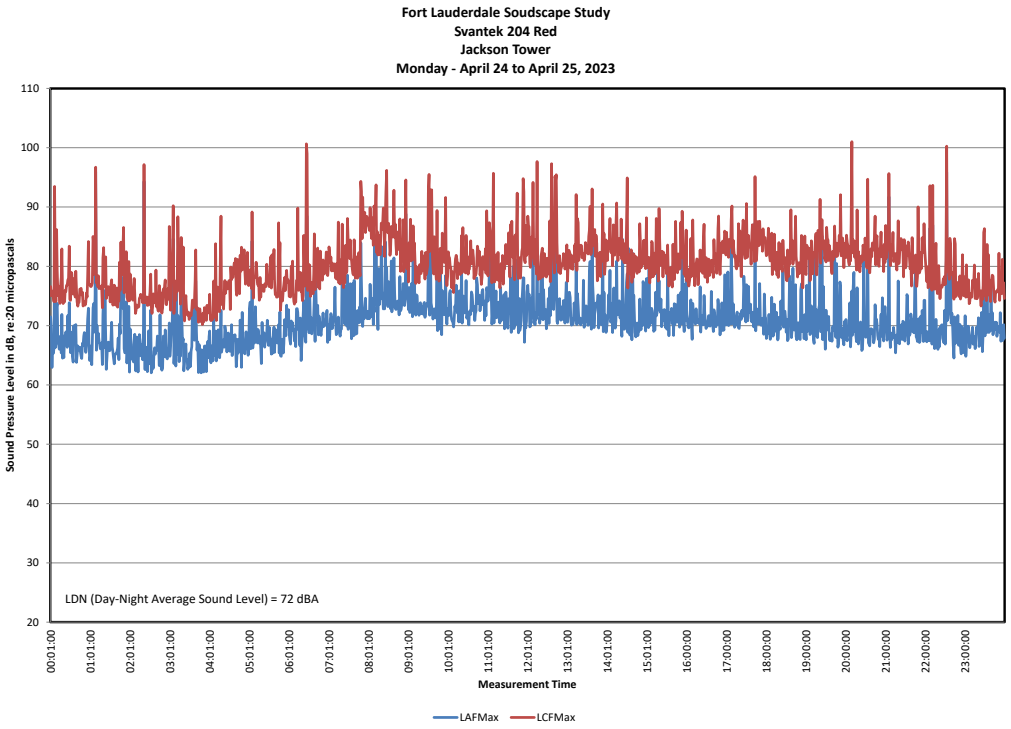

Fort Lauderdale Soundscape Study
Svantek 282 Purple
Esplanade on New River - Upper Floor Unit
Saturday - April 22 to April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 70 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

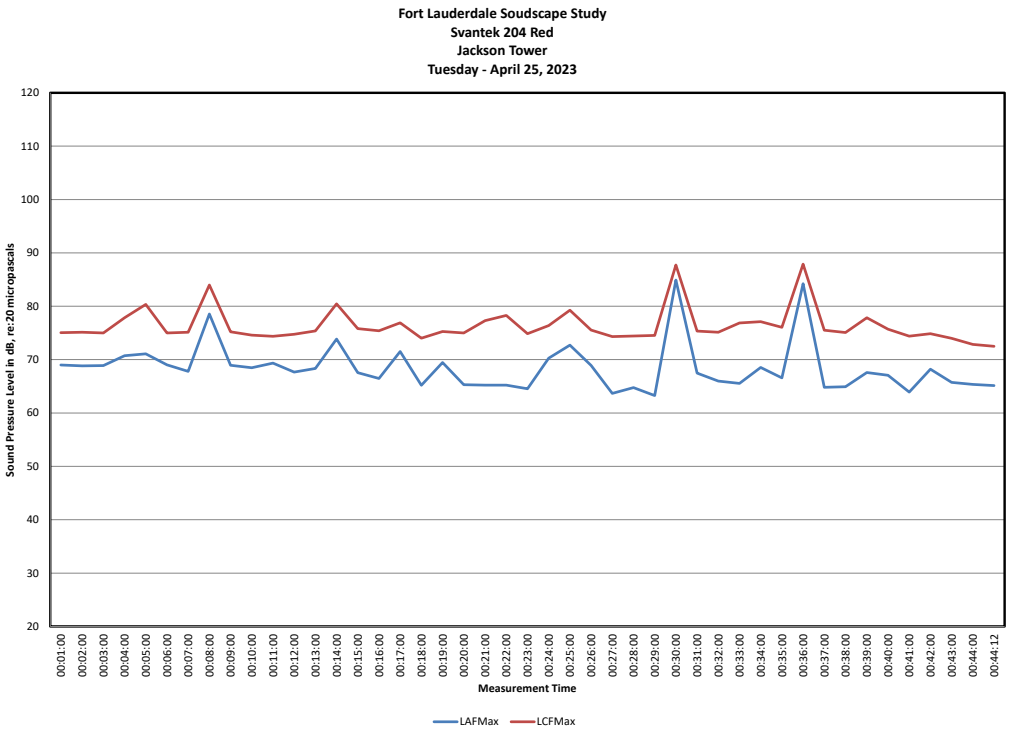

Fort Lauderdale Soundscape Study
Svantek 282 Purple
Esplanade on New River - Upper Floor Unit
Sunday - April 23 to April 24, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 69 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC


Fort Lauderdale Soundscape Study
Svantek 282 Purple
Esplanade on New River - Upper Floor Unit
Monday - April 24 to April 25, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 68 dBA
Measurement Time
LAFMax, dBA
LCFMax, dBC

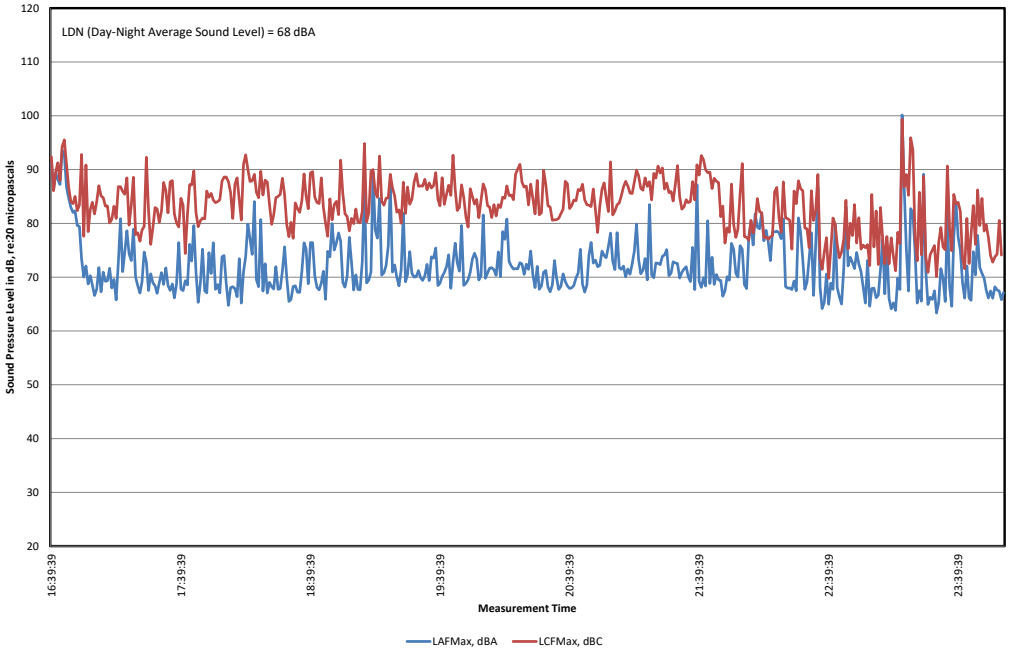

Fort Lauderdale Soundscape Study
Svantek 204 Red
Jackson Tower
Saturday - April 22 to April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 72 dBA
Measurement Time
LAFMax
LCFMax


Fort Lauderdale Soundscape Study
Svantek 204 Red
Jackson Tower
Sunday - April 23 to April 24, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 72 dBA
Measurement Time
LAFMax
LCFMax

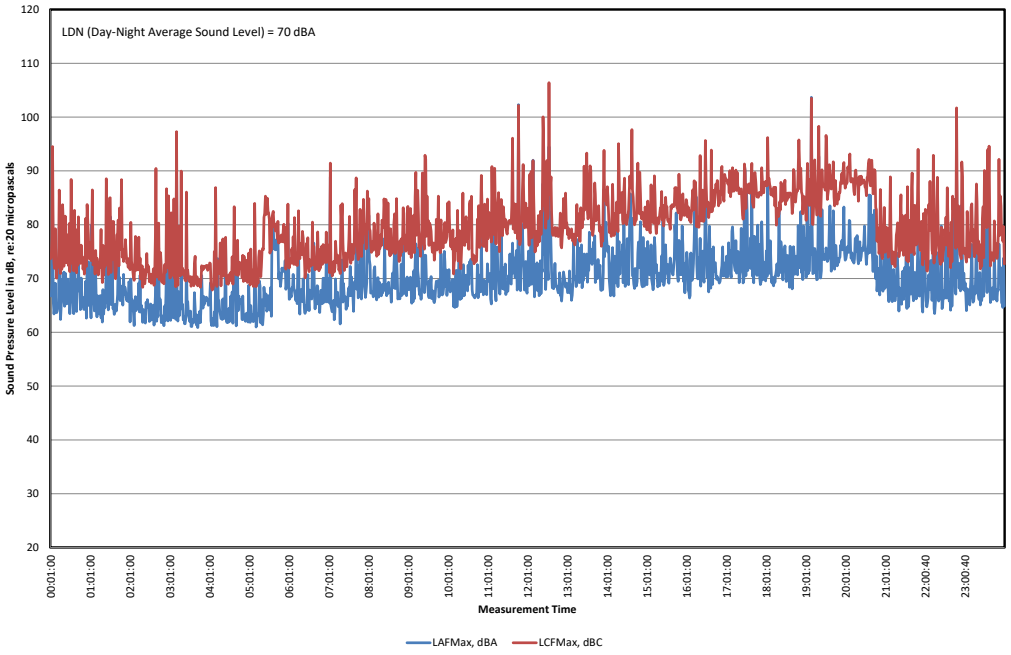

Fort Lauderdale Soudscape Study
Svantek 204 Red
Jackson Tower
Monday - April 24 to April 25, 2023
Sound Pressure Level in dB, re:20 micropascals
LDN (Day-Night Average Sound Level) = 72 dBA
Measurement Time
LAFMax
LCFMax

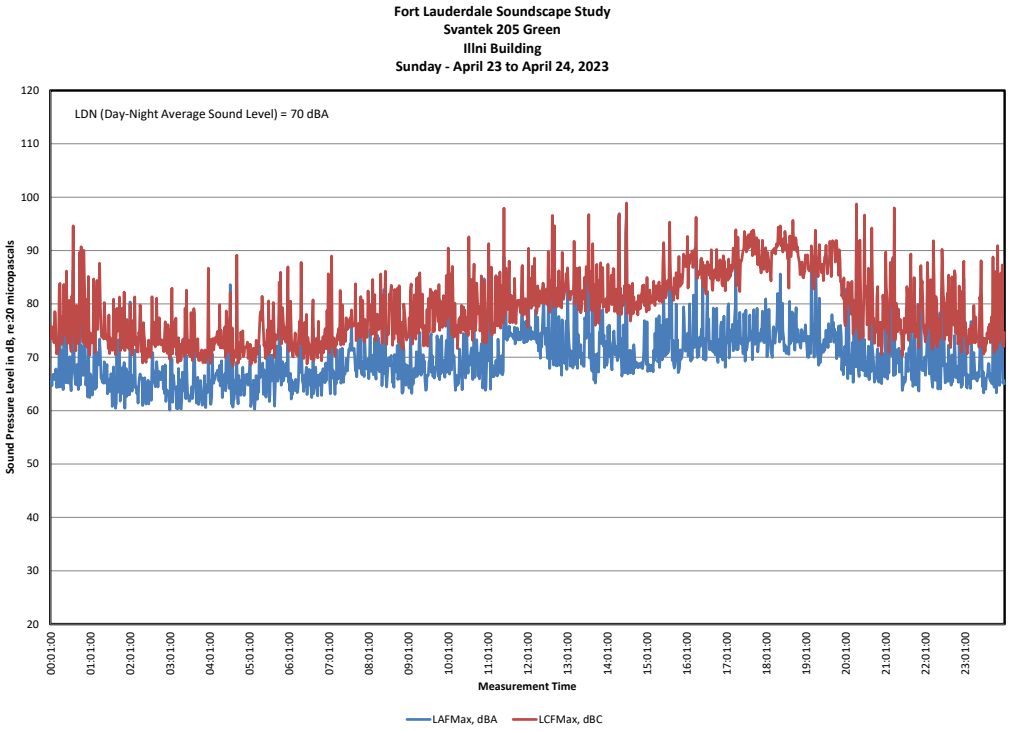

Fort Lauderdale Soudscape Study
Svantek 204 Red
Jackson Tower
Tuesday - April 25, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFMax
LCFMax

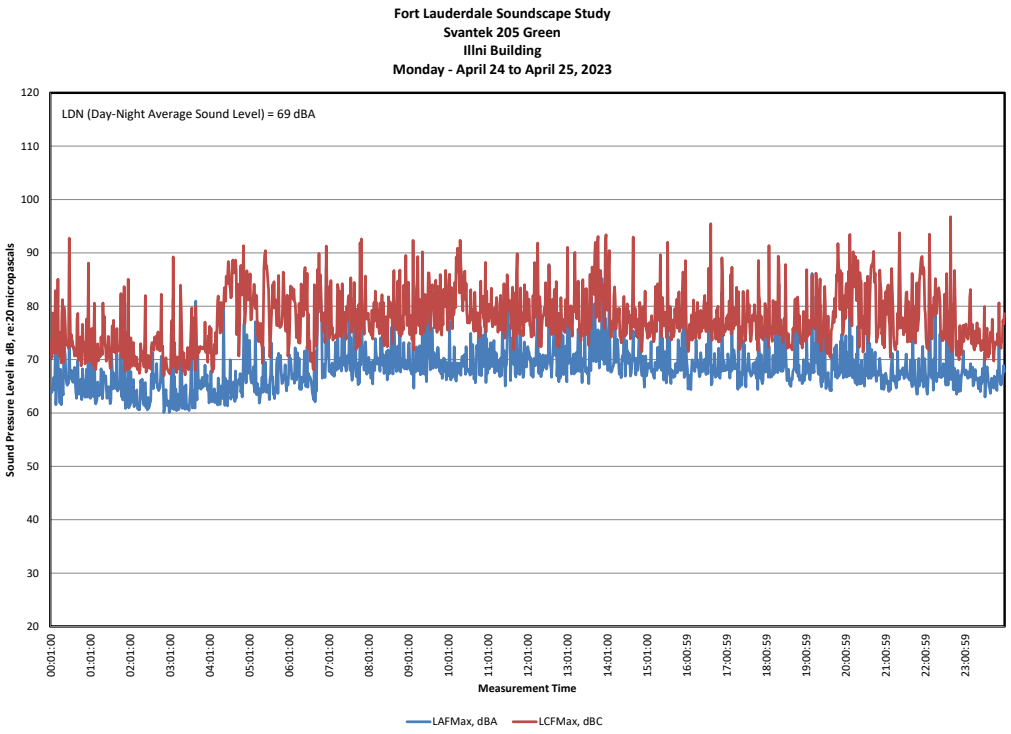
Fort Lauderdale Soundscape Study
Svantek 205 Green L182
Illni Building
Friday - April 21 to April 22, 2023



Fort Lauderdale Soundscape Study
Svantek 205 Green L184
Illni Building
Saturday - April 22 to April 23, 2023




Fort Lauderdale Soundscape Study
Svantek 205 Green
Illni Building
Sunday - April 23 to April 24, 2023
LDN (Day-Night Average Sound Level) = 70 dBA
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFMax, dBA
LCFMax, dBC


Fort Lauderdale Soundscape Study
Svantek 205 Green
Illni Building
Monday - April 24 to April 25, 2023
LDN (Day-Night Average Sound Level) = 69 dBA
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFMax, dBA
LCFMax, dBC

APPENDIX B-1:
SUMMARY TABLE
DAY AND NIGHT SOUND LEVEL RANGES
TRIP 1

TRIP 1: FEBRUARY 16 - 21, 2023

Meter	Date	LDN, dBA	Night Time Sound Level Range Early Morning	Day Time Sound Level Range 1	Day Time Sound Level Range 2	Night Time Sound Level Range Late Nights
Riverwalk Near The Wharf						
Rion 7	16-Feb-23	-	-	*6 pm - 10:22 pm*	-	-
			-	66 - 83 dBA	-	-
Rion 7	17-Feb-23	76	*12 am - 6 am*	*7 am - 4 pm*	-	*7 pm - 12 am*
			53 - 81 dBA	60 - 81 dBA	-	69 - 80 dBA
Rion 7	18-Feb-23	77	*12 am - 1:30 am*	*3 am - 11 am*	*2 pm - 7 pm*	*7 pm - 12 am*
			70 - 80 dBA	53 - 78 dBA	68 - 81 dBA	69 - 81 dBA
Rion 7	19-Feb-23	74	*12 am - 1:30 am*	*2 am - 8 am*	*1 pm - 10 pm*	-
			69 - 82 dBA	52 - 81 dBA	62.9 - 76 dBA	-
Rion 7	20-Feb-23	71	*12 am - 5:30 am*	*6:30 am - 10 pm*	-	*10 pm - 12 am*
			54 - 82 dBA	53 - 80 dBA	-	53 - 73 dBA
Rion 7	21-Feb-23	79	*12 am - 4:30 am*	*7:30 am - 7 pm*	-	*10:30 pm - 12 am*
			52- 81 dBA	53 - 82 dBA	-	55 - 87 dBA
Rion 7	22-Feb-23	78	*12 am - 4 am*	*7:30 am - 10 pm*	-	*10 pm - 12 am*
			54 - 87 dBA	56 - 82 dBA	-	55 - 79 dBA
Rion 7	23-Feb-23	73	*12 am - 5 am*	*7 am - 10 pm*	-	*11:30 pm - 12 am*
			53 - 83 dBA	60 - 80 dBA	-	56 - 81 dBA
Rion 7	24-Feb-23	-	*12 am - 5 am*	*7 am - 6 pm*	-	*6 pm - 12 am*
			53 - 81 dBA	60 - 80 dBA	-	68 - 84 dBA
Esplanade Park Between Rest Room and Stage						
Rion 8	16-Feb-23	-	-	-	-	*6:09 pm - 12 am*
			-	-	-	48 - 66 dBA
Rion 8	17-Feb-23	64	*12 am - 5:30 am*	*7 am - 3 pm*	-	*5:30 pm - 12 am*
			47 - 69 dBA	54 - 82 dBA	-	51 - 76 dBA
Rion 8	18-Feb-23	65	*12 am - 8 am*	*11 am - 3 pm*	-	*4:30 pm - 12 am*
			47 - 71 dBA	58 - 78 dBA	-	52 - 72 dBA
Rion 8	19-Feb-23	62	*12 am - 4 am*	*8:30 am - 7:30 pm*	-	*9 pm - 12 am*
			49 - 74 dBA	51 - 72 dBA	-	48 - 68 dBA
Rion 8	20-Feb-23	61	*12 am - 5 am*	*6 am - 10 pm*	-	*10 pm - 12 am*
			45 - 77 dBA	49 - 65 dBA	-	47 - 73 dBA
Rion 8	21-Feb-23	63	*12 am - 4 am*	*5:30 am - 11 pm*	-	*11 pm - 12 am*
			44.6 - 64 dBA	48 - 82 dBA	-	49 - 67 dBA
Rion 8	22-Feb-23	66	*12 am - 4 am*	*6 am - 10 pm*	-	*10 pm - 12 am*
			46.5 - 67.3 dBA	50.1 - 80.8 dBA	-	48 - 76 dBA
Rion 8	23-Feb-23	64	*12 am - 4 am*	*6 am - 3 pm*	-	*6 pm - 12 am*
			46 - 74 dBA	53 - 80 dBA	-	49 - 69 dBA
Rion 8	24-Feb-23	66	*12 am - 2 am*	*6 am - 12 am*	-	-
			48 - 68 dBA	50 - 82 dBA	-	-
Rion 8	25-Feb-23	-	*12 am - 9 am*	-	-	-

Meter	Date	LDN, dBA	Night Time Sound Level Range Early Morning	Day Time Sound Level Range 1	Day Time Sound Level Range 2	Night Time Sound Level Range Late Nights
			47 - 75 dBA	-	-	-
Bamboo Flats on Street						
Svantek 203	16-Feb-23	-	-	-	-	*6:30 pm - 12 am*
			-	-	-	50 - 89 dBA
Svantek 203	17-Feb-23	62	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			47 dBA - 77 dBA	51 - 104 dBA	-	56 - 83 dBA
Svantek 203	18-Feb-23	65	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			57 - 89 dBA	53 - 102 dBA	-	56 - 86 dBA
Svantek 203	19-Feb-23	64	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			54 - 90 dBA	49 - 94 dBA	-	52 - 83 dBA
Svantek 203	20-Feb-23	64	*12 am - 3 am*	*7 am - 12 am*	-	*10 pm - 12 am*
			51 - 89 dBA	51 - 98 dBA	-	51 - 86 dBA
Svantek 203	21-Feb-23	63	*12 am - 3 am*	*7 am - 9 pm*	-	*10 pm - 12 am*
			45 - 92 dBA	52 - 96 dBA	-	49 - 91 dBA
Svantek 203	22-Feb-23	63	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			45 - 80 dBA	50 - 99 dBA	-	51 - 81 dBA
Svantek 203	23-Feb-23	64	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			46 - 92 dBA	49 - 95 dBA	-	56 - 95 dBA
Svantek 203	24-Feb-23	64	*12 am - 3 am*	*6:30 am - 9 pm*	-	*10 pm - 12 am*
			55 - 87 dBA	52 - 99 dBA	-	56 - 84 dBA
Svantek 203	25-Feb-23	72	*12 am - 3 am*	*8 am - 6 pm*	-	*6 pm - 12 am*
			55 - 113 dBA	51 - 100 dBA	-	59 - 92 dBA
Median in A1A South on the Beach						
Svantek 204	17-Feb-23	72	*12 am - 5 am*	*7 am - 2 pm*	*2 pm - 6 pm*	*6 pm - 12 am*
			56 - 93 dBA	67 - 103 dBA	68 - 88 dBA	66 - 102 dBA
Svantek 204	18-Feb-23	76	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			57 - 85 dBA	67 - 105 dBA	-	68 - 105 dBA
Svantek 204	19-Feb-23	73	*12 am - 3 am*	*3 am - 3 pm*	*3 pm - 9 pm*	*10 pm - 12 am*
			61 - 99 dBA	59 - 100 dBA	68 - 75 dBA	63 - 100 dBA
Svantek 204	20-Feb-23	71	*12 am - 2 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			62 - 89 dBA	67 - 105 dBA	-	68 - 105 dBA
Svantek 204	21-Feb-23	72	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			47 - 88 dBA	66 - 104 dBA	-	64 - 110 dBA
Svantek 204	22-Feb-23	70	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			49 - 93 dBA	66 - 106 dBA	-	64 - 92 dBA
Svantek 204	23-Feb-23	70	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			52 - 88 dBA	66 - 102 dBA	-	67 - 94 dBA
Svantek 204	24-Feb-23	74	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			50 - 90 dBA	66 - 106 dBA	-	67- 110 dBA
Svantek 204	25-Feb-23	73	*12 am - 3 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			58 - 95 dBA	65 - 106 dBA	-	67 - 103 dBA

Meter	Date	LDN, dBA	Night Time Sound Level Range Early Morning	Day Time Sound Level Range 1	Day Time Sound Level Range 2	Night Time Sound Level Range Late Nights
Median in A1A North on the Beach						
Svantek 205	17-Feb-23	73	*12 am - 3 am*	*6:30 am - 4 pm*	-	*6 pm - 12 am*
			55 - 94 dBA	64 - 71 dBA	-	66 - 101 dBA
Svantek 205	18-Feb-23	74	*12 am - 3 am*	*7 am - 4 am*	-	*6 pm - 12 am*
			55 - 64 dBA	64 - 99 dBA	-	62 - 109 dBA
Svantek 205	19-Feb-23	73	*12 am - 3 am*	*4 am - 1 pm*	-	*2 pm - 12 am*
			59 - 89 dBA	59 - 90 dBA	-	64 - 105 dBA
Svantek 205	20-Feb-23	73	*12 am - 3 am*	*7 am - 12 pm*	*12 pm - 6 pm*	*6 pm - 12 am*
			51 - 98 dBA	62 - 111 dBA	62 - 107 dBA	59 - 106 dBA

APPENDIX B-2:
SUMMARY TABLE DAY AND NIGHT SOUND LEVEL RANGES
ACOUSTICAL DATA
TRIP 2

TRIP 2: April 21 - 25, 2023

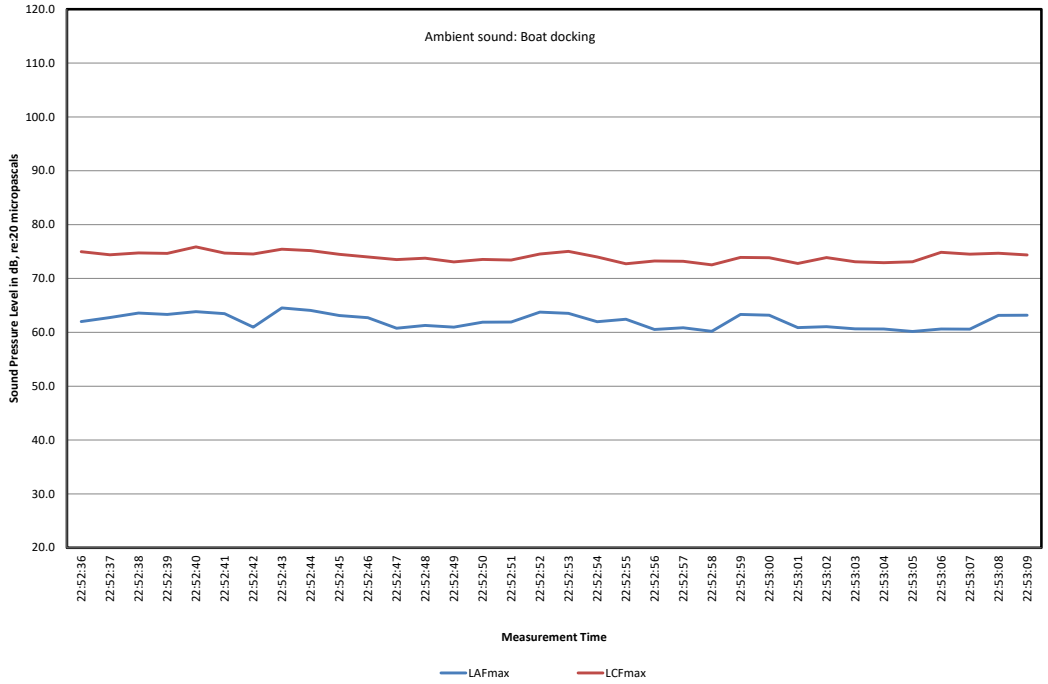
Meter	Date	LDN, dBA	Night Time Sound Level Range Early Morning 12 am - 4 am	Day Time Sound Level Range 1	Day Time Sound Level Range 2	Night Time Sound Level Range Late Nights
Parking Lot Across from Smitty's Wings						
Rion 4	21-Apr-23	-	*7:30 pm - 12 am*	-	-	-
			61 - 82 dBA	-	-	-
Rion 4	22-Apr-23	71	*12 am - 1 am*	*7 am - 9 pm*	-	*9 pm - 12 am*
			57 - 77 dBA	56 - 88 dBA	-	57 - 74 dBA
Rion 4	23-Apr-23	71	*12 am - 4 am*	*8 am - 5 pm*	*5 pm - 9 pm*	*9 pm- 12 am*
			45 - 73 dBA	58 - 78 dBA	60 - 88 dBA	53 - 79 dBA
Rion 4	24-Apr-23	69	*12 am - 3 am*	*7 am - 8 pm*	-	*10 pm - 12 am*
			43 - 76 dBA	54 - 86 dBA	-	47 - 88 dBA
Rion 4	25-Apr-23	-	*12 am - 5 am*	*7 am - 9 am*	-	-
			42 - 65 dBA	60 - 77 dBA	-	-
Colee Hammock near The Balcony and Service Alley						
Rion 7	21-Apr-23		-	-	-	*8:48 pm - 12 am*
			-	-	-	58 - 72 dBA
Rion 7	22-Apr-23	65	*12 am - 3 am*	*9 am - 10 pm*	-	*10 pm - 12 am*
			53 - 77 dBA	57 - 73 dBA	-	59 - 68 dBA
Rion 7	23-Apr-23	65	*12 am - 3 am*	*9 am - 10 pm*	-	*10 pm - 12 am*
			52 - 73 dBA	57 - 74 dBA	-	58 - 68 dBA
Rion 7	24-Apr-23	64	*12 am - 5 am*	*7 am - 8 pm*	-	*8 pm - 12 am*
			47 - 91 dBA	52 - 100 dBA	-	51 -79 dBA
Coral Villas near Truth Lounge						
Svantek 203	21-Apr-23	-	-	-	-	*8 pm - 12 am*
			-	-	-	56 - 90 dBA
Svantek 203	22-Apr-23	63	*12 am - 2 am*	*6 am - 7:30 am*	-	*7:30 pm - 12 am*
			52 - 81 dBA	52 - 81 dBA	-	51 - 80 dBA
Svantek 203	23-Apr-23	65	*12 am - 7 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			47 - 85 dBA	50 - 116 dBA	-	49 - 93 dBA
Svantek 203	24-Apr-23	65	*12 am - 5 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			47 - 91 dBA	52 - 100 dBA	-	51 - 79 dBA

Meter	Date	LDN, dBA	Night Time Sound Level Range Early Morning 12 am - 4 am	Day Time Sound Level Range 1	Day Time Sound Level Range 2	Night Time Sound Level Range Late Nights
Water Garden Upper from Living Unit						
Svantek 284	21-Apr-23	-	-	-	-	*6:20 pm - 12 am*
			-	-	-	64 - 96 dBA
Svantek 284	22-Apr-23	70	*12 am - 3 am*	*3 am - 7 am*	*7 am - 10 pm*	*10 pm - 12 am*
			59 - 98 dBA	58 - 74 dBA	62 - 100 dBA	65 - 95 dBA
Svantek 284	23-Apr-23	68	*12 am - 2:30 am*	*2:30 am - 7 am*	*7 am - 10 pm*	*10 pm - 12 am*
			60 - 90 dBA	58 - 78 dBA	60 - 97 dBA	60 - 79 dBA
Svantek 284	24-Apr-23	-	*12 am - 7 am*	*7 am - 7:20 pm*	-	-
			58 - 94 am	63 - 91 dBA	-	-
Bamboo Flats in Yard Closest to NE 8 th Street						
Svantek 291	22-Apr-23	62	*12 am - 5 am*	*5 am - 10 pm*	-	*10 pm - 12 am*
			48 - 91 dBA	49 - 91 dBA	-	56 - 80 dBA
Svantek 291	23-Apr-23	61	*12 am - 3:30 am*	*3:30 am - 7 am*	*7 am - 10 pm*	*10 pm - 12 am*
			54 - 89 dBA	46 - 78 dBA	51 - 88 dBA	50 - 88 dBA
Svantek 291	24-Apr-23	63	*12 am - 5 am*	*5 am - 9 pm*	-	*10 pm - 9 am*
			45 - 87 dBA	53 - 98 dBA	-	49 - 85 dBA
Svantek 291	25-Apr-23	-	*12 am - 5:24 am*	-	-	-
			43 - 74 dBA	-	-	-
Esplanade on New River Upper Floor Living Unit						
Svantek 282	21-Apr-23	-	-	-	-	*6:35 pm - 12 am*
			-	-	-	58 - 88 dBA
Svantek 282	22-Apr-23	70	*12 am - 3 am*	*3 am - 7 am*	*7 am - 10 pm*	*10 pm - 12 am*
			63 -93 dBA	54 - 94 dBA	58 - 92 dBA	63 - 93 dBA
Svantek 282	23-Apr-23	69	*12 am - 4 am*	*4 am - 7 am*	*7 am - 10 pm*	*10 pm - 12 am*
			64 - 91 dBA	54 - 82 dBA	56 - 96 dBA	58 - 81 dBA
Svantek 282	24-Apr-23	68	*12 am - 2 am*	*7 am - 10 pm*	-	*10 pm - 12 am*
			62 - 80 dBA	55 - 92 dBA	-	55 - 93 dBA
Jackson Tower 6th Floor Mezzanine						
Svantek 204	22-Apr-23	72	*12 am - 3 am*	*7 am - 2 pm*	*2 pm - 7 pm*	*7 pm - 12 am*
			64 - 90 dBA	64 - 100 dBA	67 - 97 dBA	65 - 93 dBA
Svantek 204	23-Apr-23	72	*12 am - 3 am*	*3 am - 7 am*	*7 am - 10 pm*	*10 pm - 12 am*
			63 - 94 dBA	62 - 88 dBA	64 - 100 dBA	65 - 94 dBA
Svantek 204	24-Apr-23	72	*12 am - 3 am*	*8 am - 10 pm*	-	*10 pm - 12 am*
			62 - 96 dBA	65 - 94 dBA	-	65 - 96 dBA
Svantek 204	25-Apr-23	-	*12 am - 12:44 am*	-	-	-
			63 - 85 dBA	-	-	-

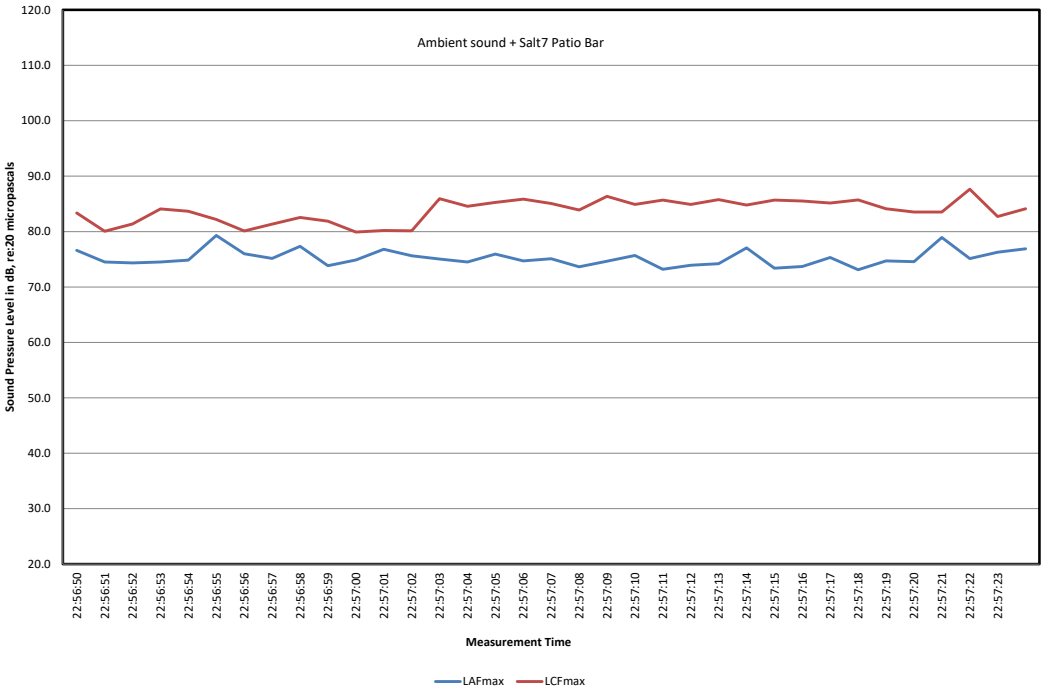
Meter	Date	LDN, dBA	Night Time Sound Level Range Early Morning 12 am - 4 am	Day Time Sound Level Range 1	Day Time Sound Level Range 2	Night Time Sound Level Range Late Nights
ILLNI Upper Floor Living Unit						
Svantek 205	21-Apr-23	-	-	-	-	*4:40 pm 12 am*
			-	-	-	63 - 100 dBA
Svantek 282	22-Apr-23	70	*12 am - 5:30 am*	*5:30 am - 8 pm*	-	*8 pm - 12 am*
			61 - 95 dBA	62 - 104 dBA	-	63 - 90 dBA
Svantek 282	23-Apr-23	70	*12 am - 7 am*	*7 am - 8 pm*	-	*8 pm - 12 am*
			60 - 86 dBA	63 - 97 dBA	-	63 - 98 dBA
Svantek 282	24-Apr-23	69	*12 am - 7 am*	*7 am - 12 am*	-	-
			60 - 87 dBA	63 - 92 dBA	-	-

APPENDIX C-1:
GRAPHS OF SHORT TERM ACOUSTICAL MEASUREMENTS

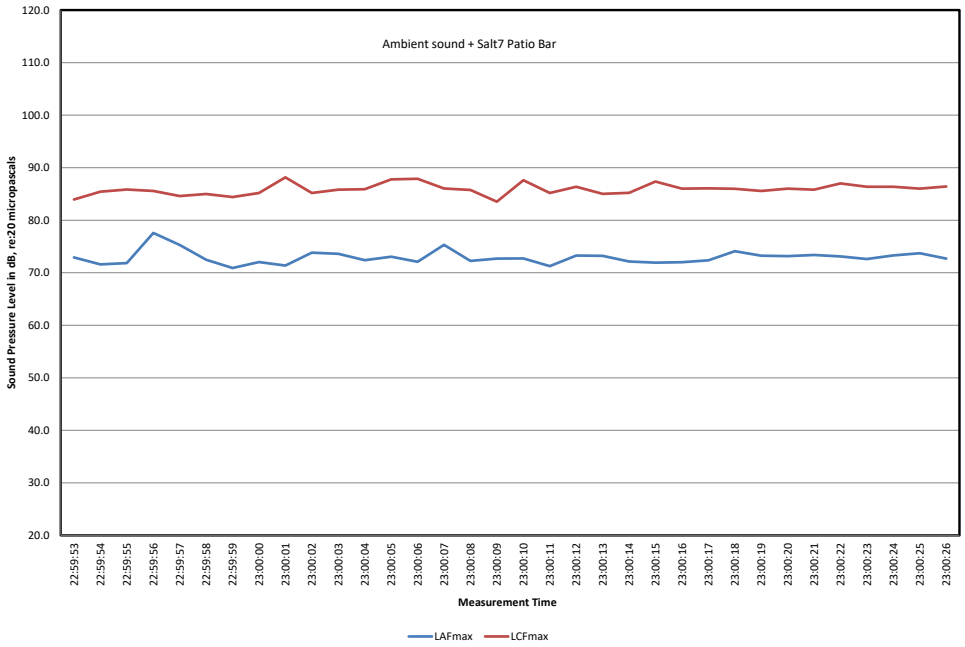
Fort Lauderdale Soundscape Study
Entry of the Riverside hotel
LD2.03
Thurday - February 16, 2023



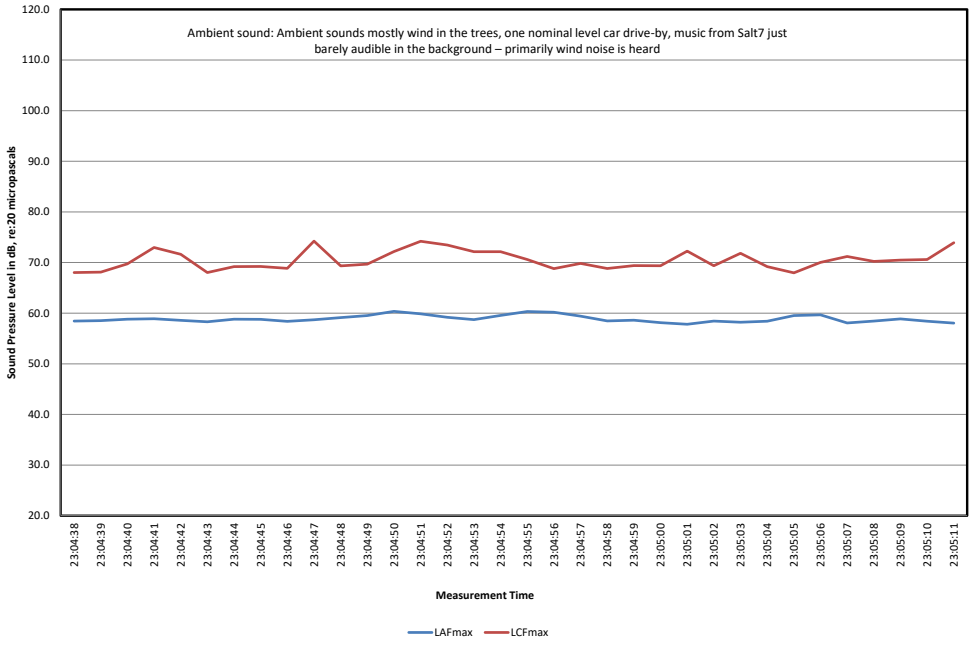
Fort Lauderdale Soundscape Study
Outside the Salt7 patio bar – east side
LD2.04
Thursday - February 16, 2023



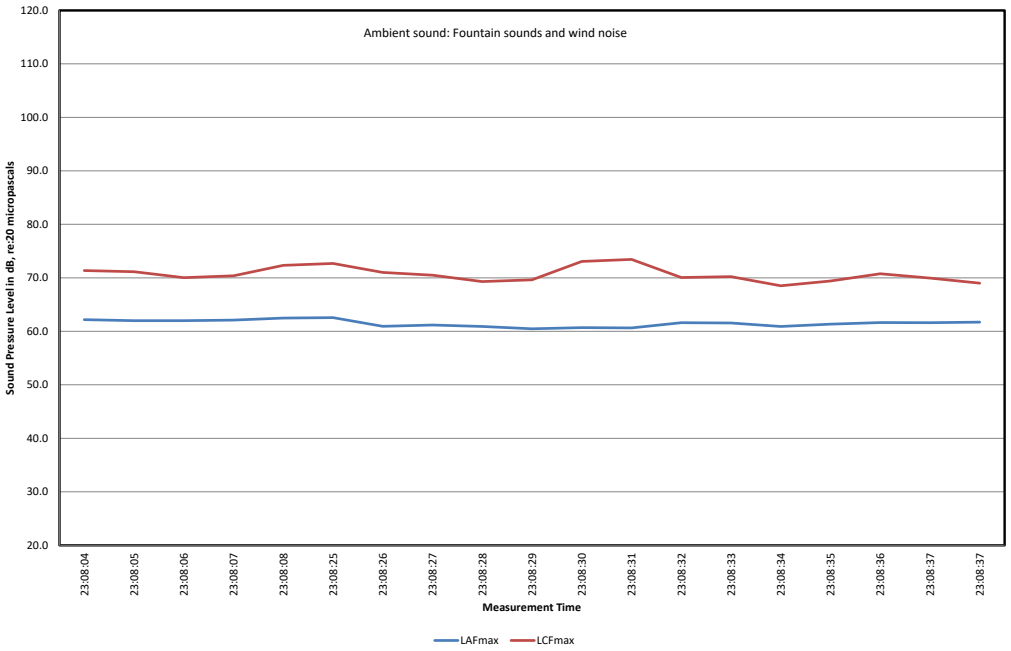
Fort Lauderdale Soundscape Study
Outside Salt7 near the street and the condominiums - west side of Salt7
LD2.05
Thursday - February 16, 2023



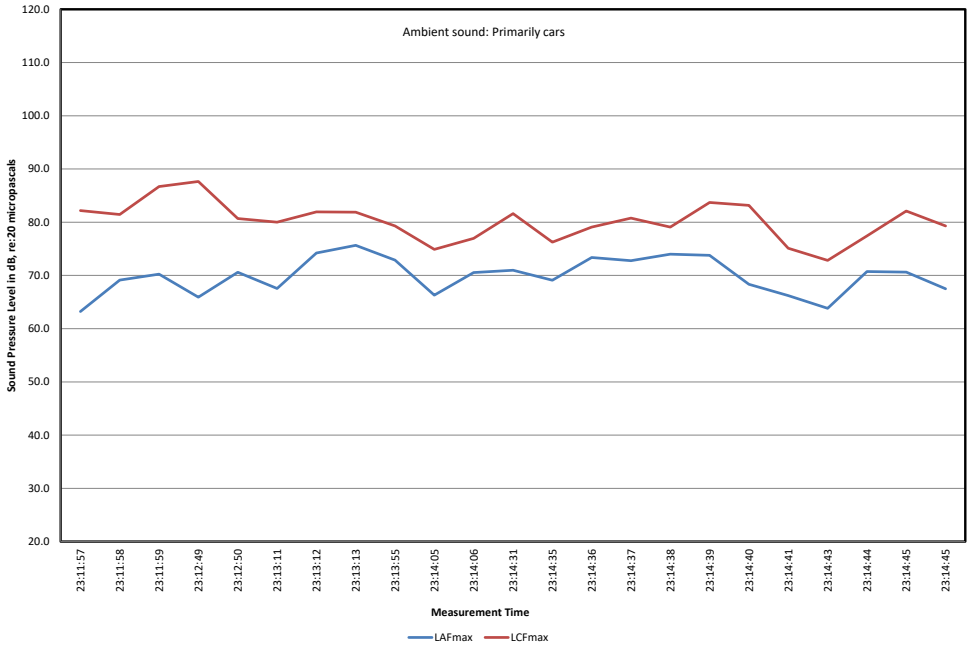
Fort Lauderdale Soundscape Study
Outside Salt 7
LD2.06
Thursday - February 16, 2023

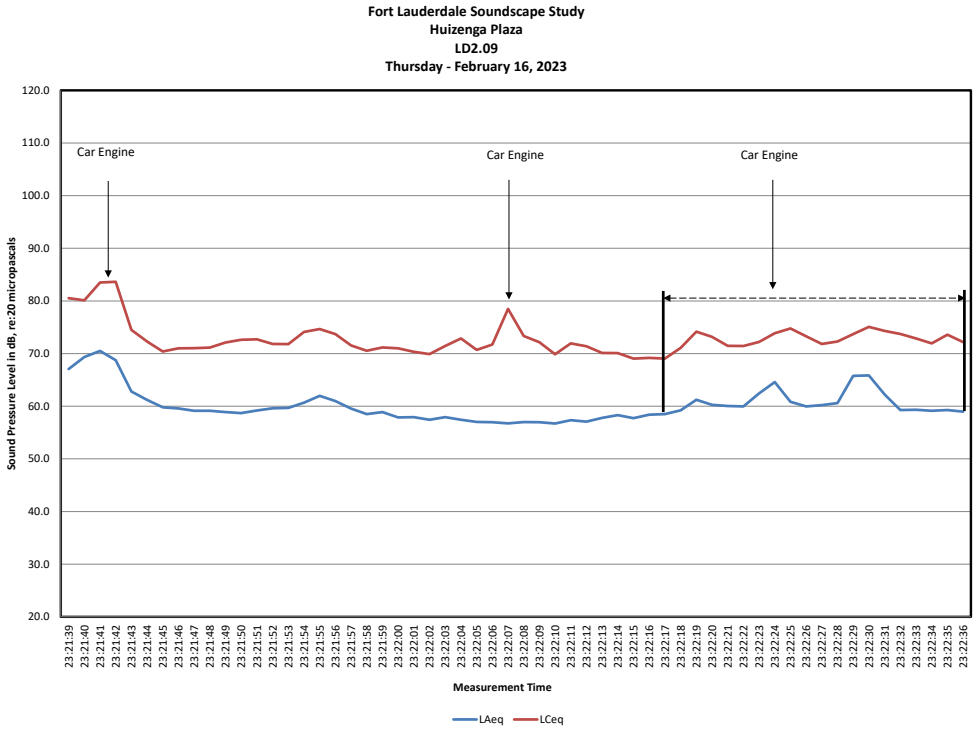


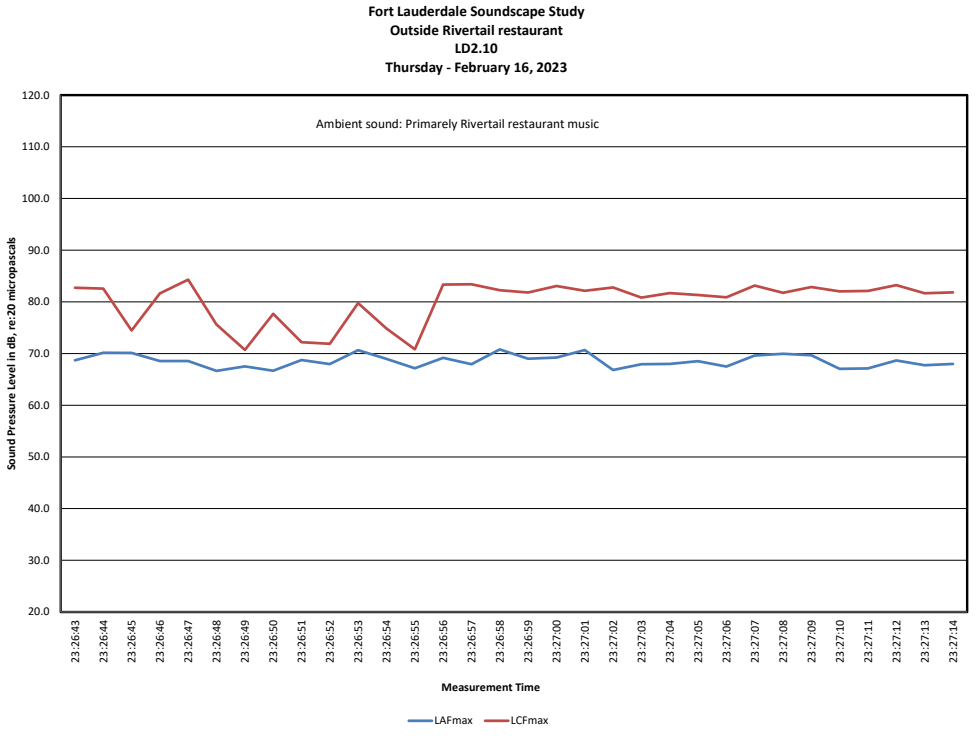
Fort Lauderdale Soundscape Study
Across the street from Water Garden
LD2.07
Thursday - February 16, 2023



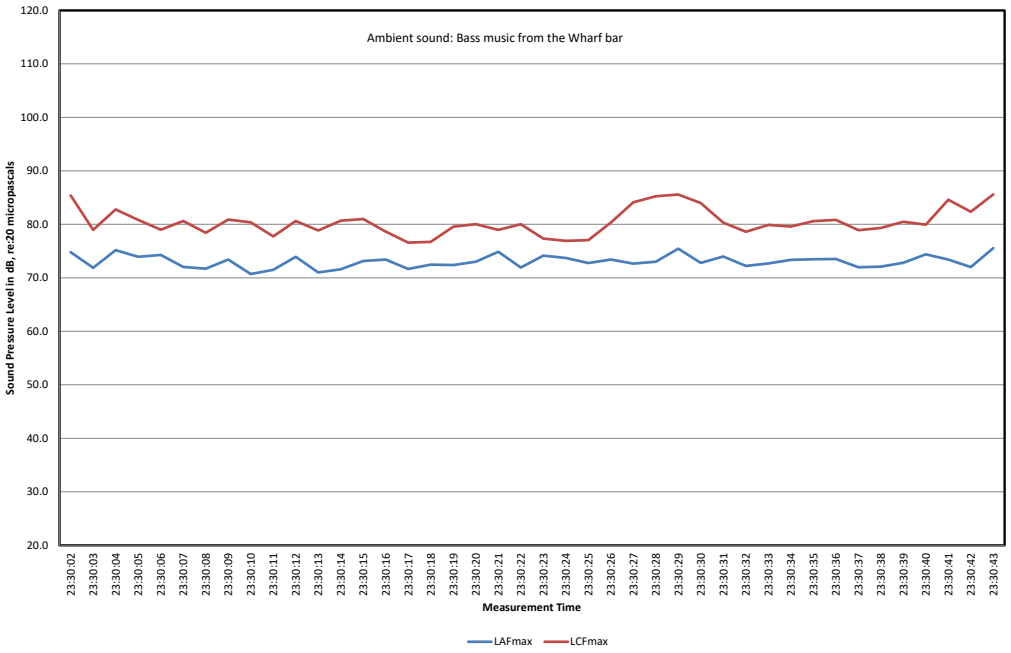
Fort Lauderdale Soundscape Study
New River, which is crossed by a grand overpass
LD2.08
Thursday - February 16, 2023



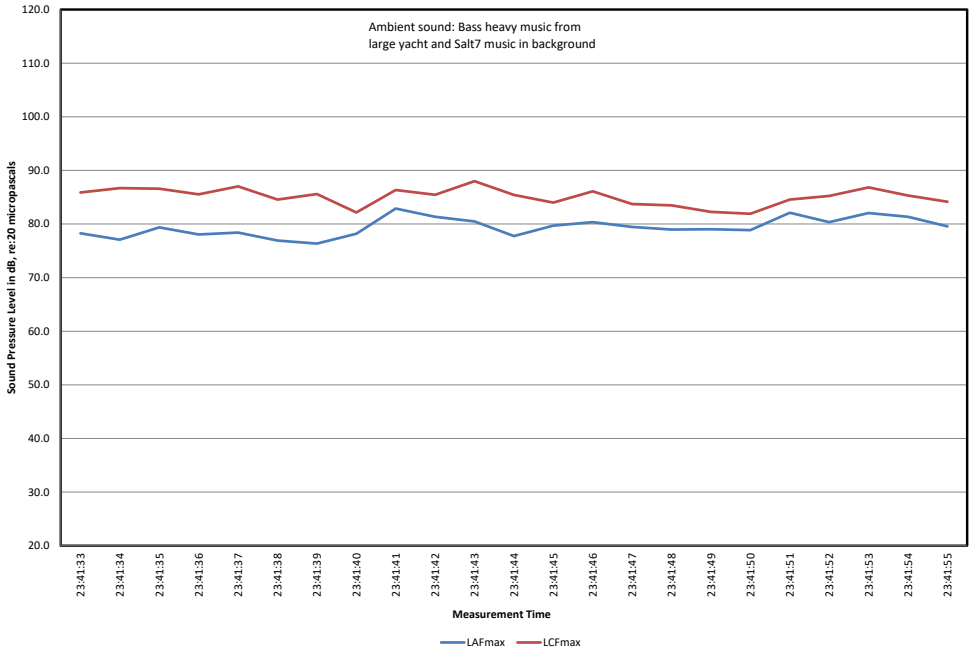

Fort Lauderdale Soundscape Study
Huizenga Plaza
LD2.09
Thursday - February 16, 2023
Car Engine
Car Engine
Car Engine
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAeq
LCeq


Fort Lauderdale Soundscape Study
Outside Rivertail restaurant
LD2.10
Thursday - February 16, 2023
Ambient sound: Primarely Rivertail restaurant music
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

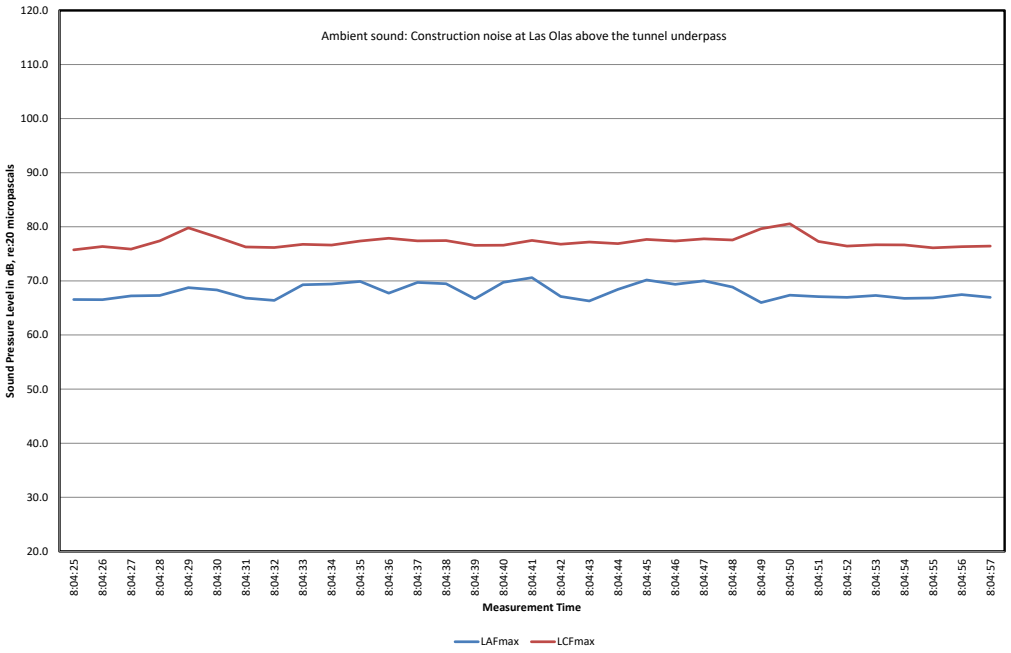
Fort Lauderdale Soundscape Study
Outside the Wharf between the Wharf and River
LD2.11
Thursday - February 16, 2023



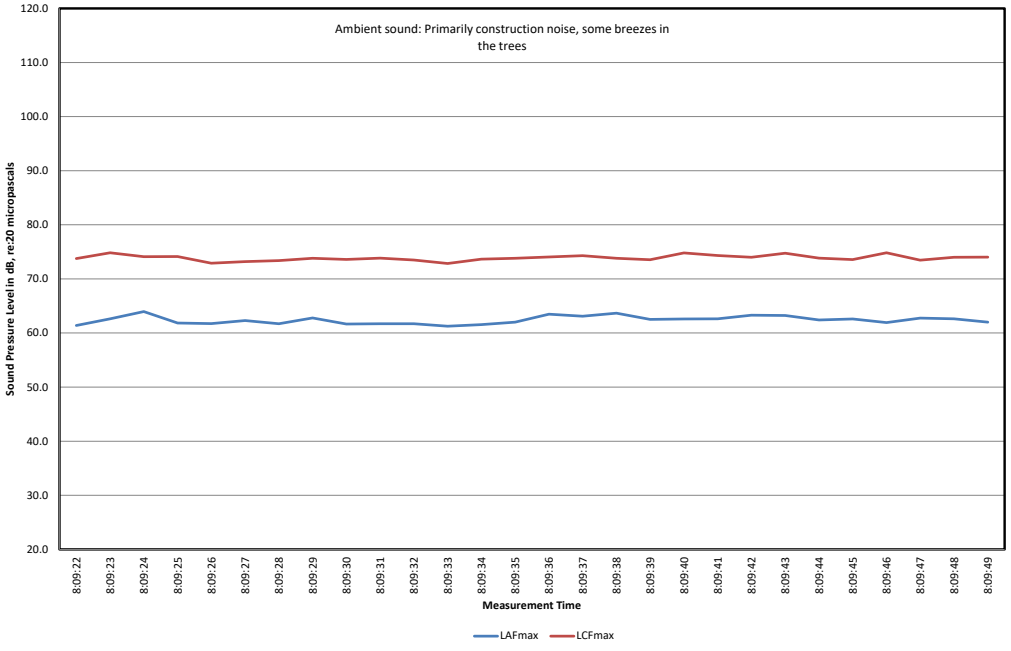
Fort Lauderdale Soundscape Study
In front of Salt7
LD2.12
Thursday - February 16, 2023



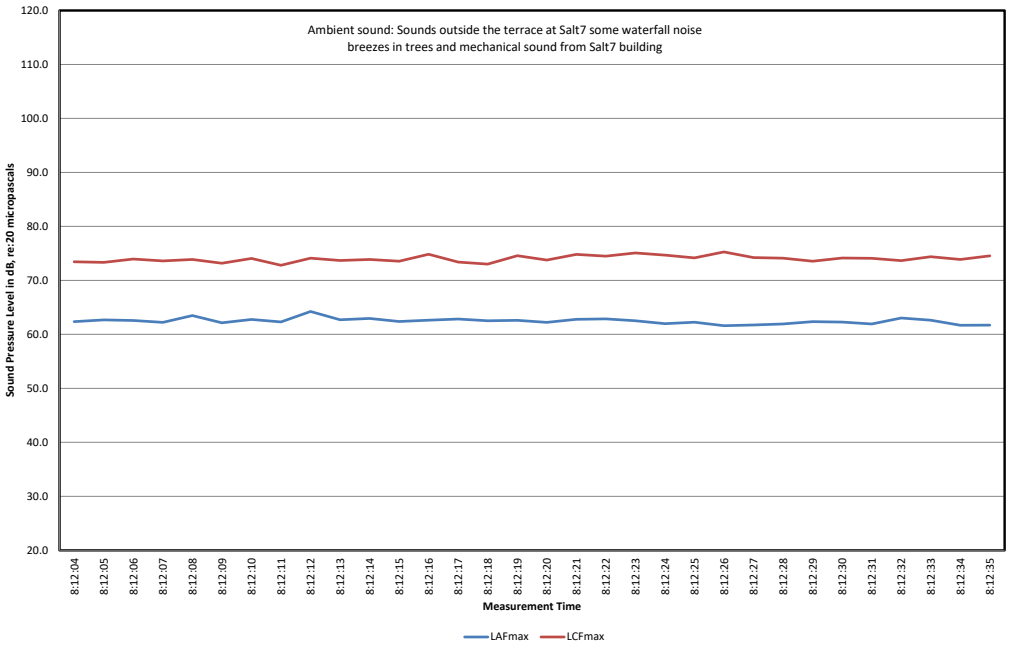
Fort Lauderdale Soundscape Study
Las Olas above the tunnel underpass
LD2.13
Friday - February 17, 2023



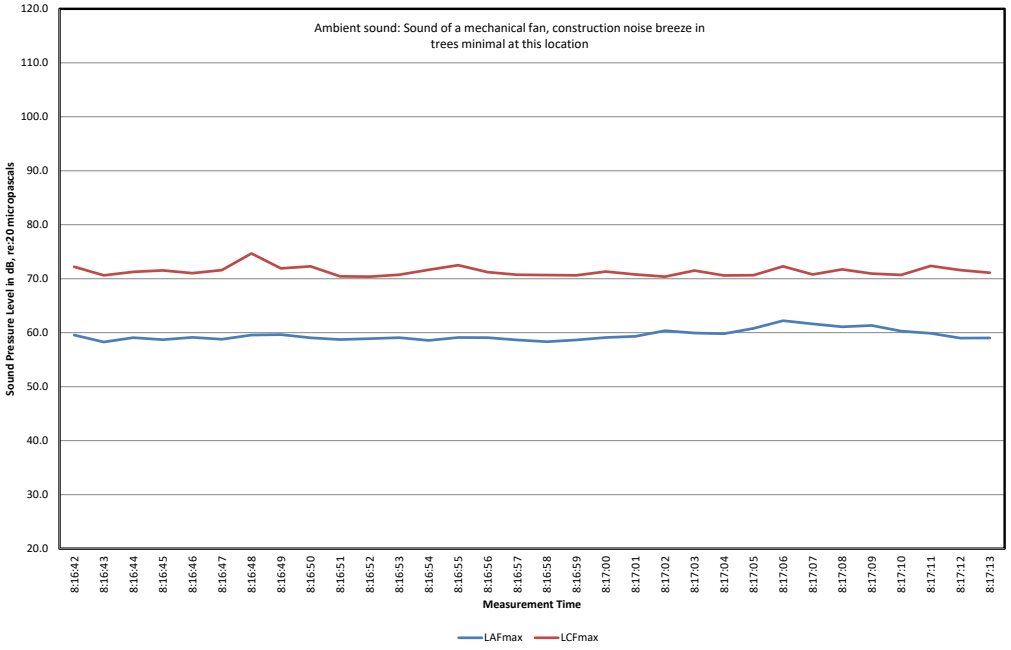
Fort Lauderdale Soundscape Study
Riverside Hotel entrance
LD2.14
Friday- February 17, 2023

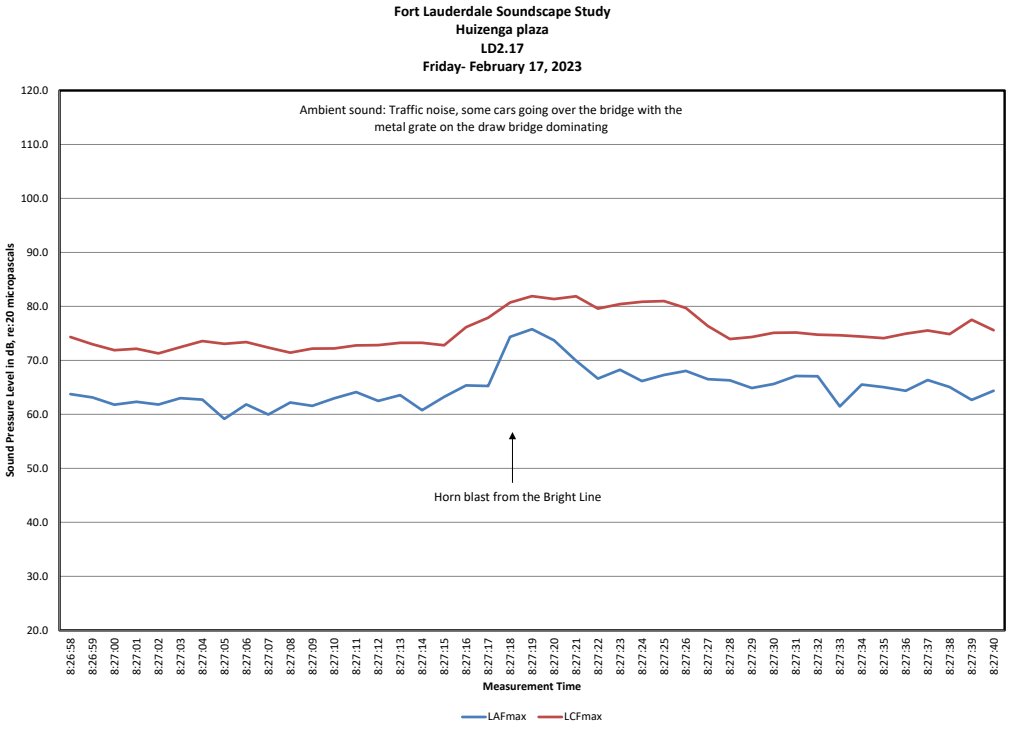


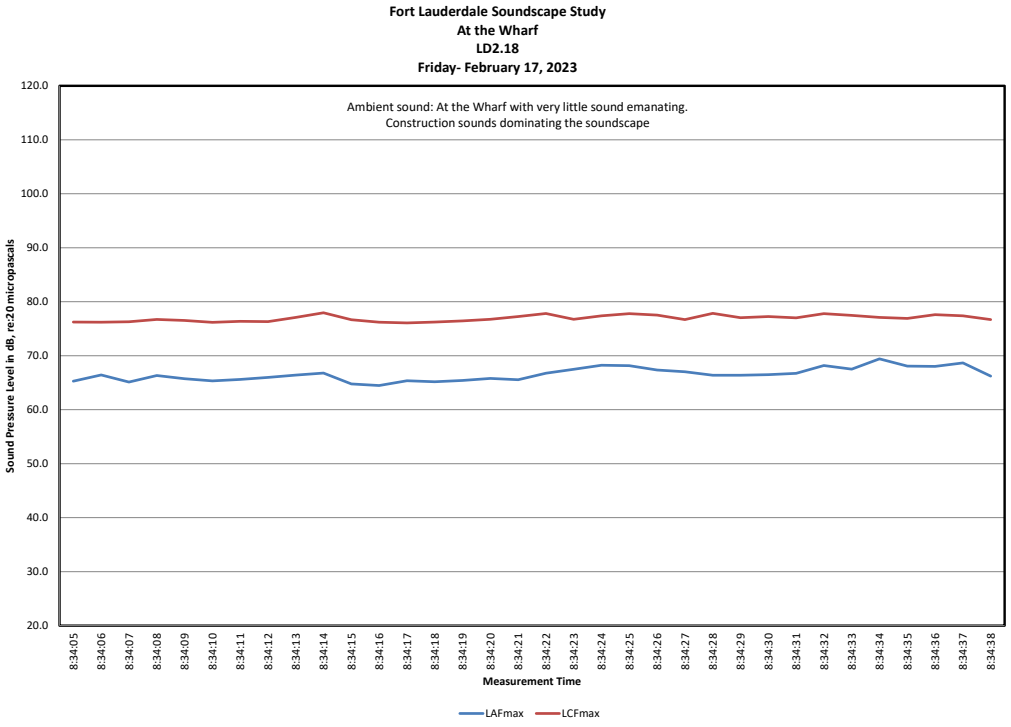
Fort Lauderdale Soundscape Study
Sounds outside the terrace at Salt7 some waterfall noise breezes in trees and some repetitive banging noise
LD2.15
Friday- February 17, 2023



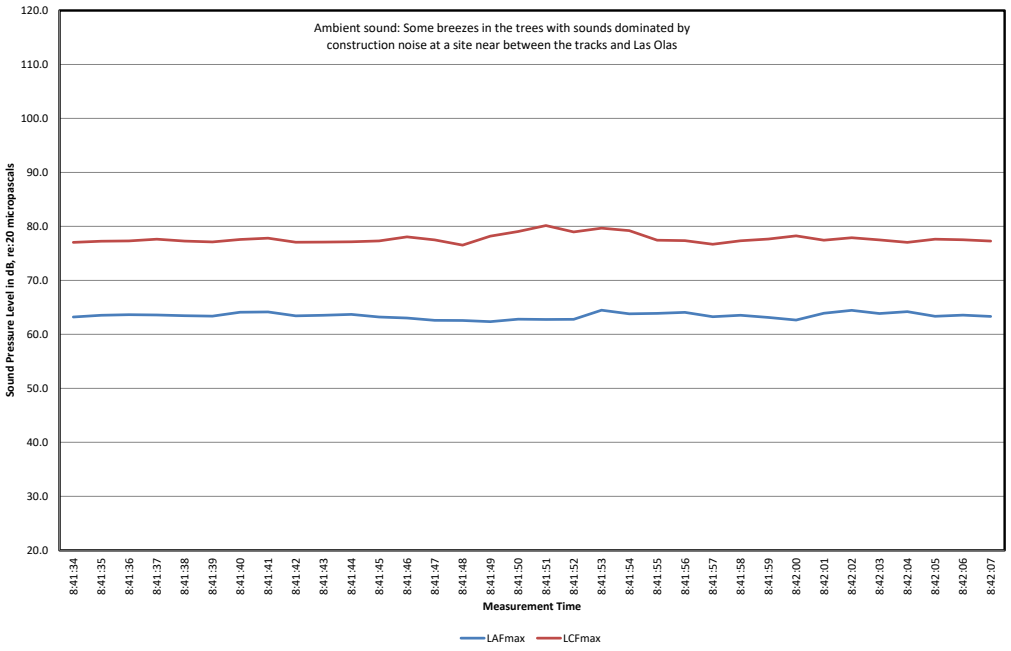
Fort Lauderdale Soundscape Study
Outside Salt7 on the west side
LD2.16
Friday- February 17, 2023



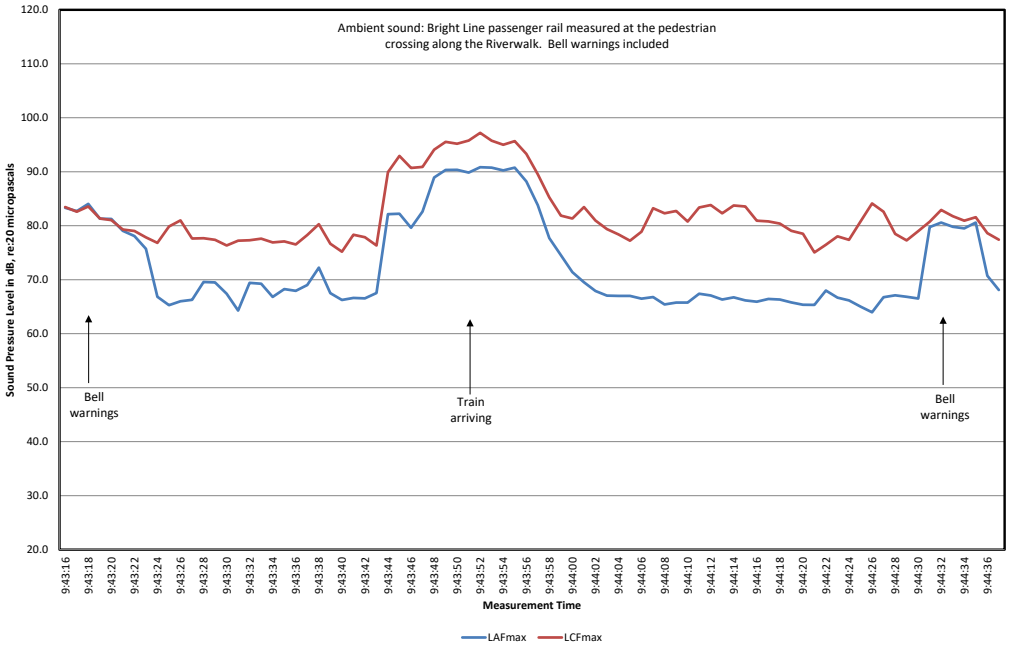

Fort Lauderdale Soundscape Study
Huizenga plaza
LD2.17
Friday- February 17, 2023
Ambient sound: Traffic noise, some cars going over the bridge with the metal grate on the draw bridge dominating
Horn blast from the Bright Line
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

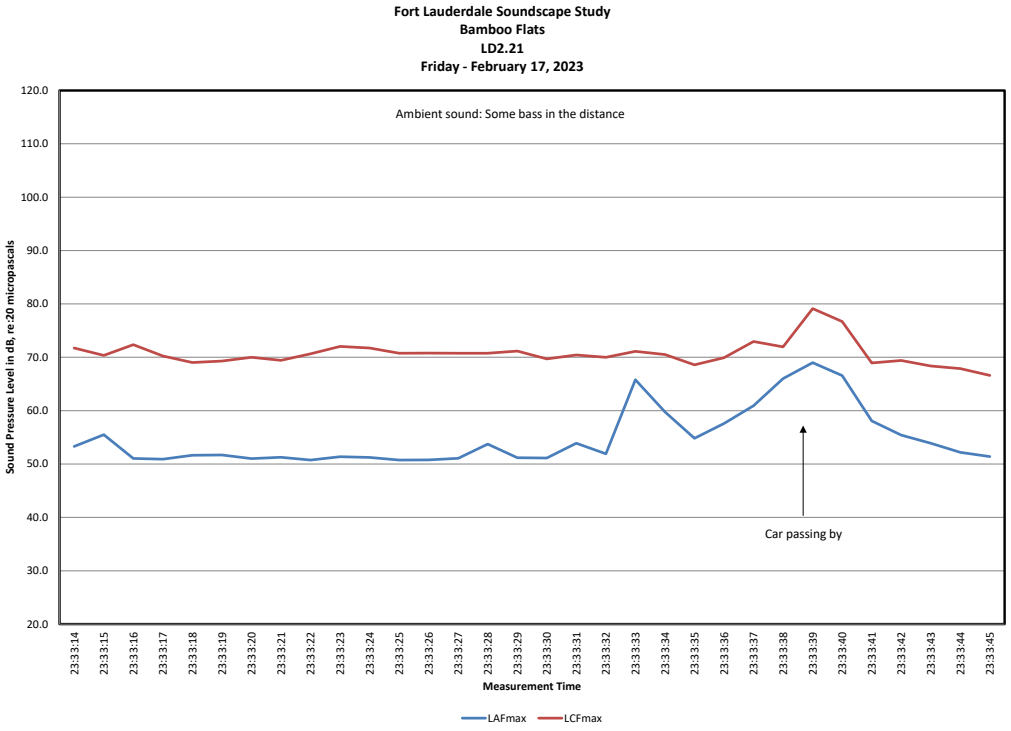

Fort Lauderdale Soundscape Study
At the Wharf
LD2.18
Friday- February 17, 2023
Ambient sound: At the Wharf with very little sound emanating. Construction sounds dominating the soundscape
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

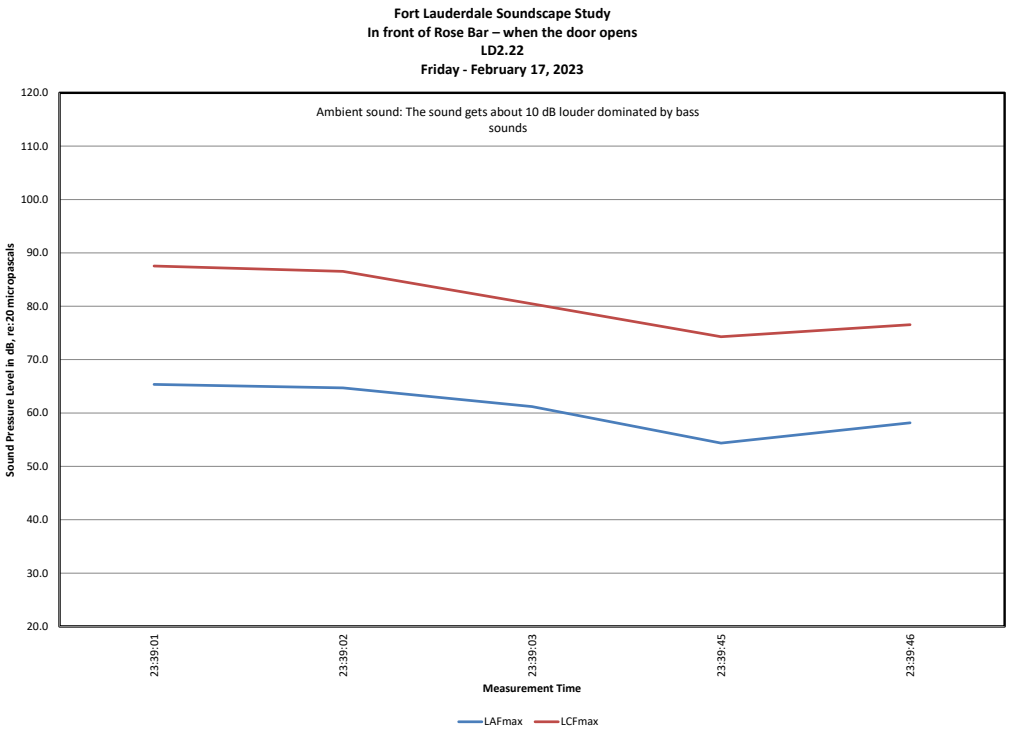
Fort Lauderdale Soundscape Study
In front of King Cromartie House
LD2.19
Friday- February 17, 2023



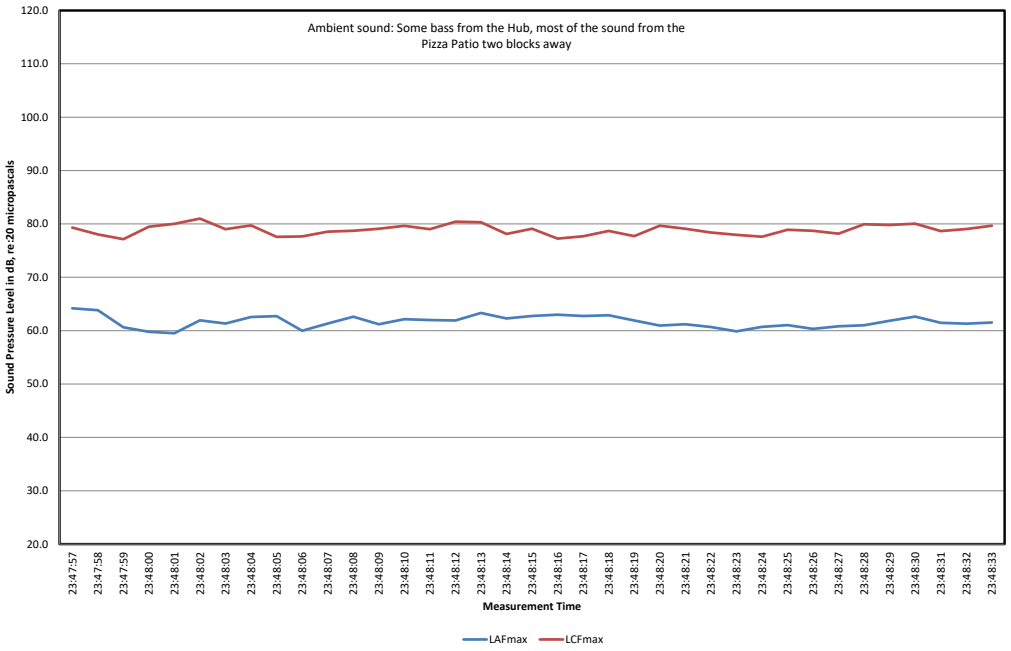
Fort Lauderdale Soundscape Study
At the pedestrian crossing along the Riverwalk
LD2.20
Friday - February 17, 2023



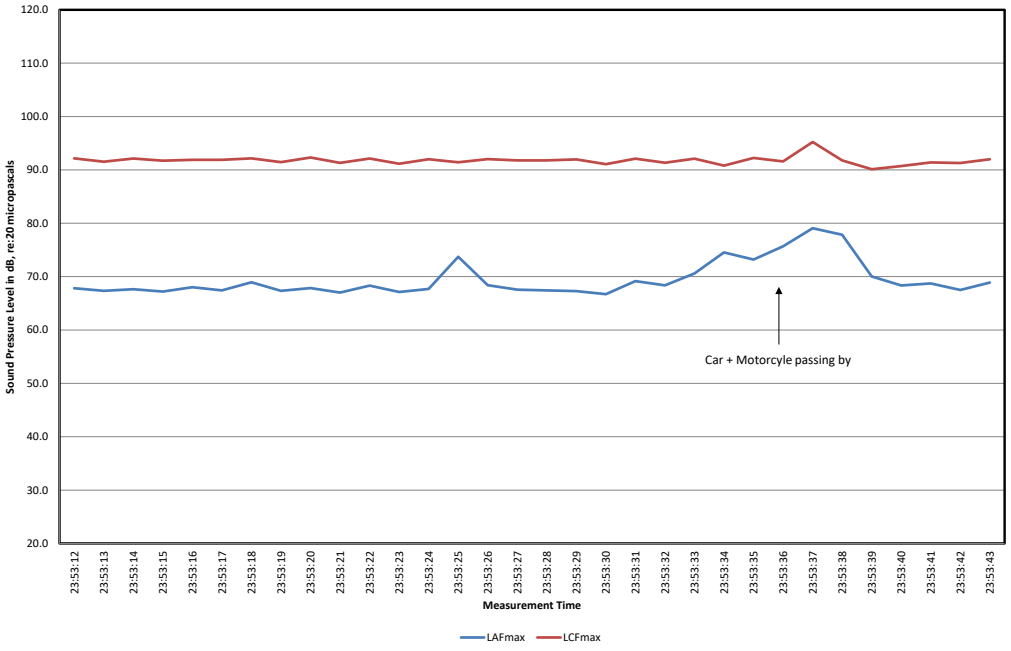

Fort Lauderdale Soundscape Study
Bamboo Flats
LD2.21
Friday - February 17, 2023
Ambient sound: Some bass in the distance
Car passing by
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
In front of Rose Bar – when the door opens
LD2.22
Friday - February 17, 2023
Ambient sound: The sound gets about 10 dB louder dominated by bass sounds
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

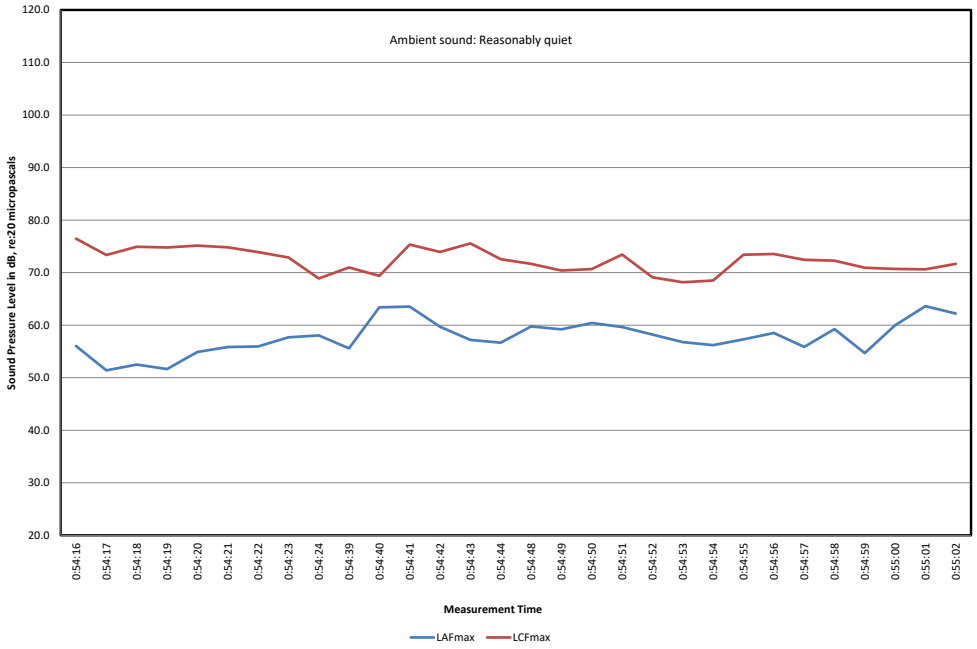
Fort Lauderdale Soundscape Study
North of the Hub
LD2.23
Friday - February 17, 2023



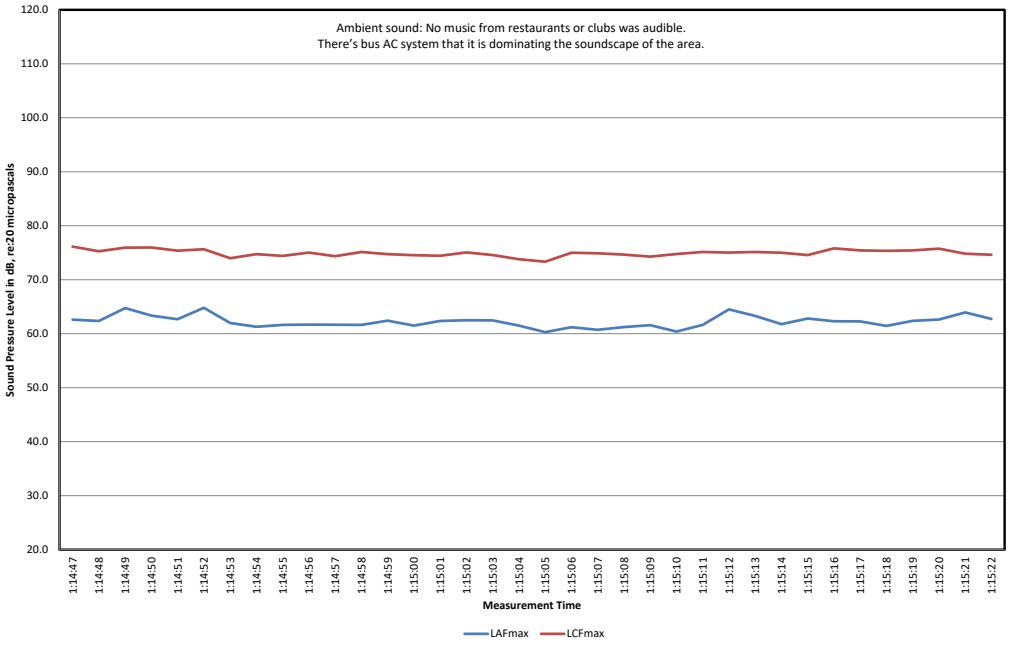
Fort Lauderdale Soundscape Study
Closer to the Pizza Patio, about 600 to 700 feet across the street and railroad tracks
LD2.24
Friday - February 17, 2023

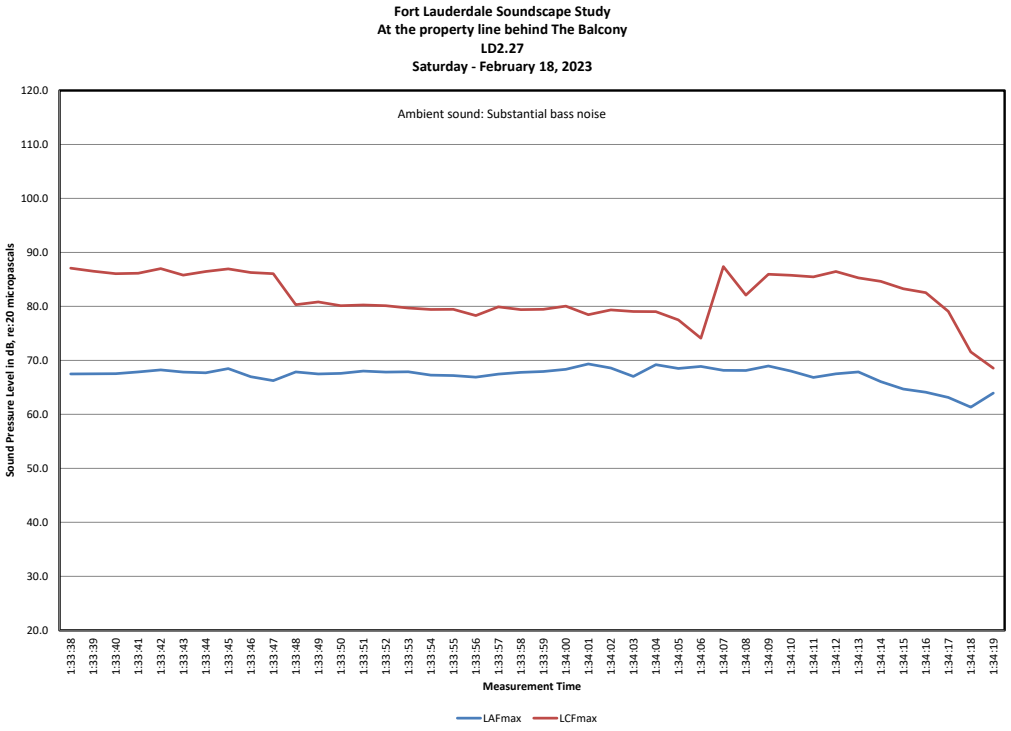


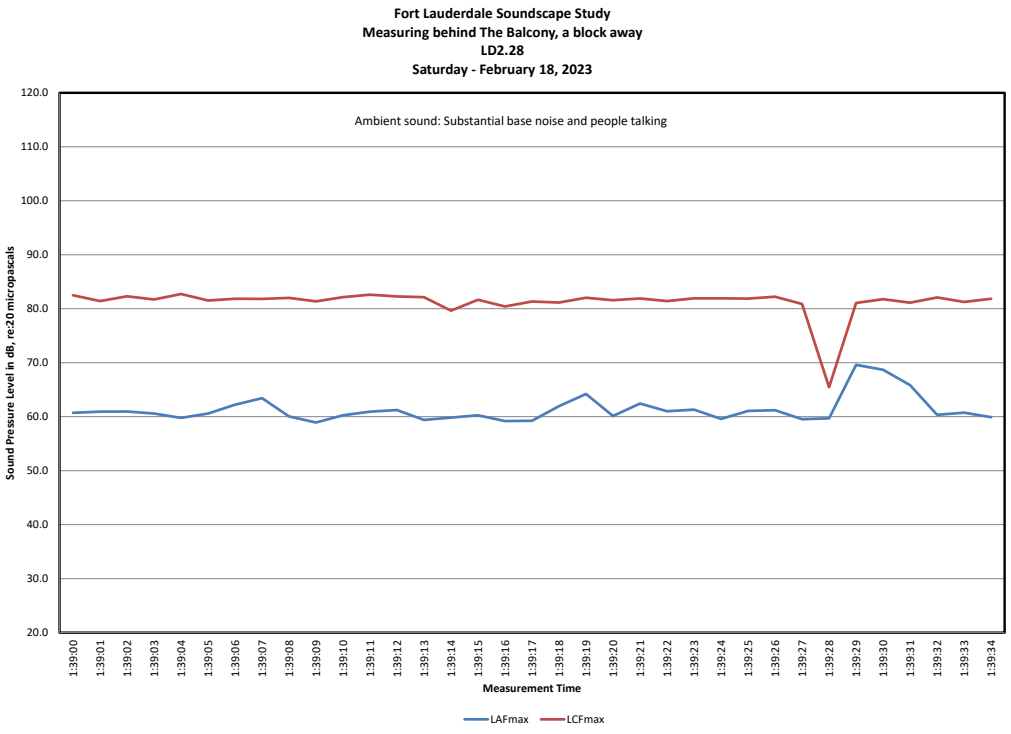
Fort Lauderdale Soundscape Study
Behind the Truth Lounge
LD2.25
Saturday - February 18, 2023

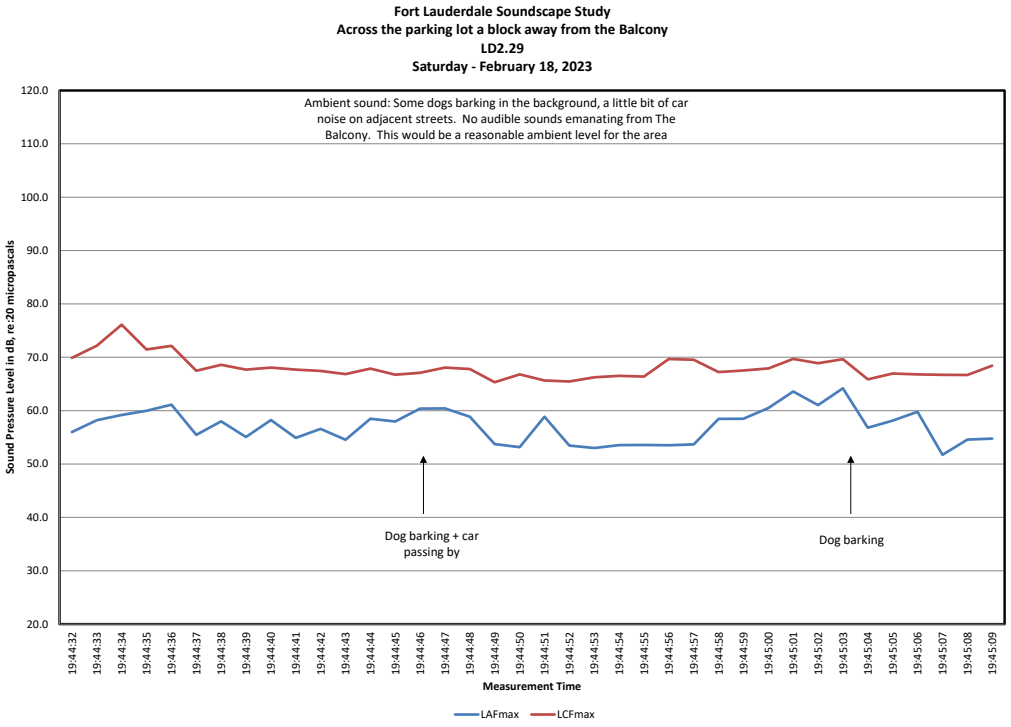


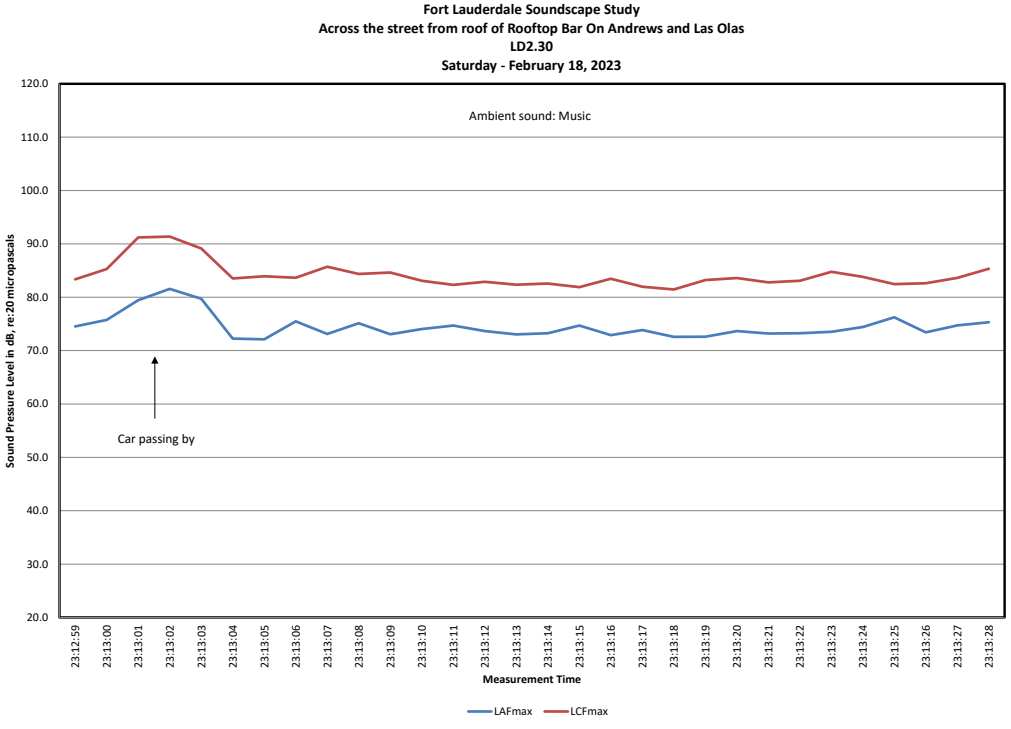
Fort Lauderdale Soundscape Study
Beach entertaiment distric. Behind Drunken Taco in the clubs along the beach near Las Olas
LD2.26
Saturday - February 18, 2023



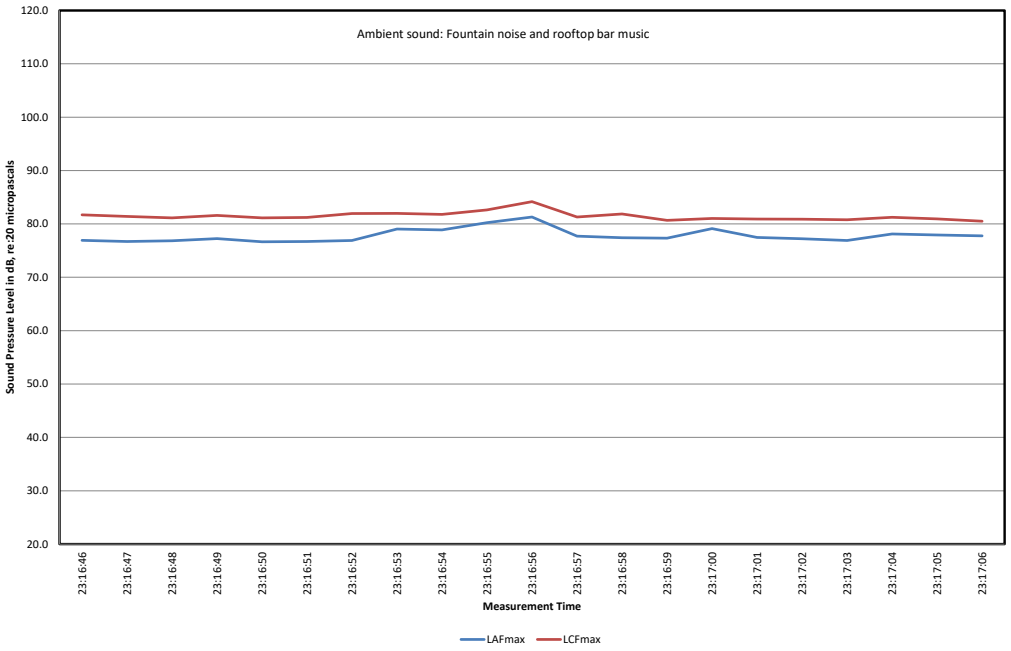

Fort Lauderdale Soundscape Study
At the property line behind The Balcony
LD2.27
Saturday - February 18, 2023
Ambient sound: Substantial bass noise
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
Measuring behind The Balcony, a block away
LD2.28
Saturday - February 18, 2023
Ambient sound: Substantial base noise and people talking
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

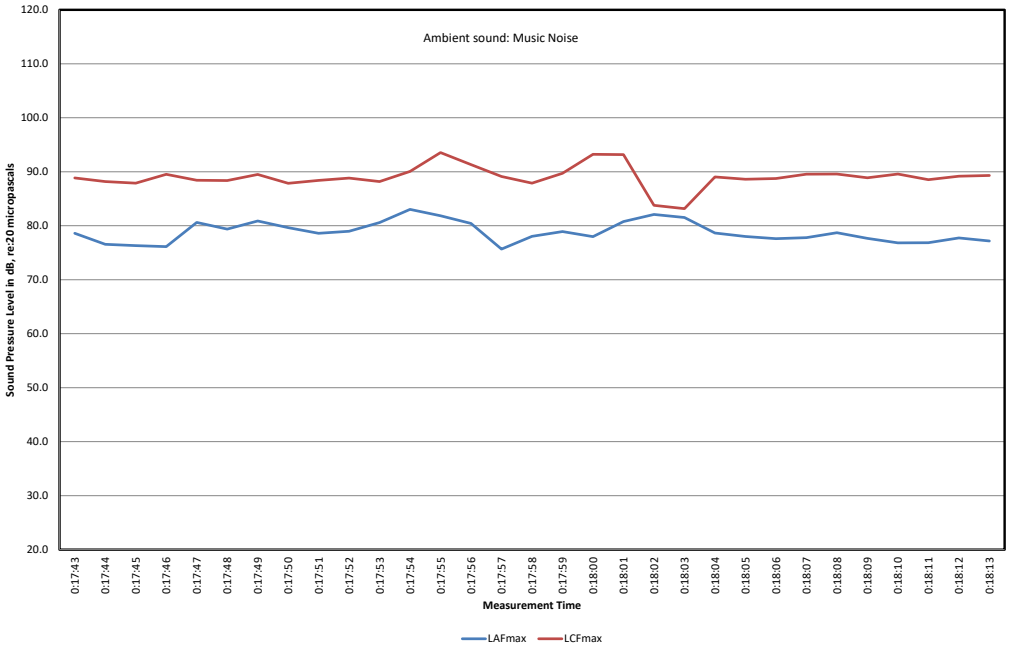

Fort Lauderdale Soundscape Study
Across the parking lot a block away from the Balcony
LD2.29
Saturday - February 18, 2023
Ambient sound: Some dogs barking in the background, a little bit of car noise on adjacent streets. No audible sounds emanating from The Balcony. This would be a reasonable ambient level for the area
Sound Pressure Level in dB, re:20 micropascals
Dog barking + car passing by
Dog barking
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
Across the street from roof of Rooftop Bar On Andrews and Las Olas
LD2.30
Saturday - February 18, 2023
Ambient sound: Music
Sound Pressure Level in dB, re:20 micropascals
Car passing by
Measurement Time
LAFmax
LCFmax

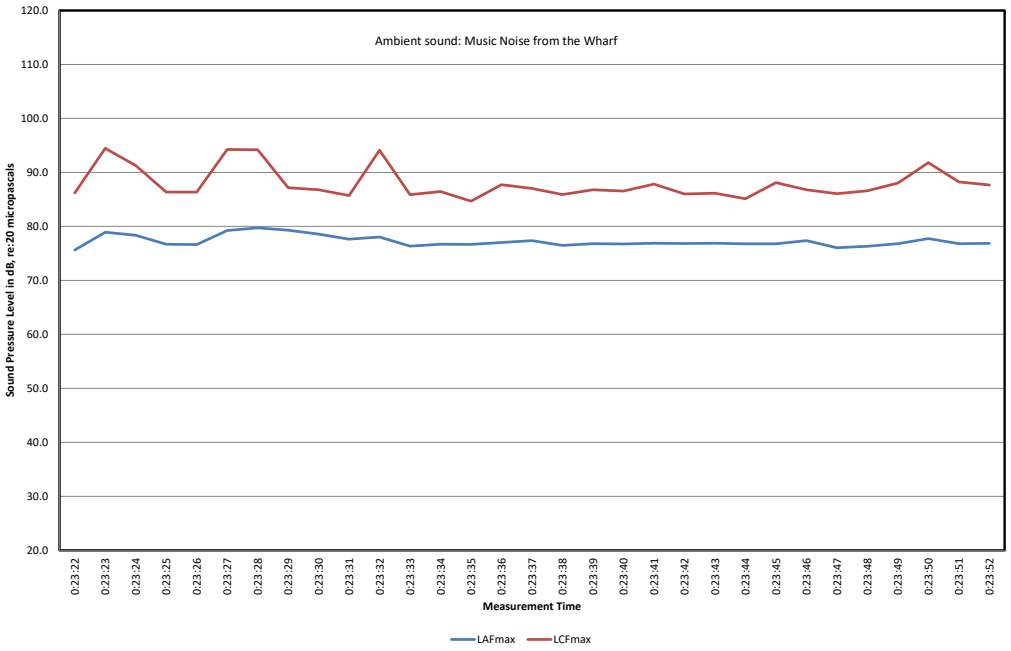
Fort Lauderdale Soundscape Study
The fountain outside Huizenga Park near Las Olas
LD2.31
Saturday - February 18, 2023



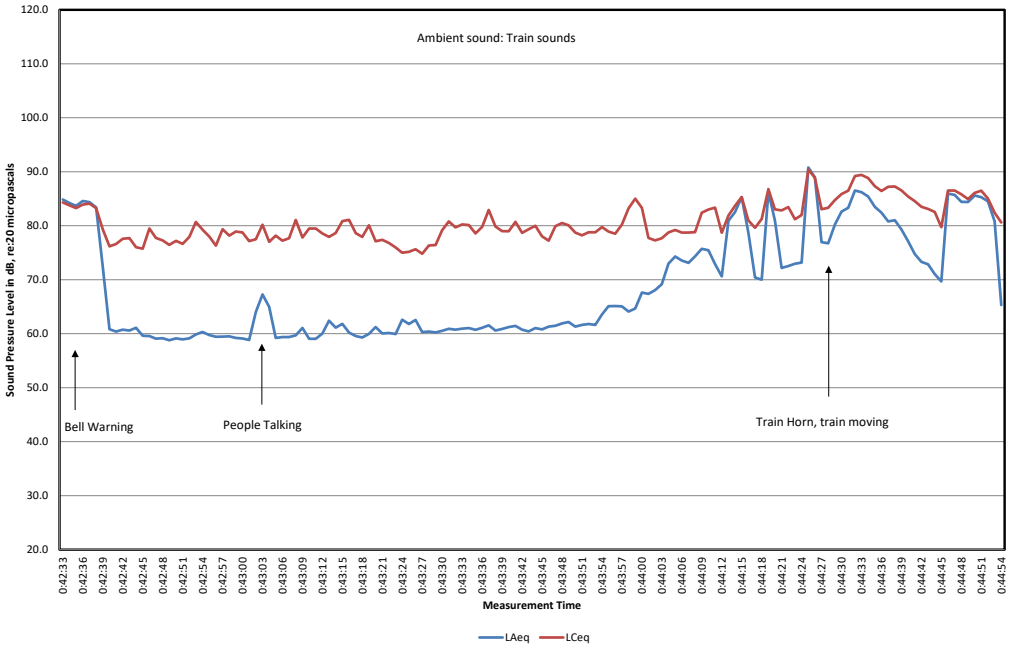
Fort Lauderdale Soundscape Study
Standing outside the Wharf
LD2.32
Saturday - February 18, 2023

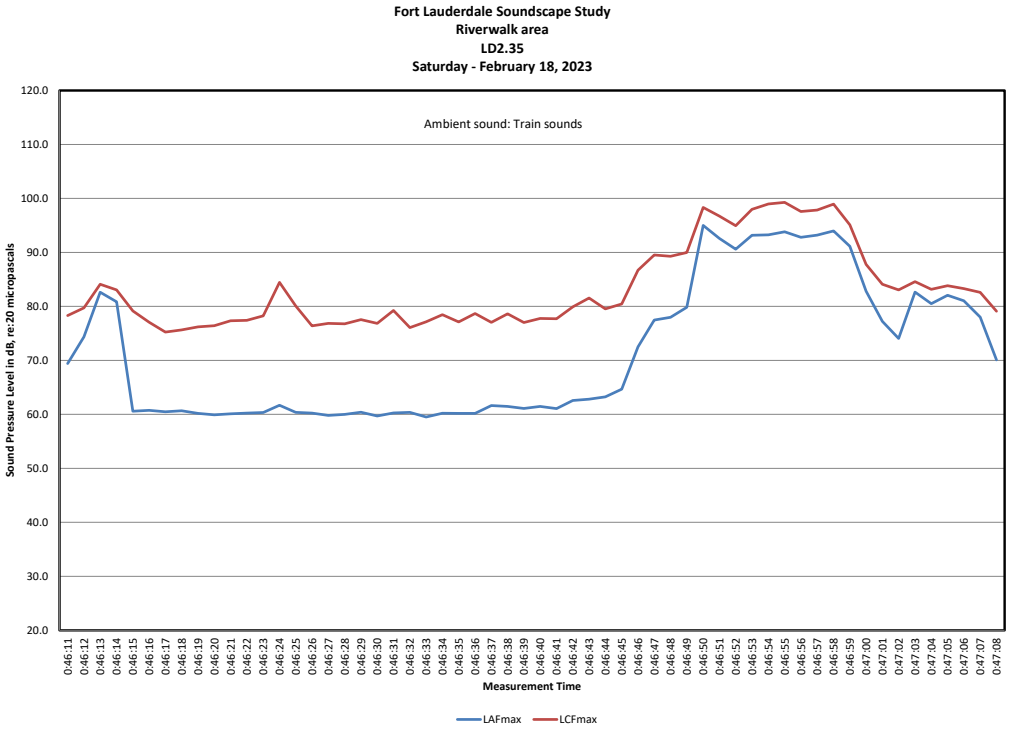


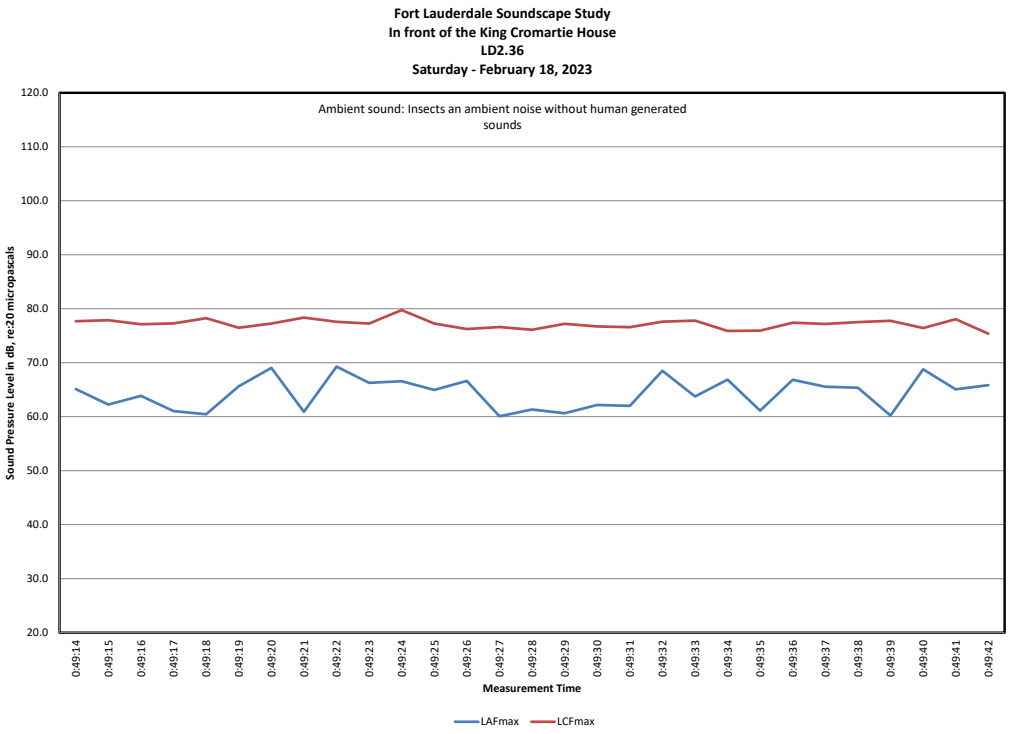
Fort Lauderdale Soundscape Study
On the top level (seventh floor) of the parking garage to the east of the Wharf on the second floor
LD2.33
Saturday - February 18, 2023



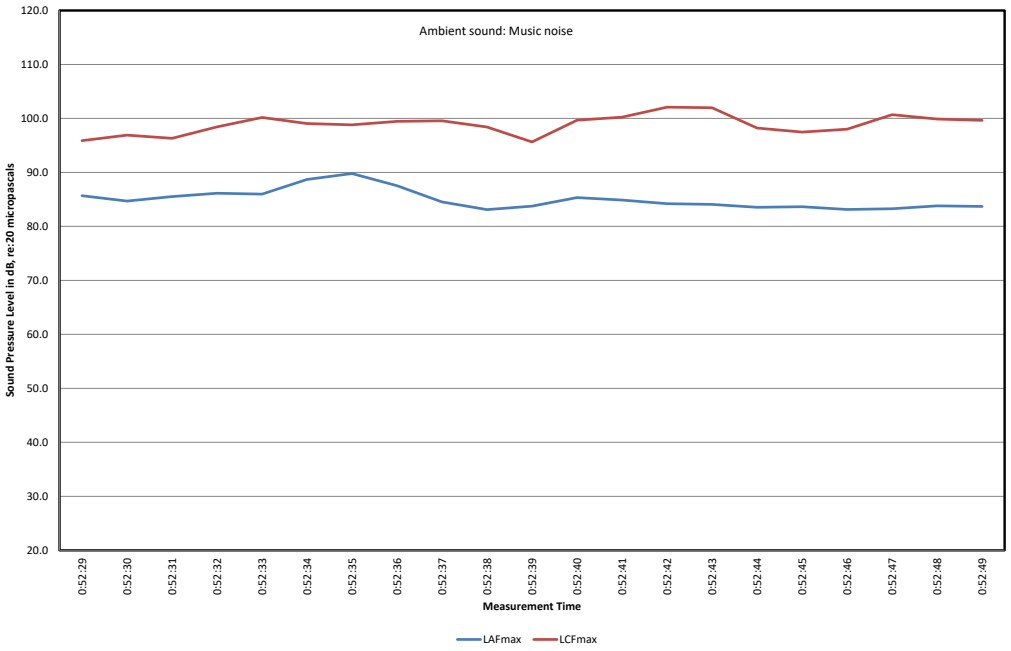
Fort Lauderdale Soundscape Study
Maintenance train moving down the track with horns and moving fairly slowly
LD2.34
Saturday - February 18, 2023



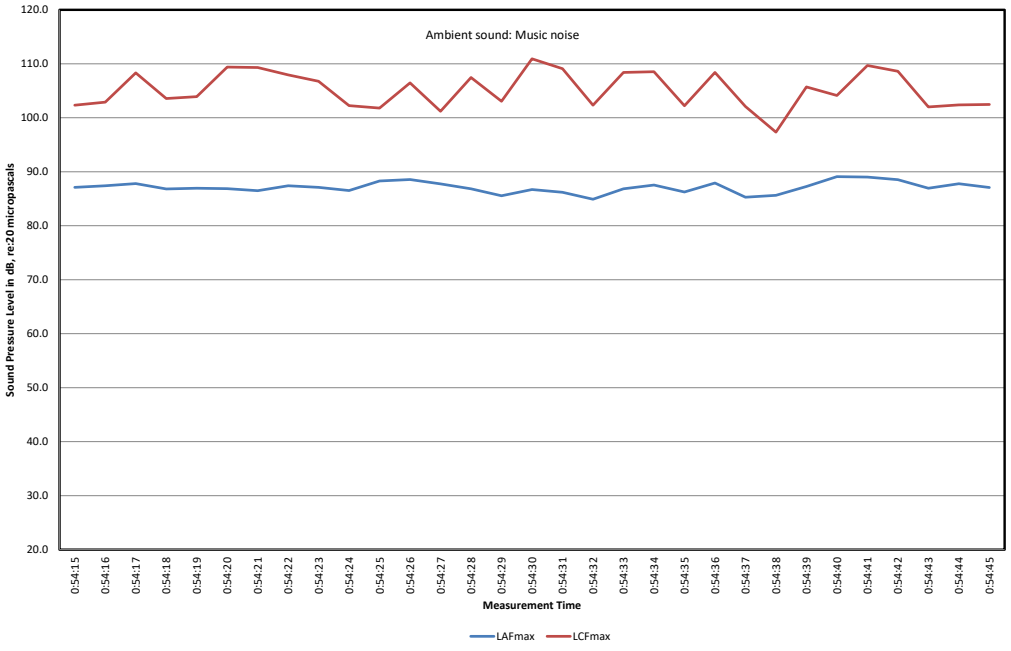

Fort Lauderdale Soundscape Study
Riverwalk area
LD2.35
Saturday - February 18, 2023
Ambient sound: Train sounds
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
In front of the King Cromartie House
LD2.36
Saturday - February 18, 2023
Ambient sound: Insects an ambient noise without human generated sounds
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

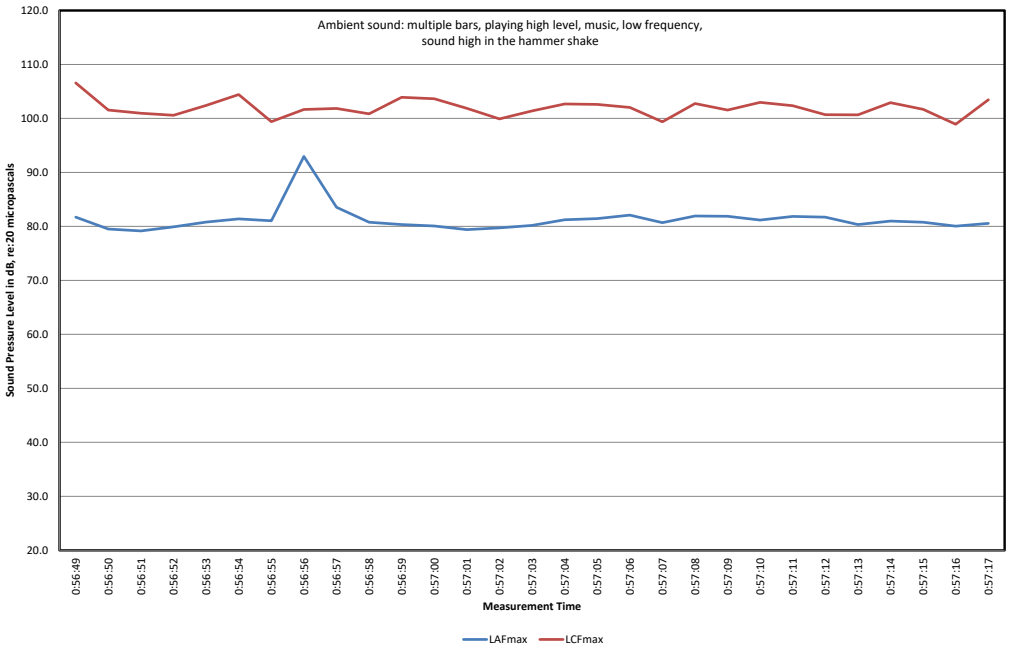
Fort Lauderdale Soundscape Study
In front of the clubs at the corner of Himmarshee district the first club on the corner
LD2.37
Sunday - February 19, 2023



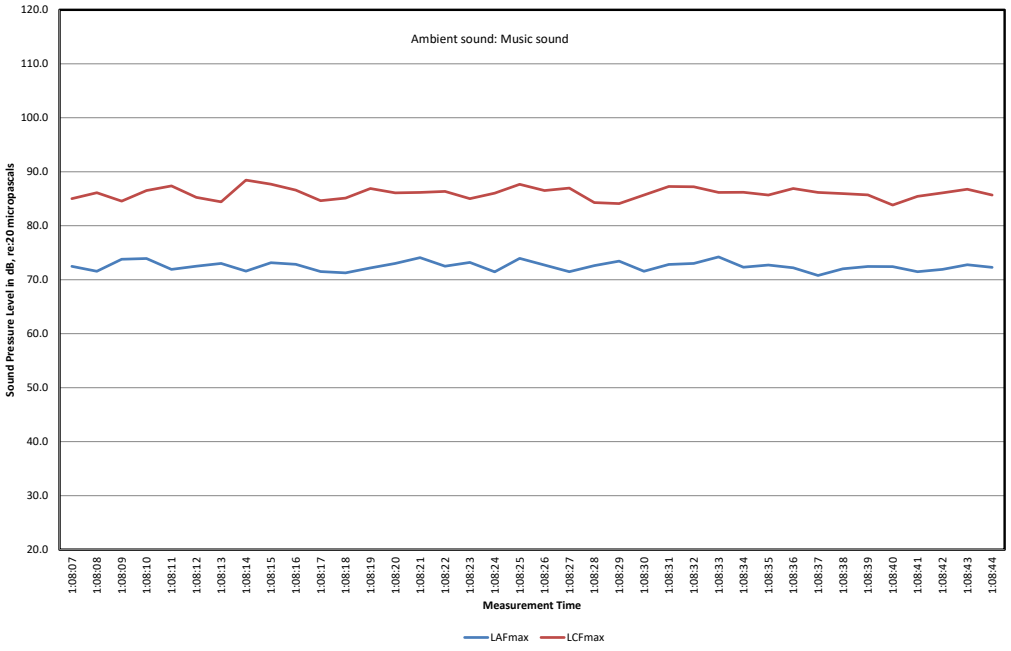
Fort Lauderdale Soundscape Study
In front of the Clovis in the Himmarshee district wide open outdoors
LD2.38
Sunday - February 19, 2023



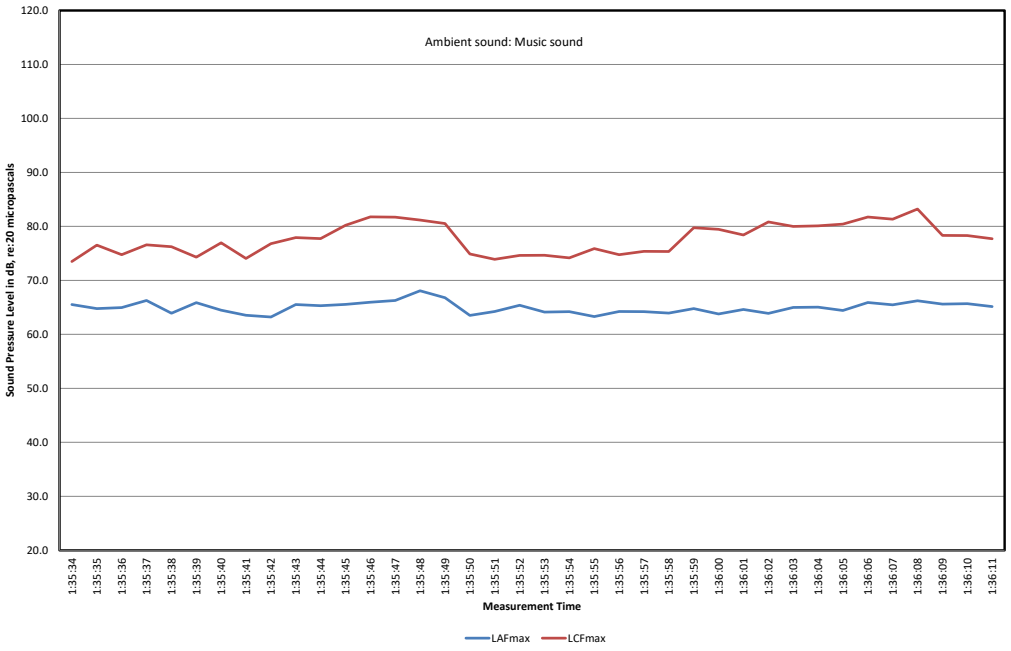
Fort Lauderdale Soundscape Study
Himmarshee District
LD2.39
Sunday - February 19, 2023



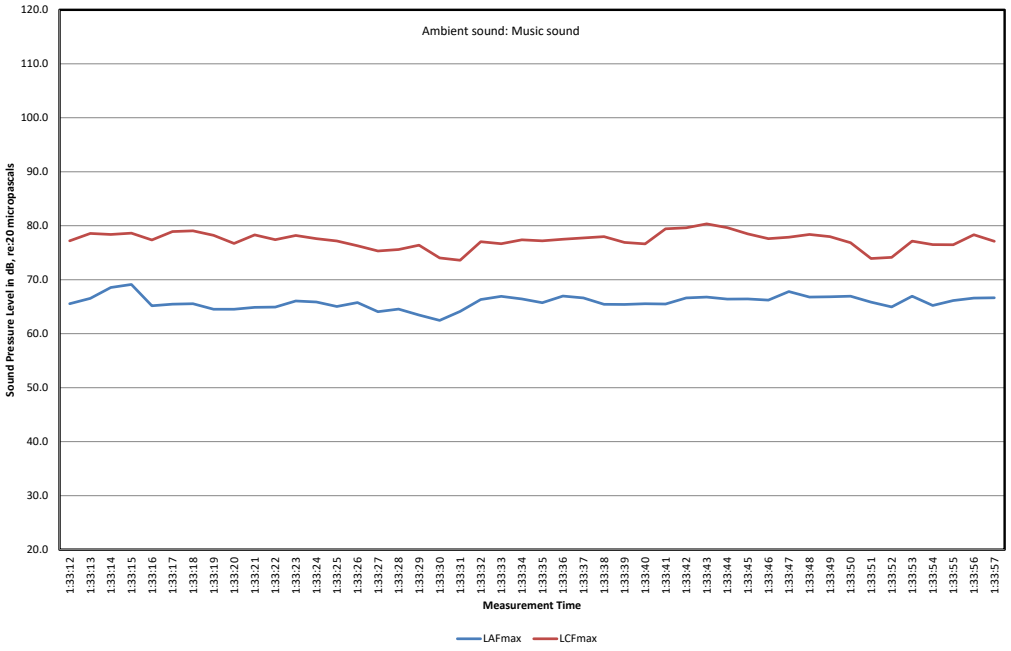
Fort Lauderdale Soundscape Study
On the roof of the garage looking out over the Himmarshee District
LD2.40
Sunday - February 19, 2023



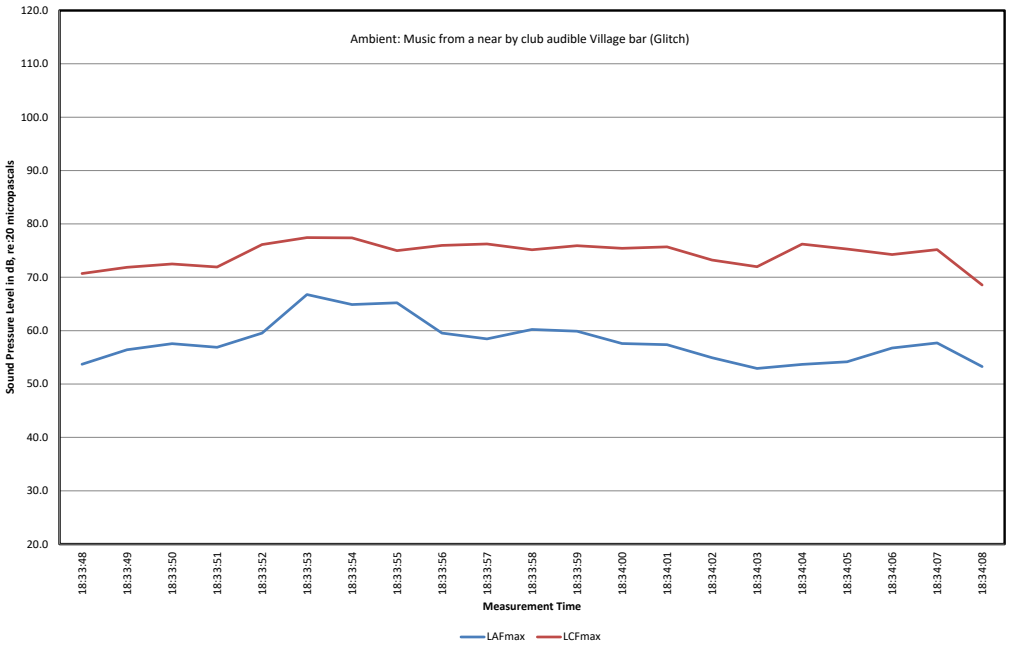
Fort Lauderdale Soundscape Study
On the parking deck at the gap between the parking garage across from Yolo at the bridge between two parking decks
LD2.42
Sunday - February 19, 2023



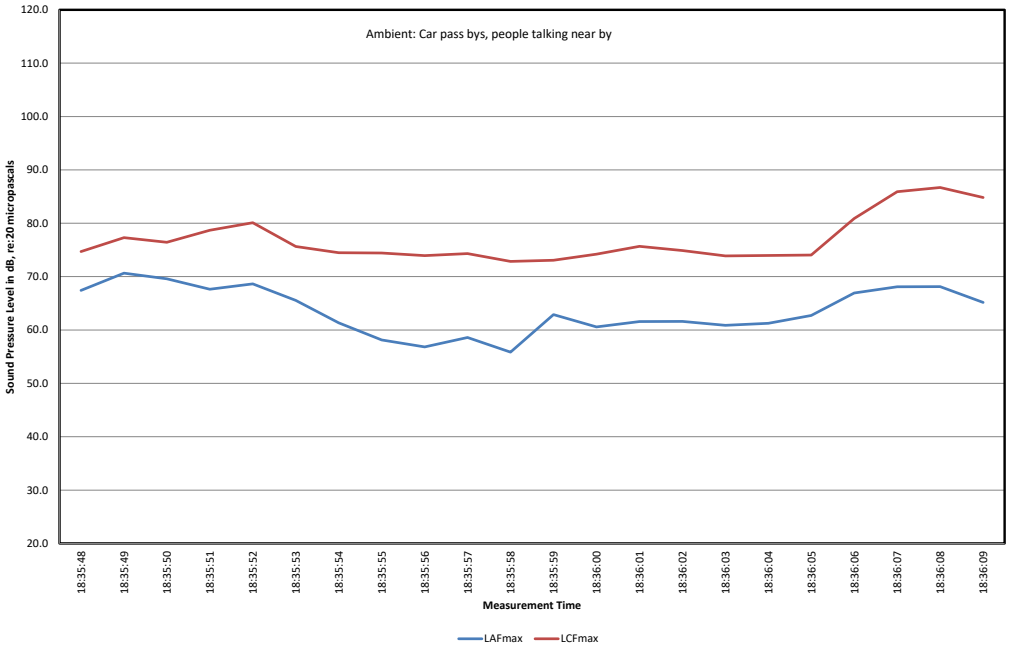
Fort Lauderdale Soundscape Study
Across the street from Yolo on top of the parking deck
LD2.41
Sunday - February 19, 2023



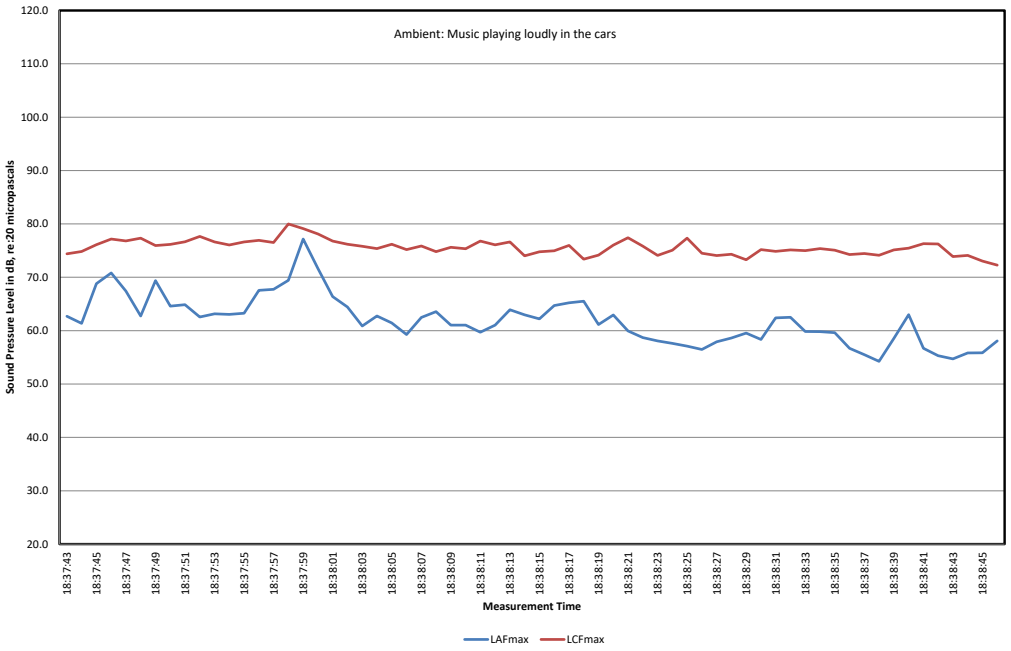
Fort Lauderdale Soundscape Study
Across the street from the Hub (828 NE Fourth Ave)
LD3.01
Thursday - February 16, 2023



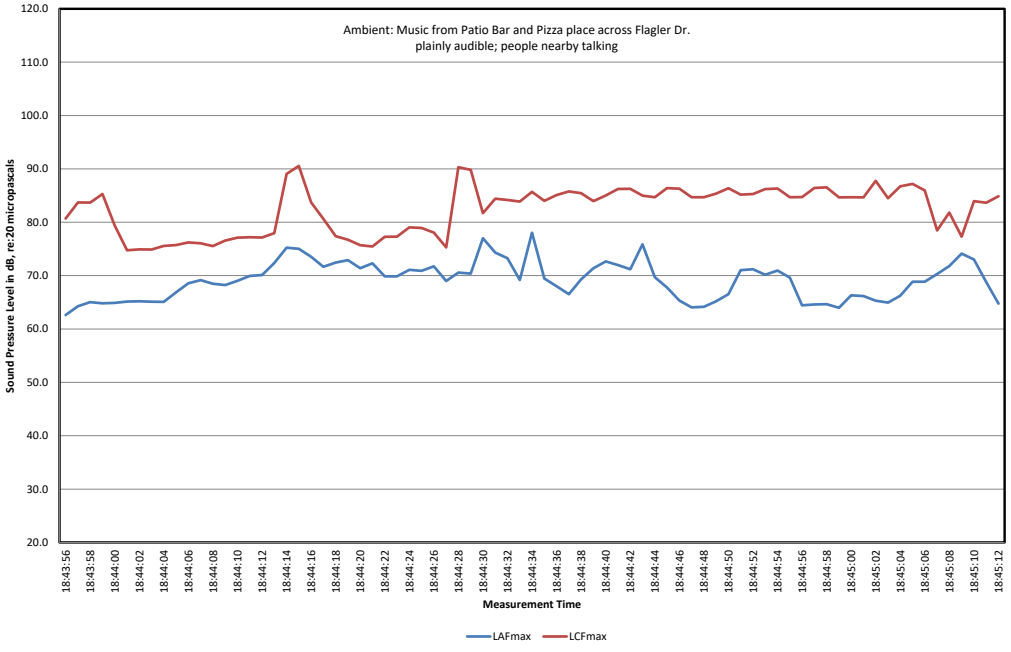
Fort Lauderdale Soundscape Study
Corner of parking lot in front of rail line with sight line to the Glitch
LD3.02
Thursday - February 16, 2023

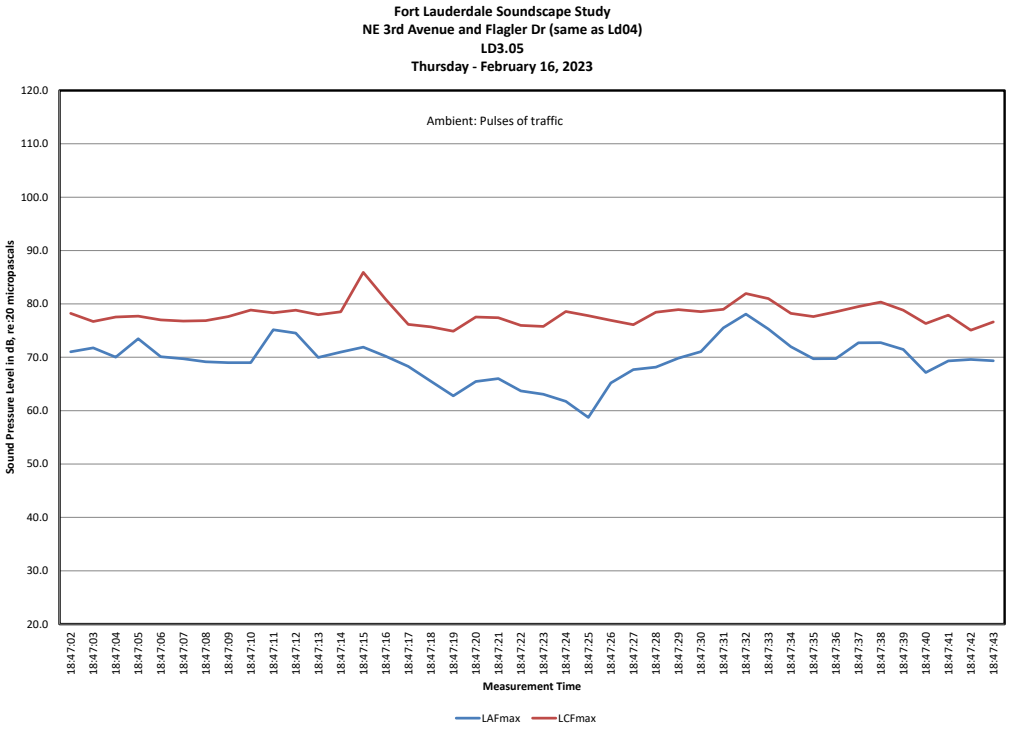


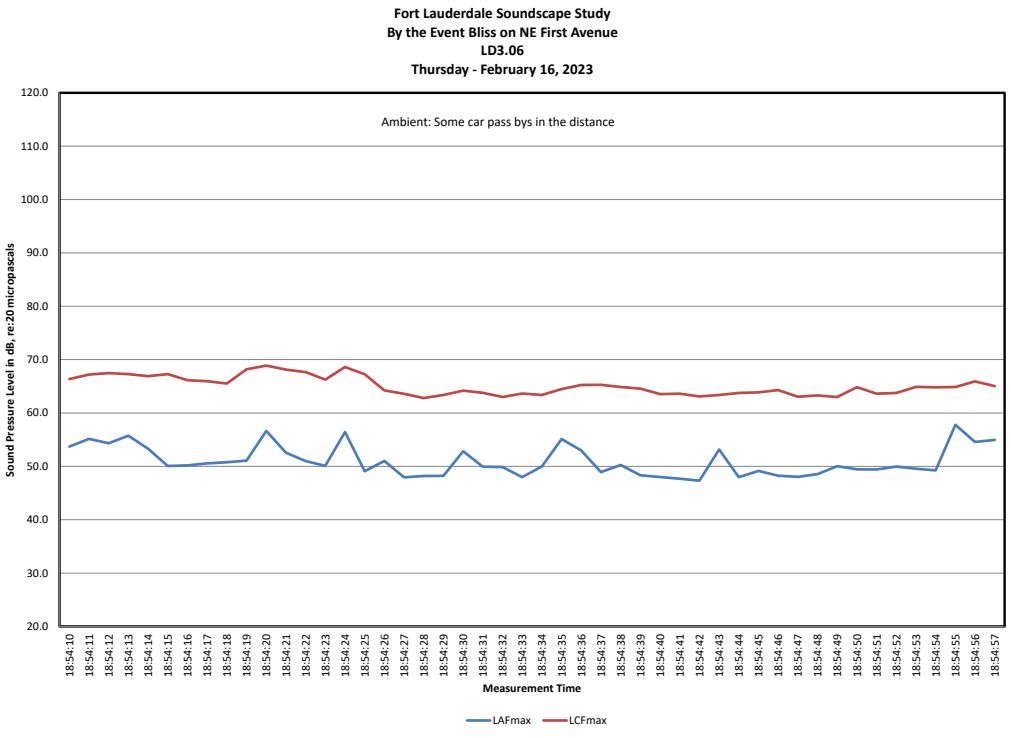
Fort Lauderdale Soundscape Study
Middle of parking lot of Glitch bar
LD3.03
Thursday - February 16, 2023



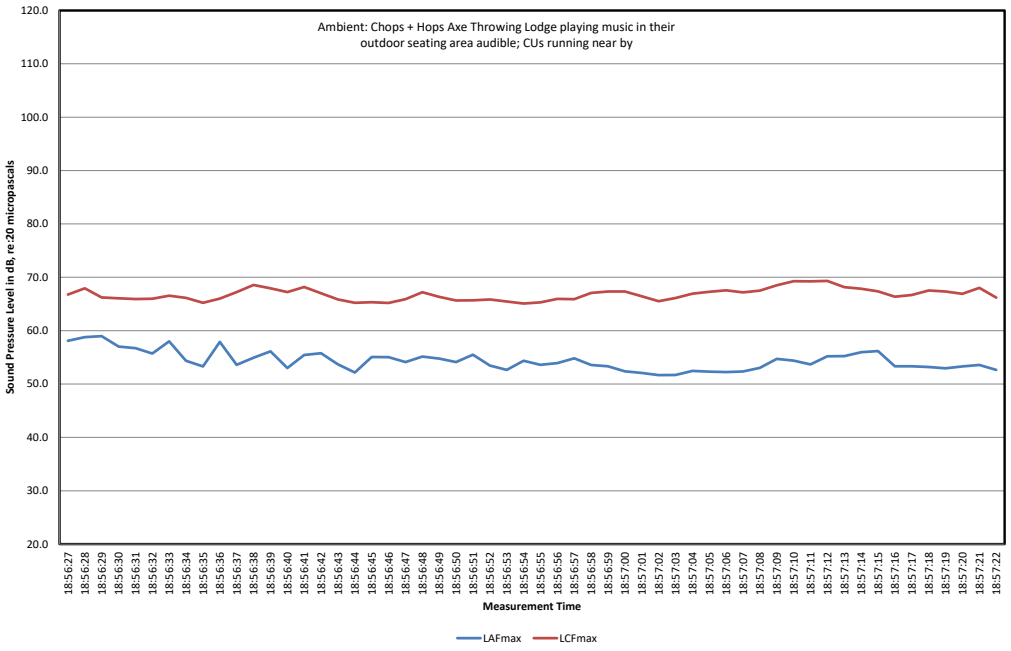
Fort Lauderdale Soundscape Study
NE 3rd Avenue and Flagler Dr
LD3.04
Thursday - February 16, 2023



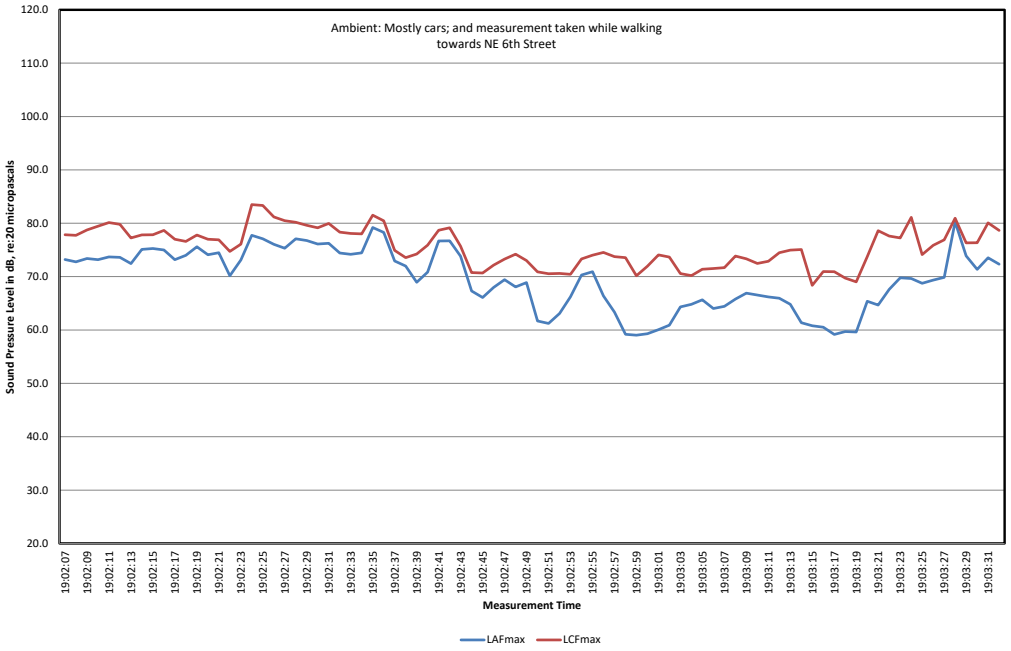

Fort Lauderdale Soundscape Study
NE 3rd Avenue and Flagler Dr (same as Ld04)
LD3.05
Thursday - February 16, 2023
Ambient: Pulses of traffic
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
By the Event Bliss on NE First Avenue
LD3.06
Thursday - February 16, 2023
Ambient: Some car pass bys in the distance
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

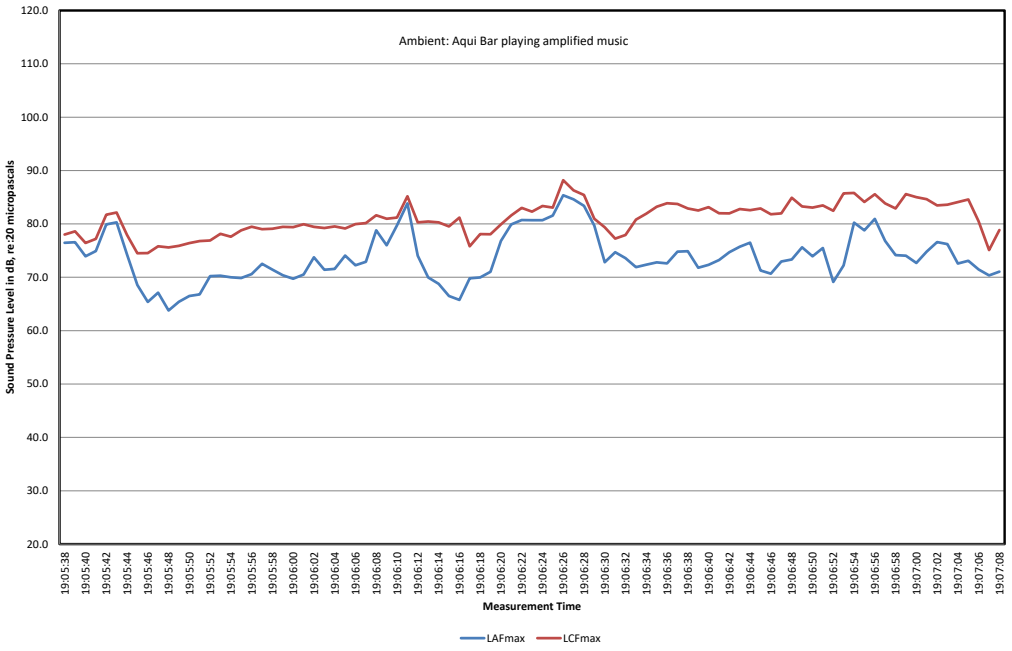
Fort Lauderdale Soundscape Study
NE Seventh St
LD3.07
Thursday - February 16, 2023



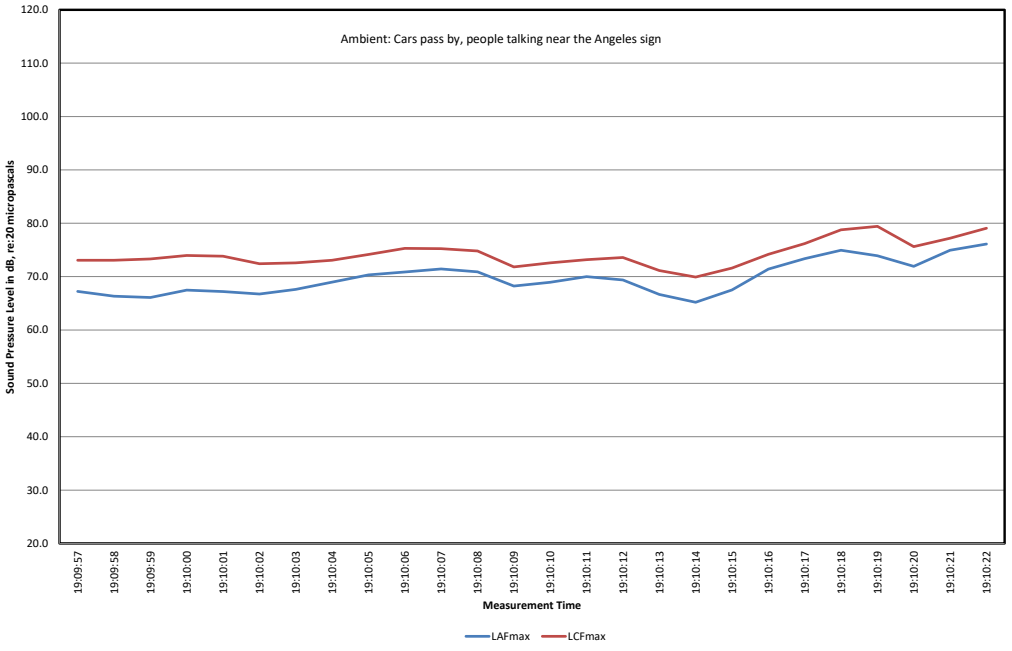
Fort Lauderdale Soundscape Study
Along NE 3rd Avenue from NW 7th Street to NE 6th Street
LD3.08
Thursday - February 16, 2023



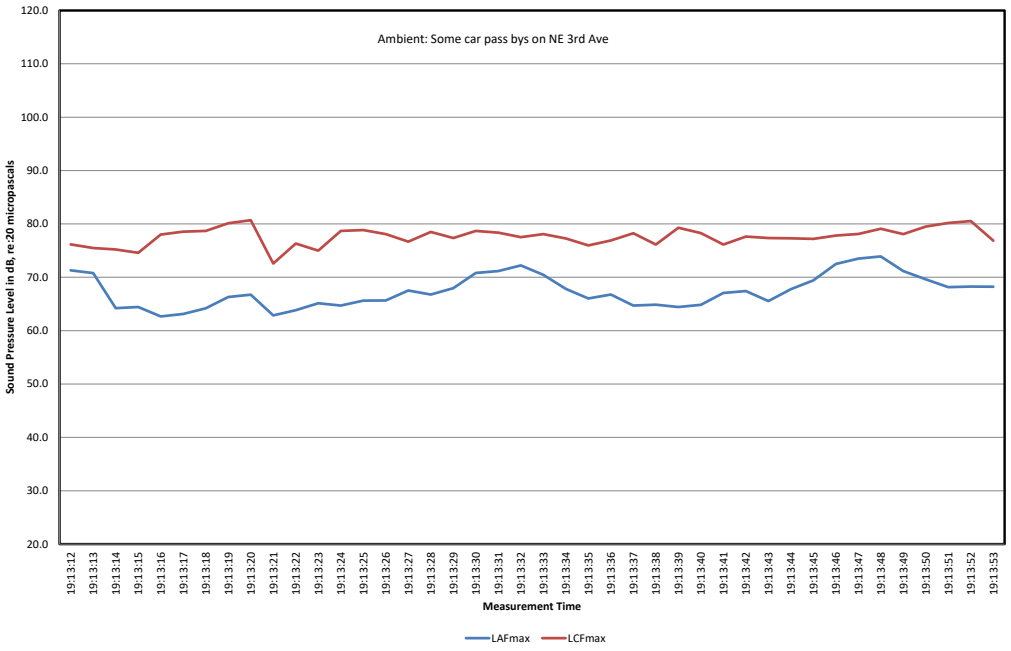
Fort Lauderdale Soundscape Study
From Circle T food store which was across the street
LD3.09
Thursday - February 16, 2023



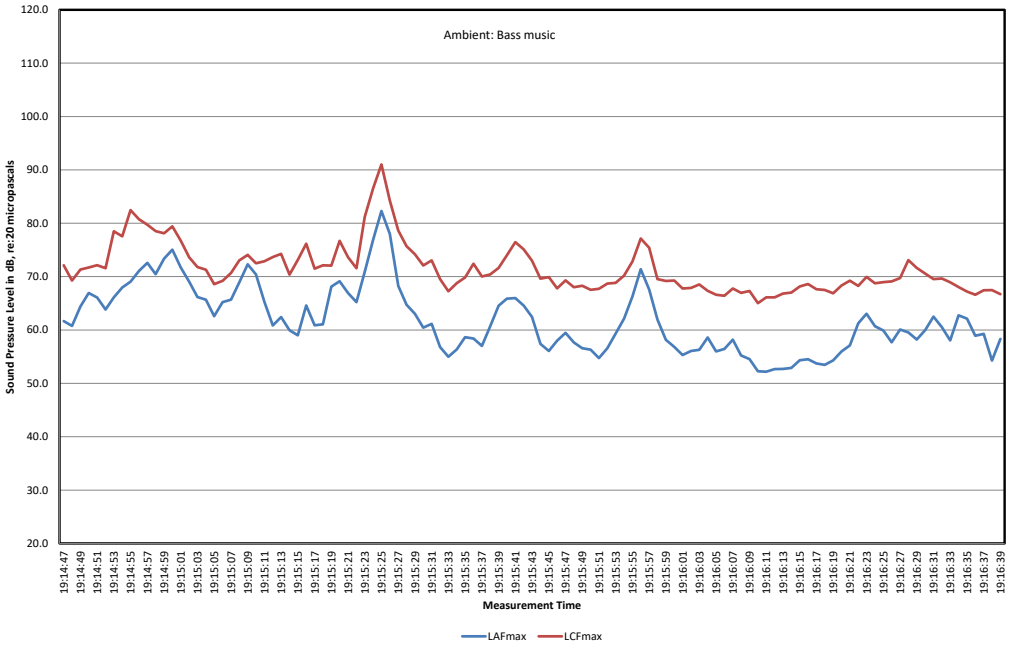
Fort Lauderdale Soundscape Study
Along NE 3rd Avenue from NE 5th Street to Holly Blue Restaurant
LD3.10
Thursday - February 16, 2023

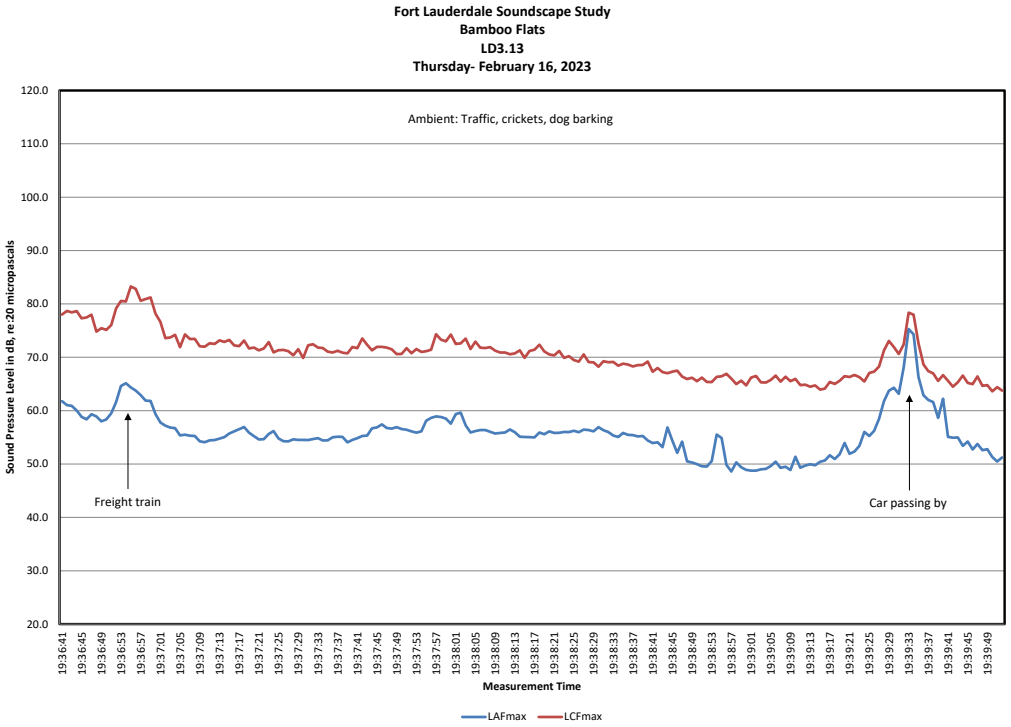


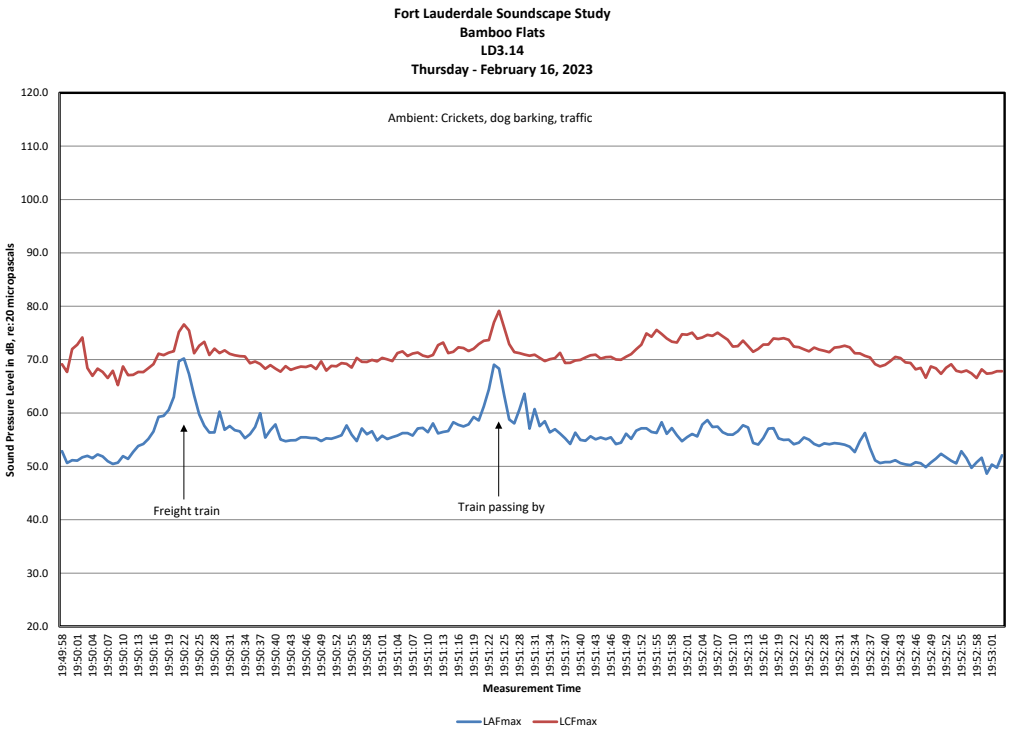
Fort Lauderdale Soundscape Study
By the dining area of the Angeles
LD3.11
Thursday - February 16, 2023

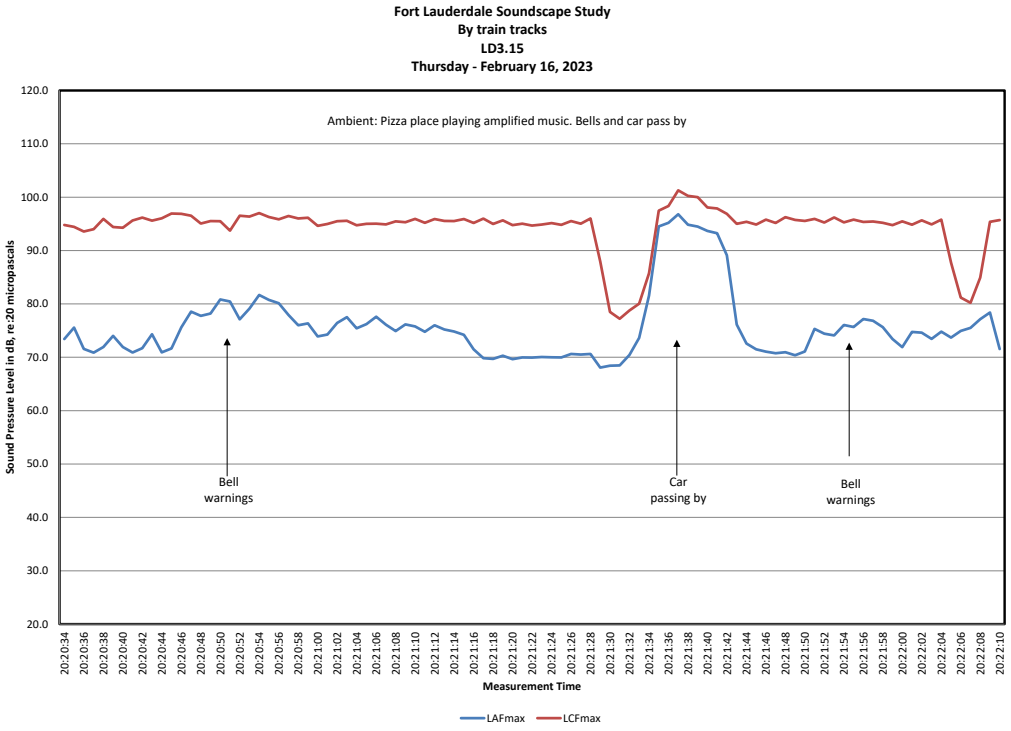


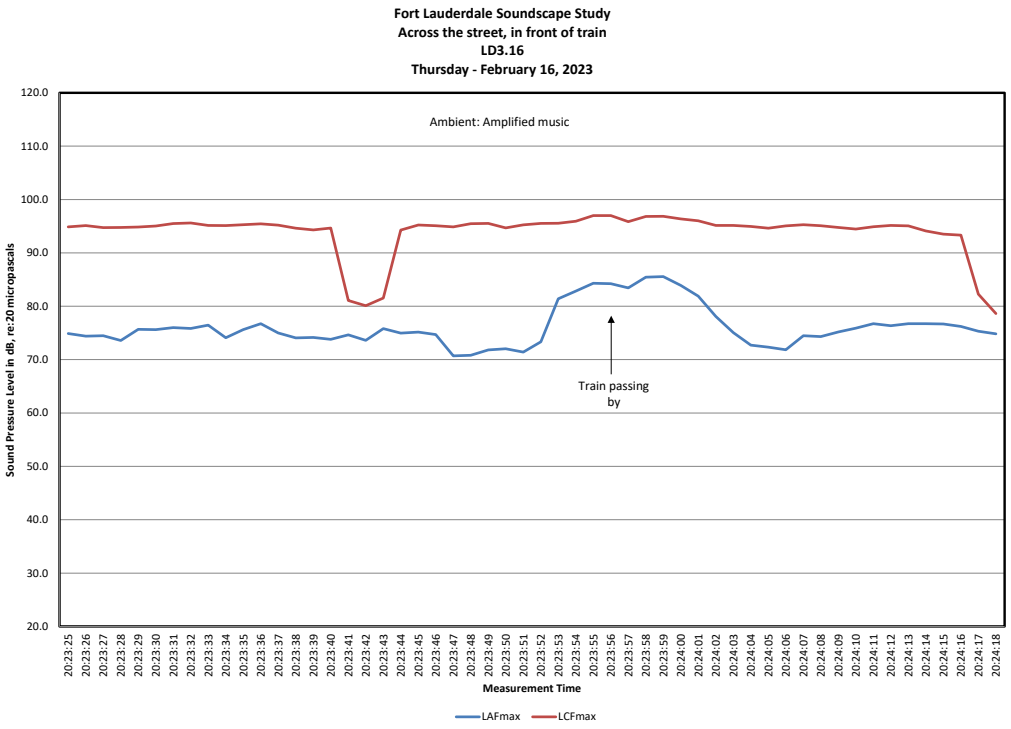
Fort Lauderdale Soundscape Study
The Hub
LD3.12
Thursday - February 16, 2023



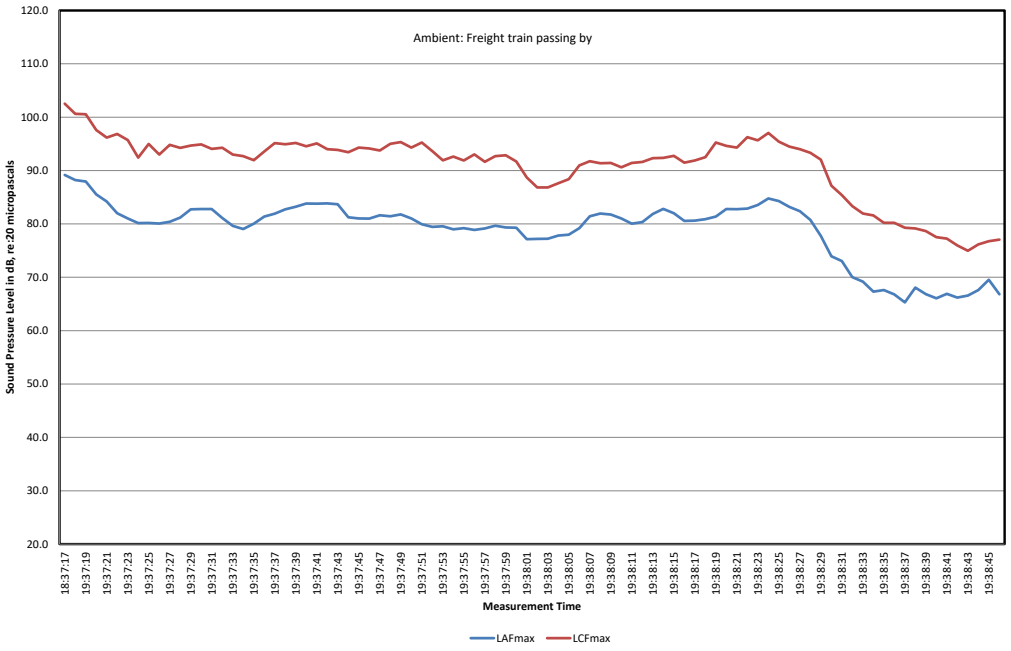

Fort Lauderdale Soundscape Study
Bamboo Flats
LD3.13
Thursday- February 16, 2023
Ambient: Traffic, crickets, dog barking
Sound Pressure Level in dB, re:20 micropascals
Freight train
Car passing by
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
Bamboo Flats
LD3.14
Thursday - February 16, 2023
Ambient: Crickets, dog barking, traffic
Sound Pressure Level in dB, re:20 micropascals
Freight train
Train passing by
Measurement Time
LAFmax
LCFmax

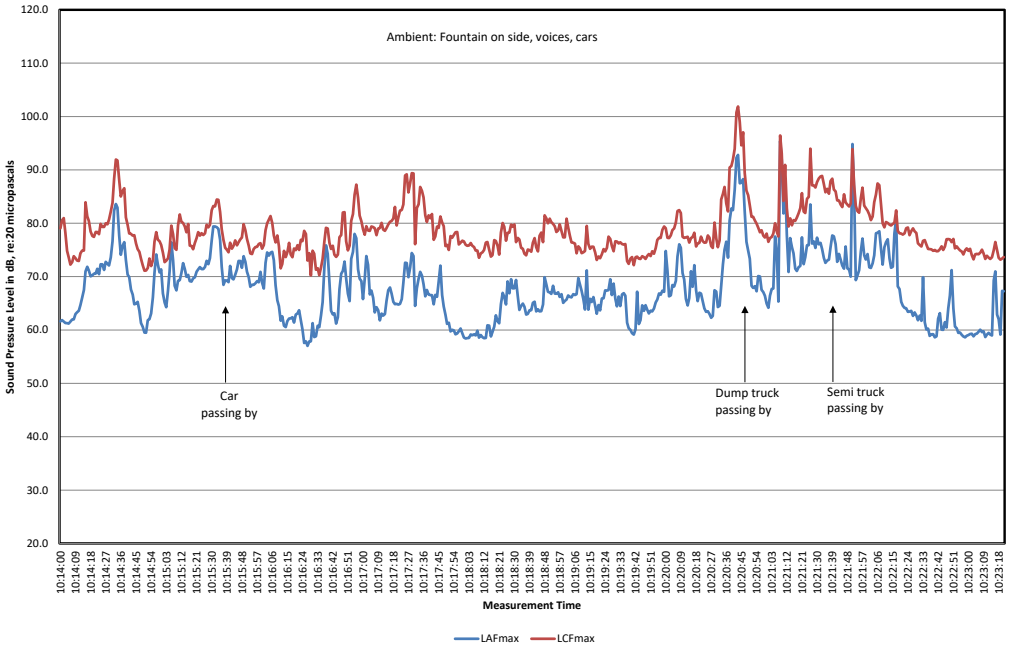

Fort Lauderdale Soundscape Study
By train tracks
LD3.15
Thursday - February 16, 2023
Ambient: Pizza place playing amplified music. Bells and car pass by
Bell warnings
Car passing by
Bell warnings
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
Across the street, in front of train
LD3.16
Thursday - February 16, 2023
Ambient: Amplified music
Train passing by
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

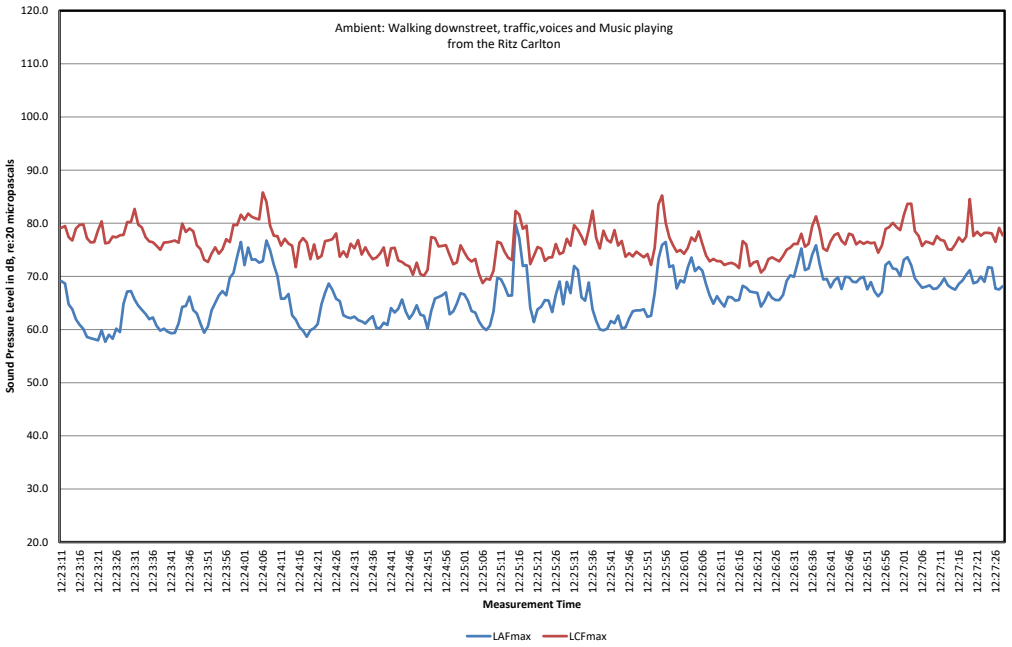
Fort Lauderdale Soundscape Study
Aida
LD3.17
Thursday - February 16, 2023



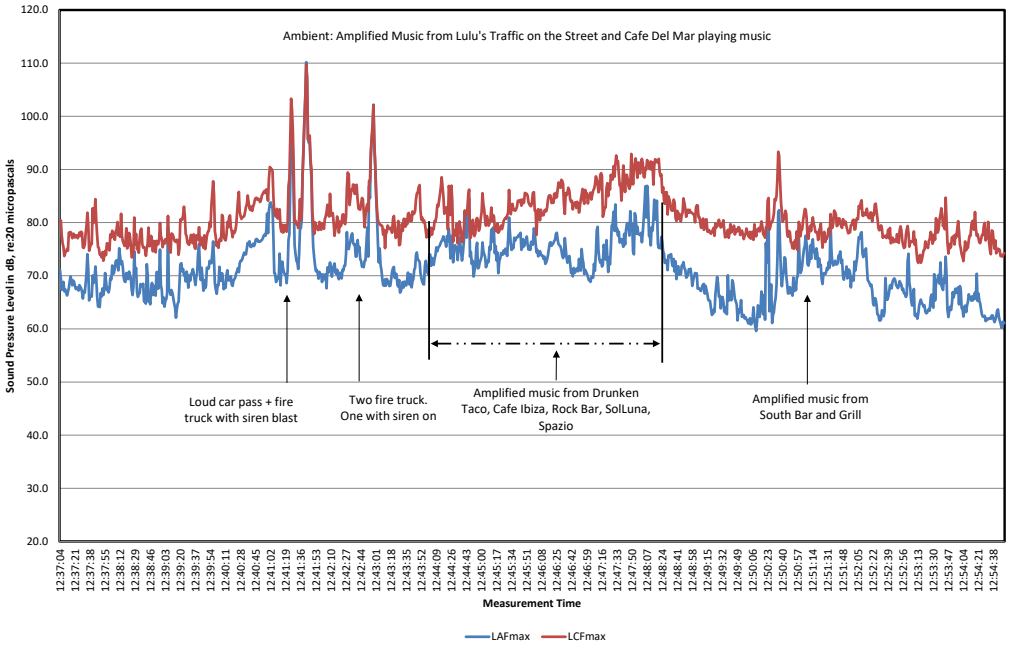
Fort Lauderdale Soundscape Study
Soundwalk along the beach
LD3.18
Friday - February 17, 2023



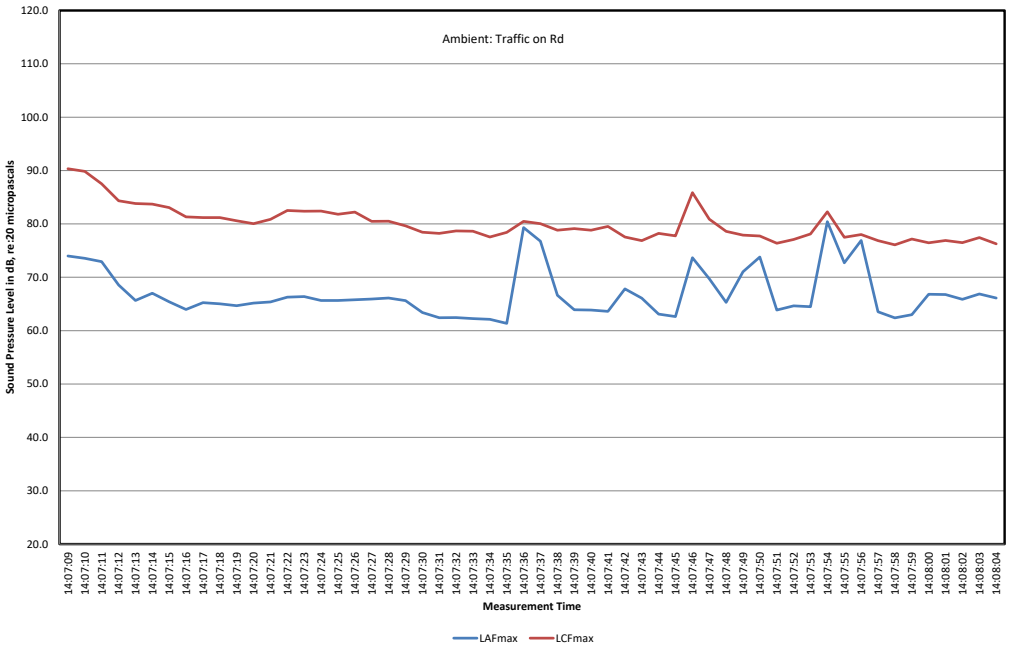
Fort Lauderdale Soundscape Study
Beach Soundwalk Start at Svantek 205 and end at CVS
LD3.19
Friday - February 17, 2023



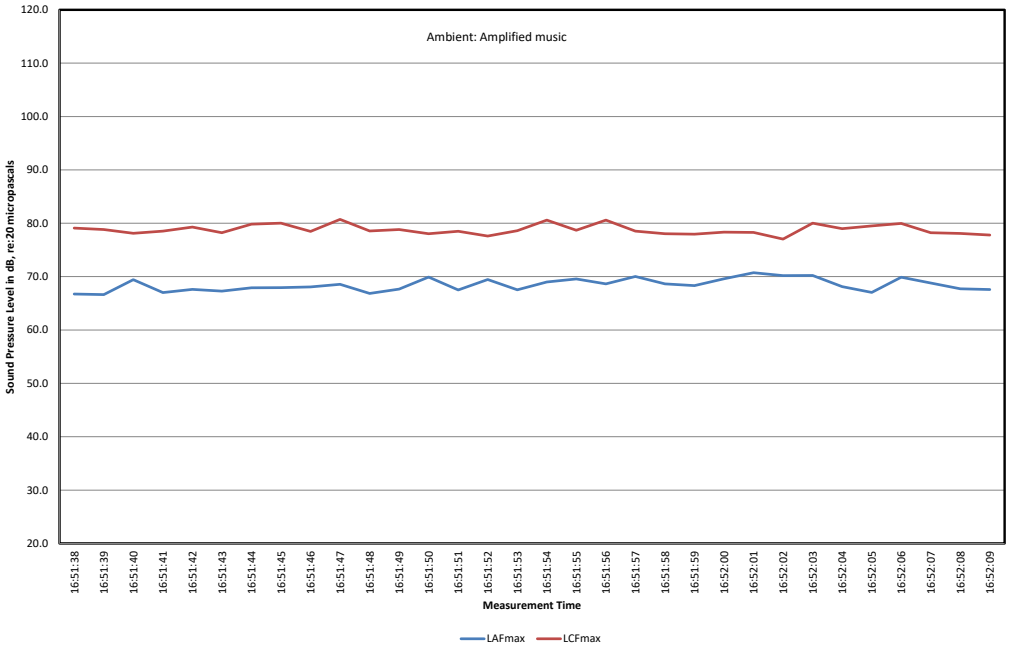
Fort Lauderdale Soundscape Study
Soundwalk: Beach Soundwalk Start at CVS to Cafe Del Mar
LD3.20
Friday - February 17, 2023



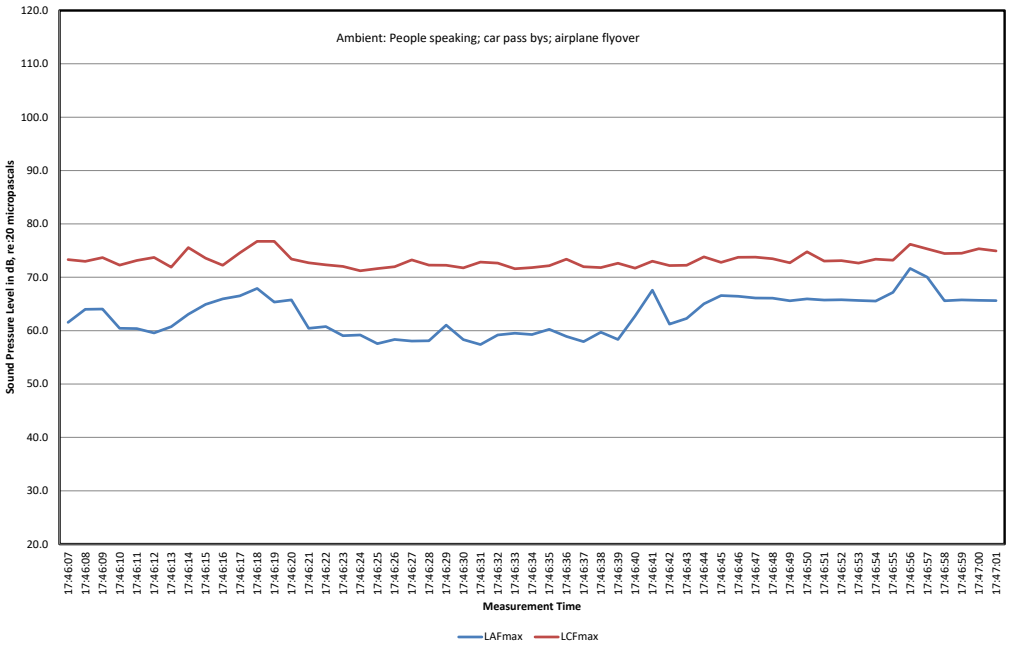
Fort Lauderdale Soundscape Study
Soundwalk: From hotel to Las Olas
LD3.21
Friday - February 17, 2023



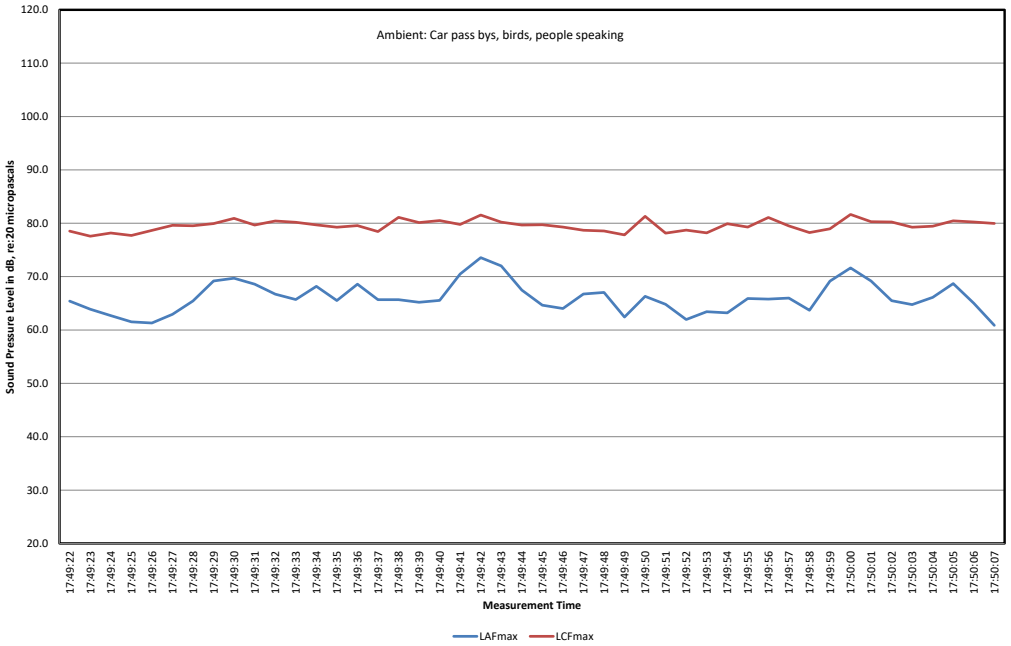
Fort Lauderdale Soundscape Study
5 ft from The Wharf
LD3.22
Friday - February 17, 2023

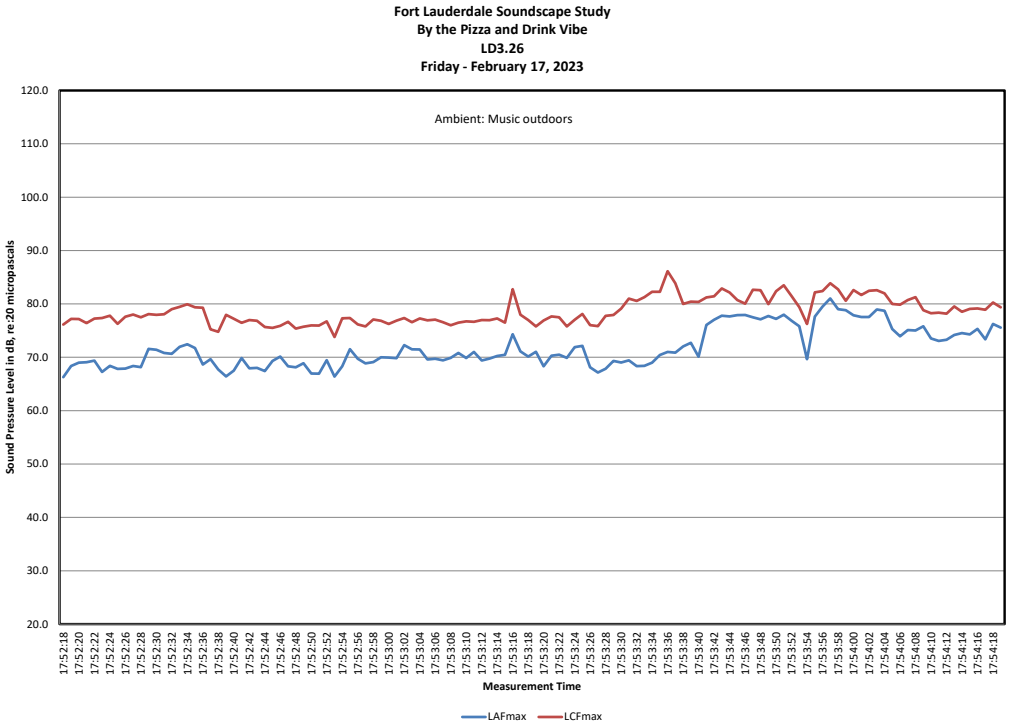


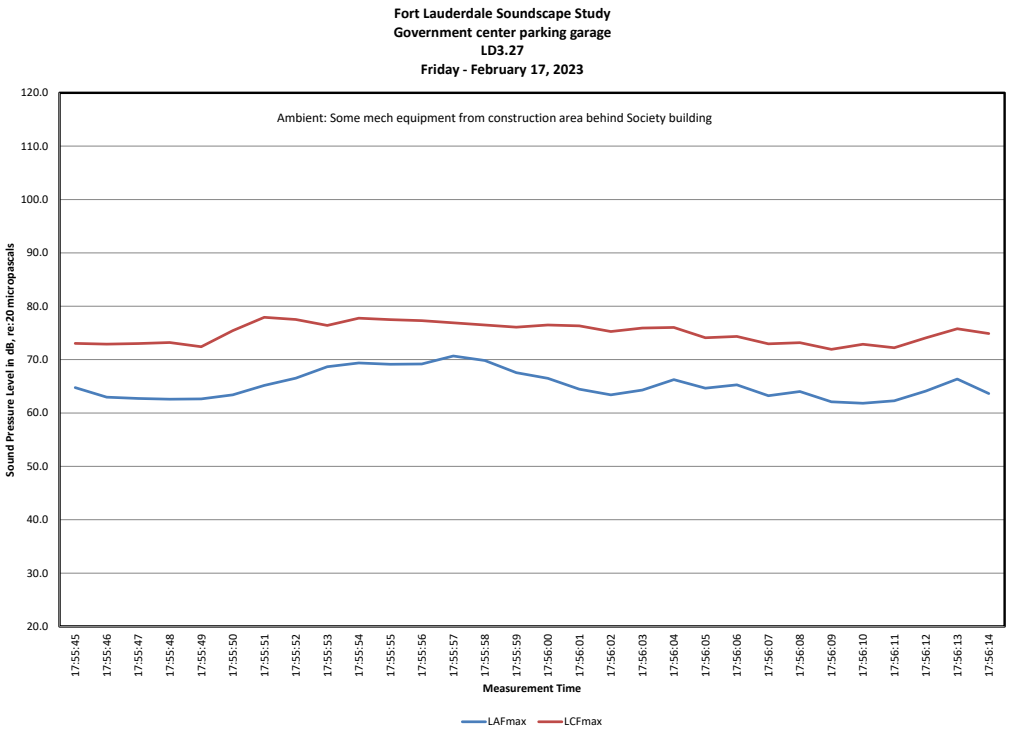
Fort Lauderdale Soundscape Study
Near the IMAX theater
LD3.24
Friday - February 17, 2023



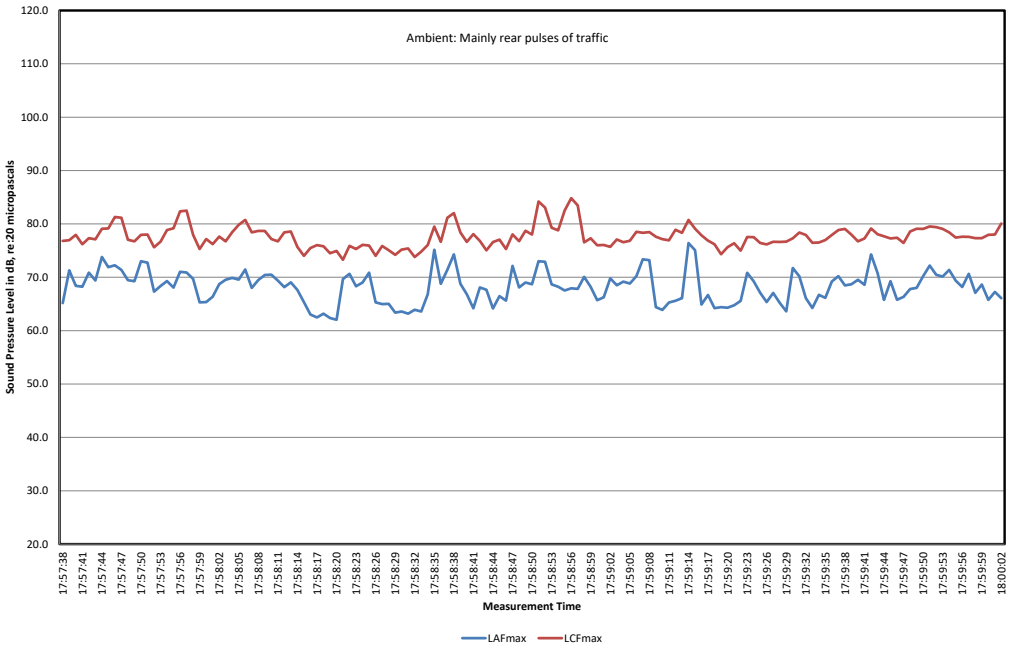
Fort Lauderdale Soundscape Study
By OO's
LD3.25
Friday - February 17, 2023



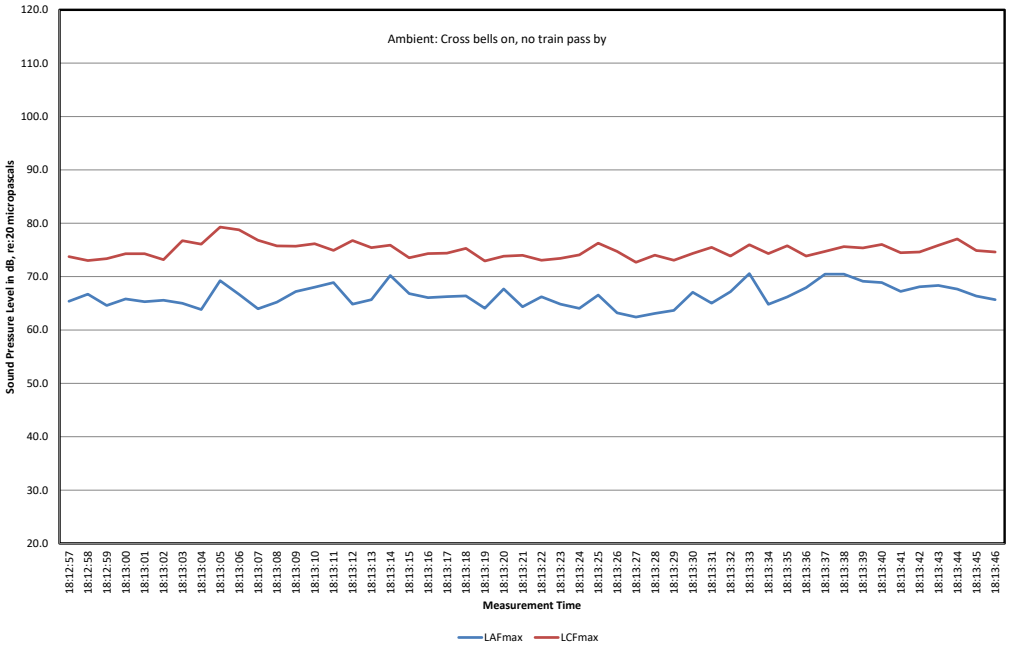

Fort Lauderdale Soundscape Study
By the Pizza and Drink Vibe
LD3.26
Friday - February 17, 2023
Ambient: Music outdoors
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

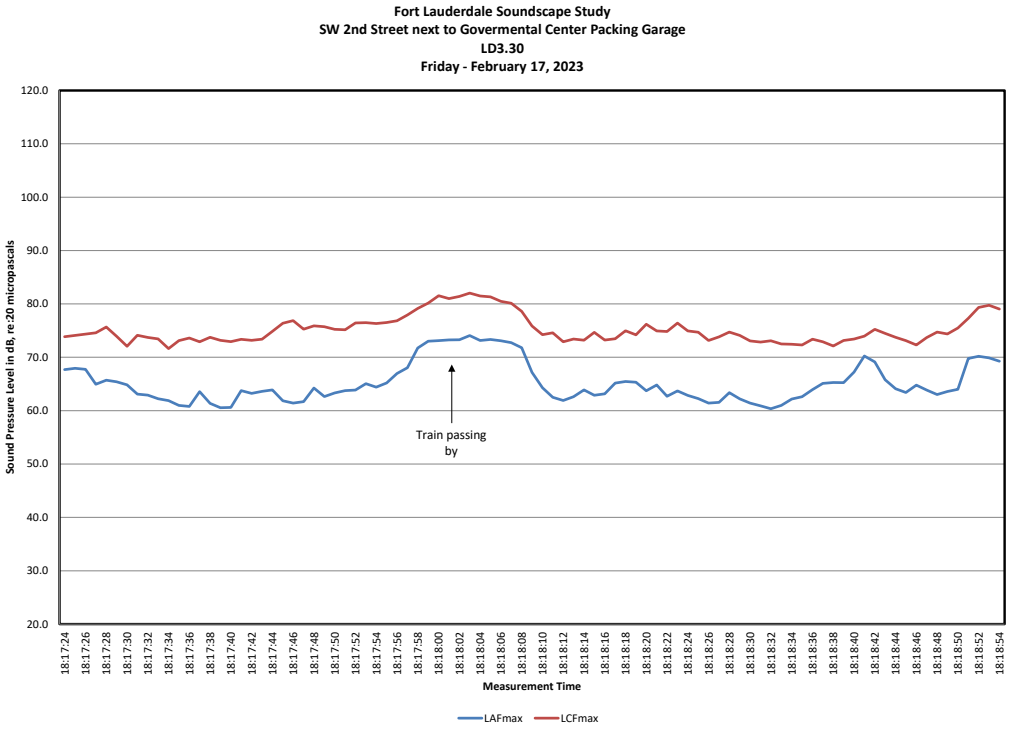

Fort Lauderdale Soundscape Study
Government center parking garage
LD3.27
Friday - February 17, 2023
Ambient: Some mech equipment from construction area behind Society building
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

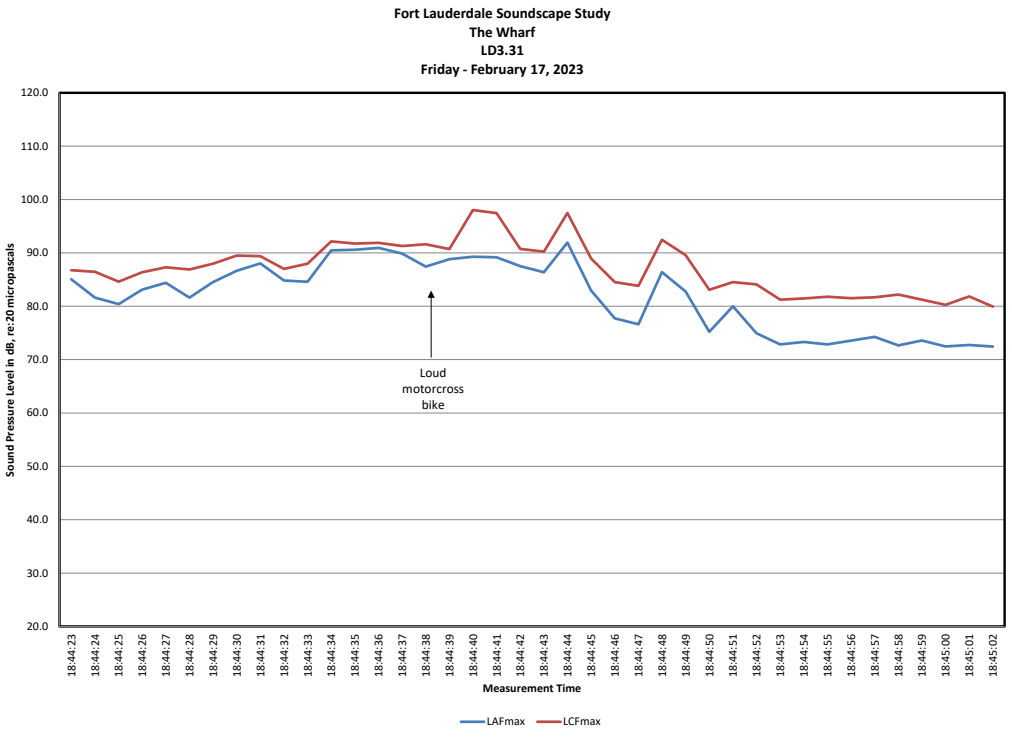
Fort Lauderdale Soundscape Study
Corner SW 1st Avenue and SW 2nd Street
LD3.28
Friday - February 17, 2023

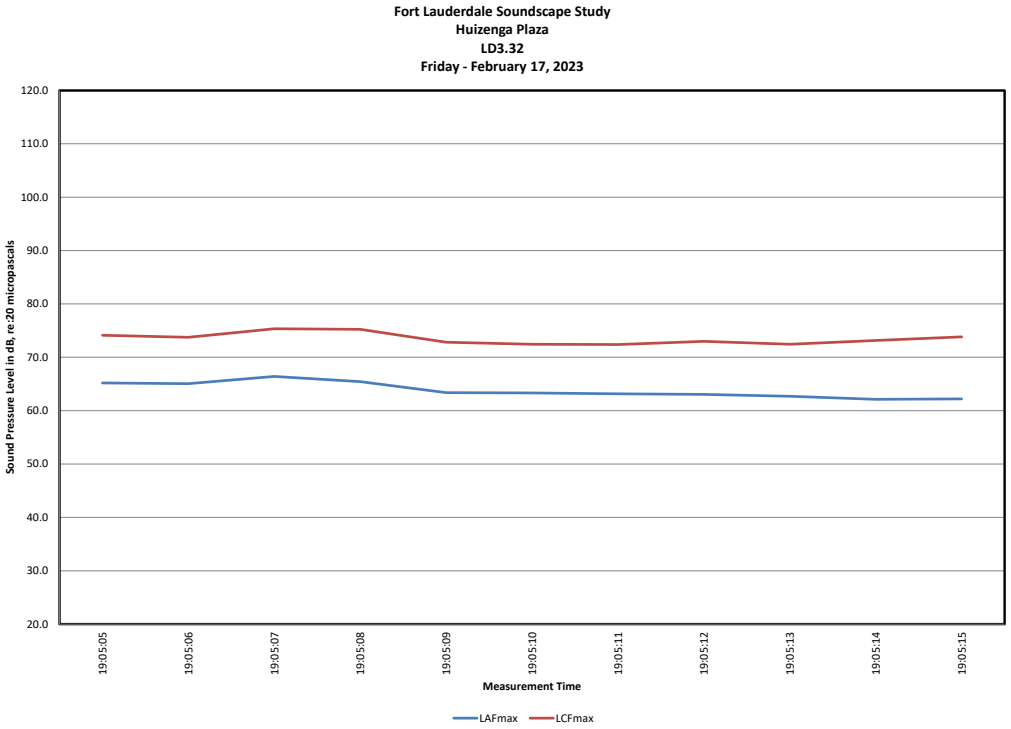


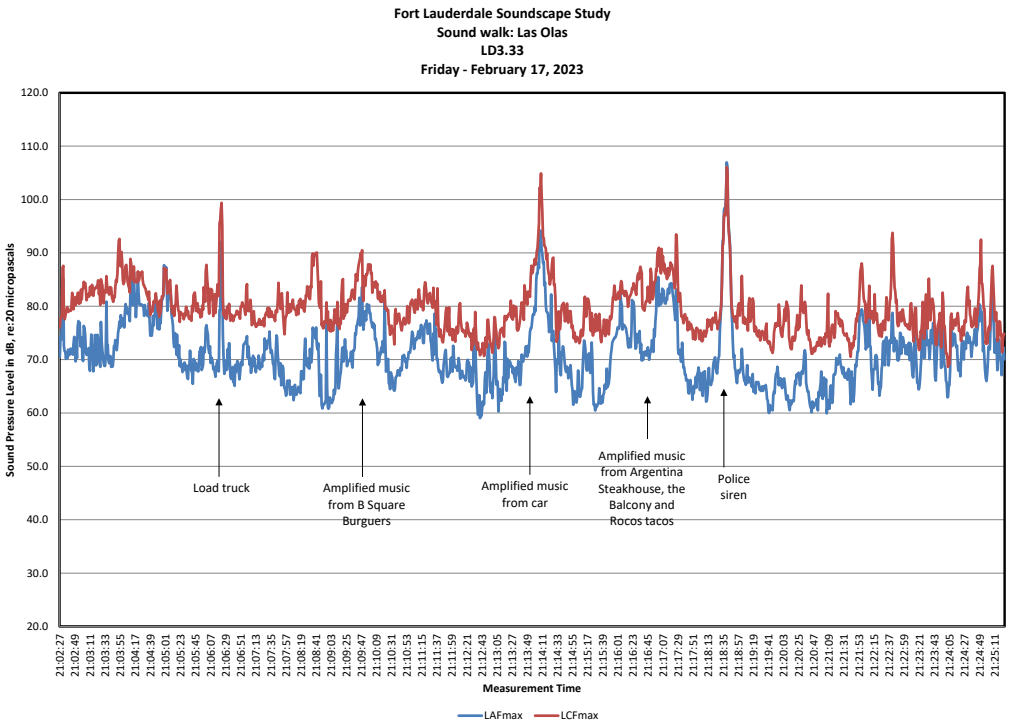
Fort Lauderdale Soundscape Study
SW 2nd Street next to Govermental Center Packing Garage
LD3.29
Friday - February 17, 2023

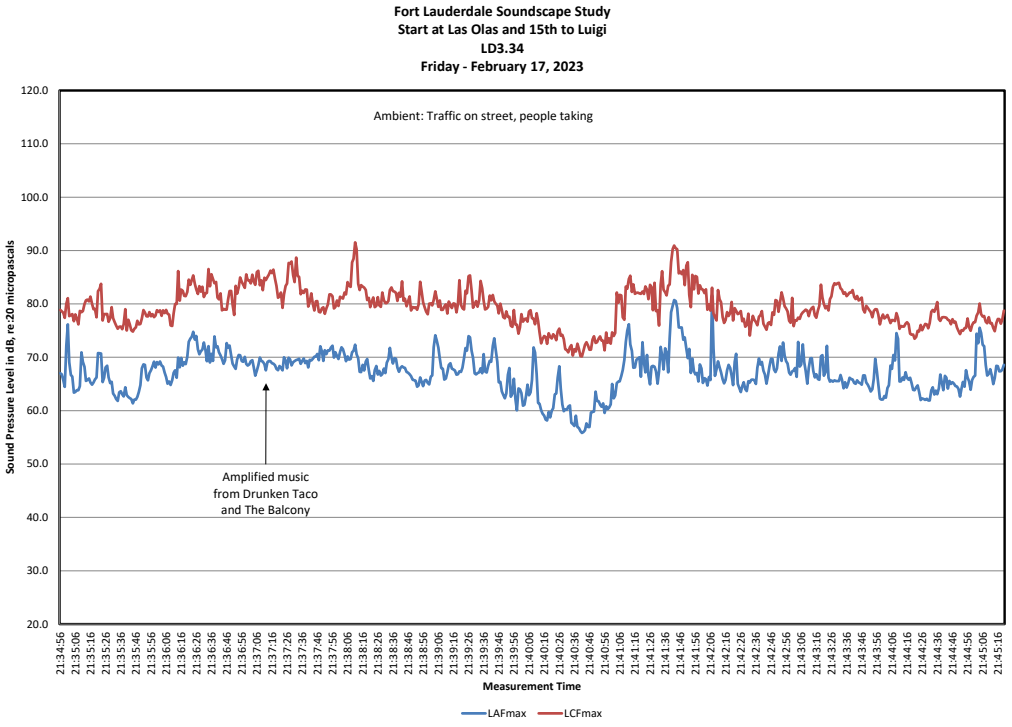


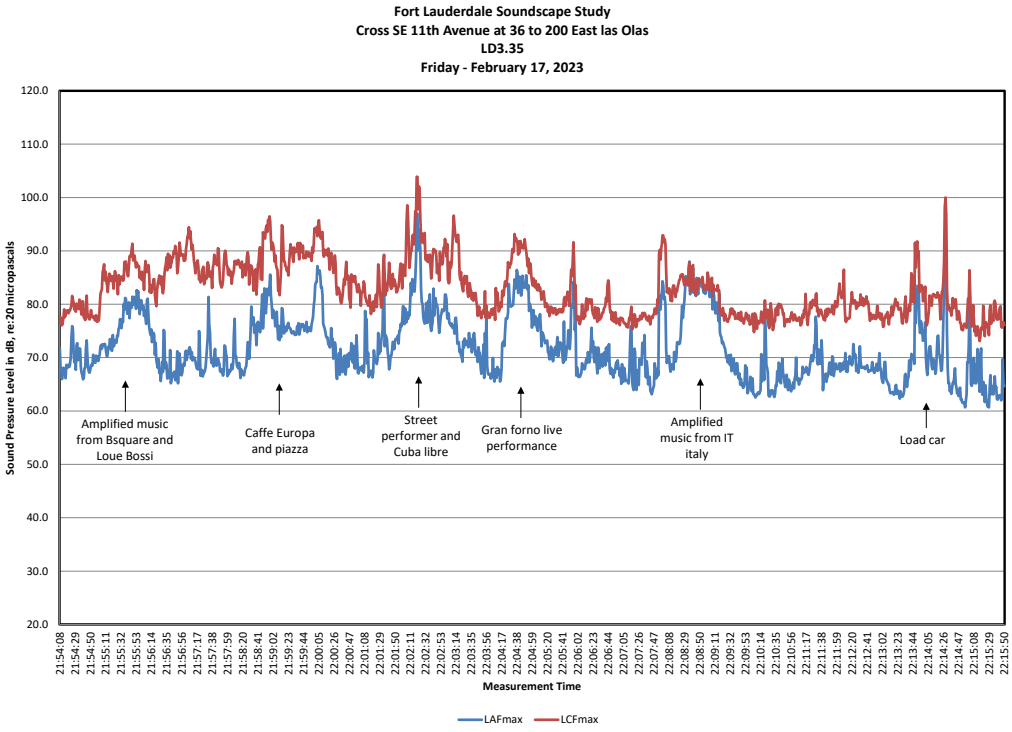

Fort Lauderdale Soundscape Study
SW 2nd Street next to Govermental Center Packing Garage
LD3.30
Friday - February 17, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
Train passing by
LAFmax
LCFmax

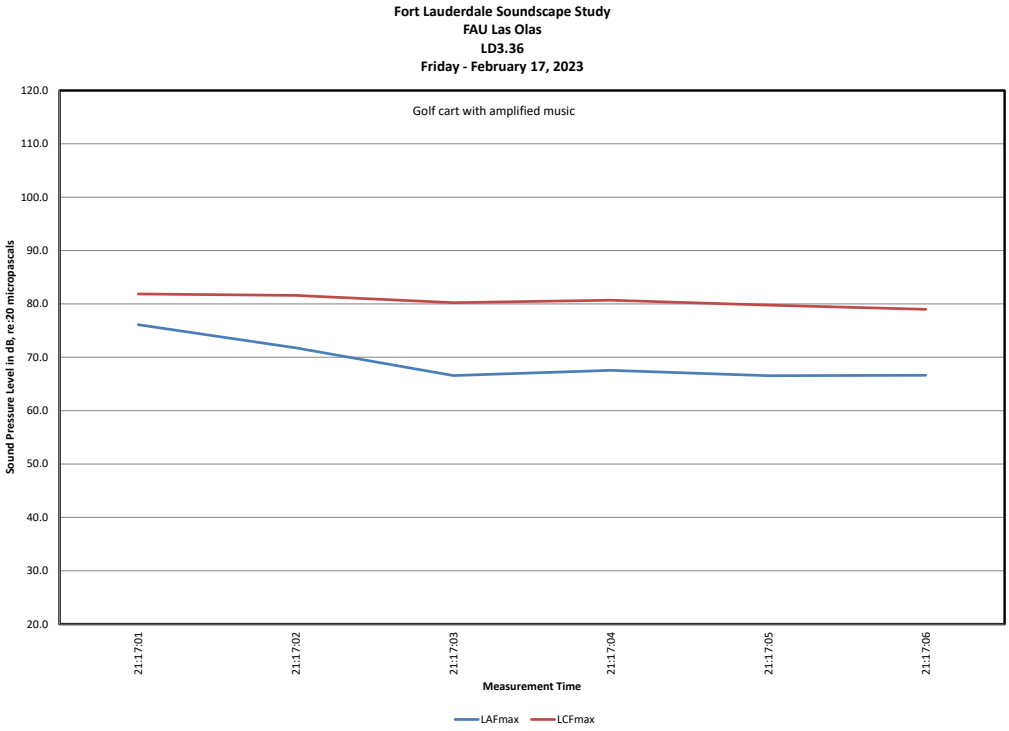

Fort Lauderdale Soundscape Study
The Wharf
LD3.31
Friday - February 17, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
Loud motorcross bike
LAFmax
LCFmax

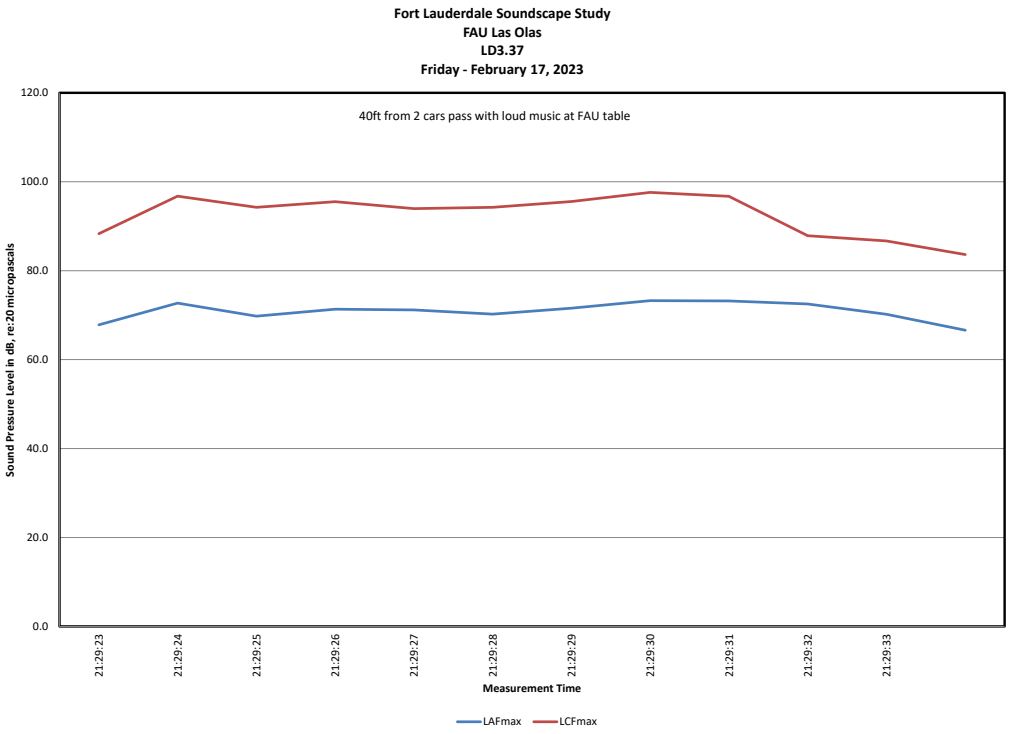

Fort Lauderdale Soundscape Study
Huizenga Plaza
LD3.32
Friday - February 17, 2023
Sound Pressure Level in dB, re:20 micropascals
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
19:05:05
19:05:06
19:05:07
19:05:08
19:05:09
19:05:10
19:05:11
19:05:12
19:05:13
19:05:14
19:05:15
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
Sound walk: Las Olas
LD3.33
Friday - February 17, 2023
Sound Pressure Level in dB, re:20 micropascals
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
Load truck
Amplified music from B Square Burguers
Amplified music from car
Amplified music from Argentina Steakhouse, the Balcony and Rocos tacos
Police siren
Measurement Time
LAFmax
LCFmax

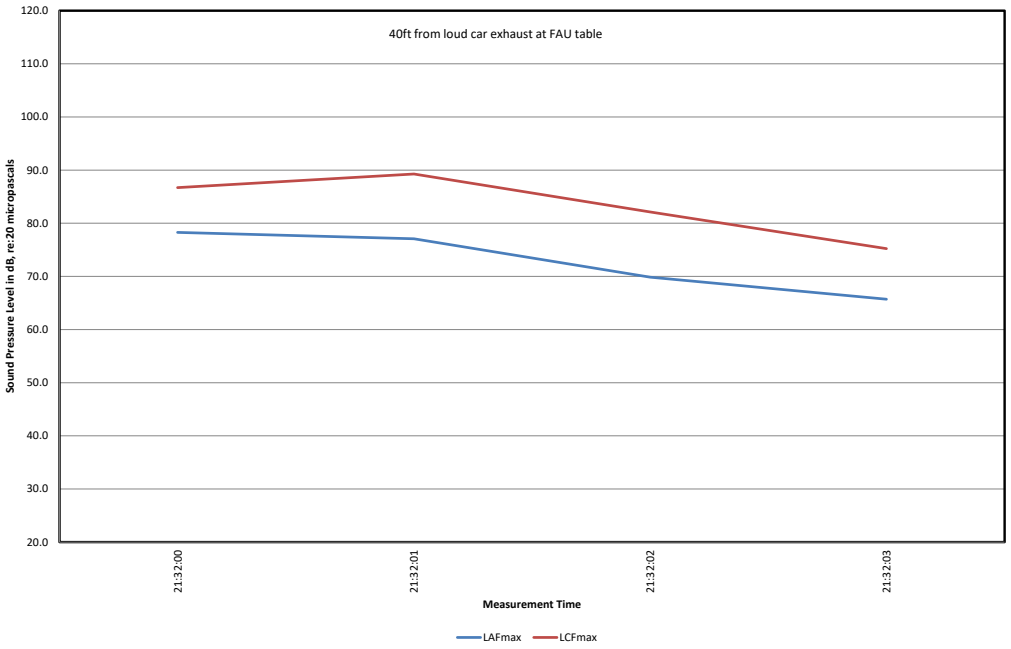

Fort Lauderdale Soundscape Study
Start at Las Olas and 15th to Luigi
LD3.34
Friday - February 17, 2023
Ambient: Traffic on street, people taking
Amplified music from Drunken Taco and The Balcony
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
Cross SE 11th Avenue at 36 to 200 East las Olas
LD3.35
Friday - February 17, 2023
Amplified music from Bsquare and Loue Bossi
Caffe Europa and piazza
Street performer and Cuba libre
Gran forno live performance
Amplified music from IT italy
Load car
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

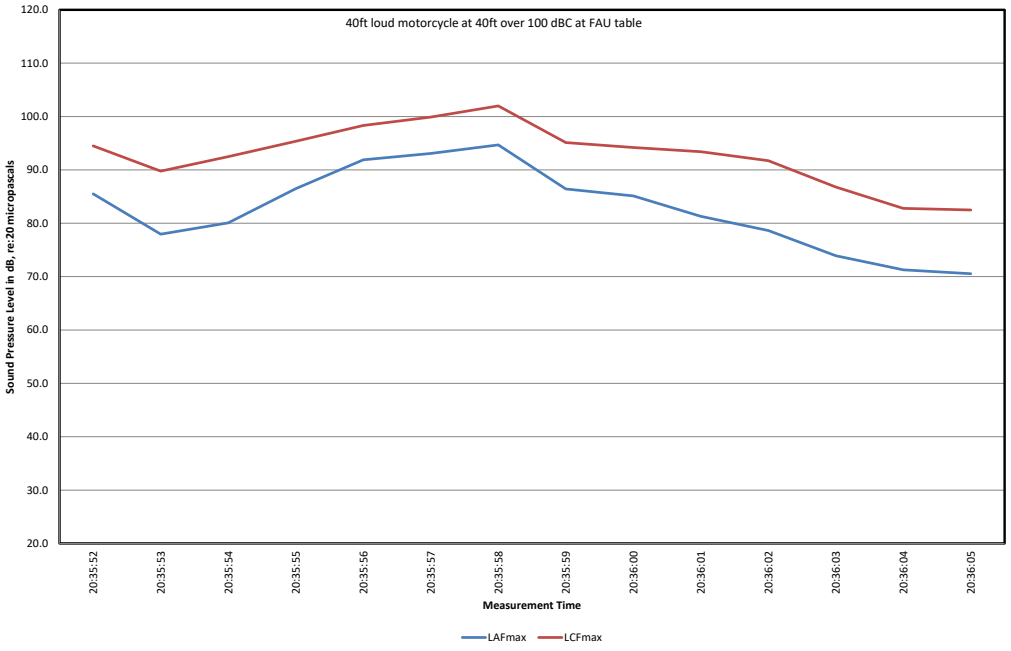

Fort Lauderdale Soundscape Study
FAU Las Olas
LD3.36
Friday - February 17, 2023
Golf cart with amplified music
Sound Pressure Level in dB, re:20 micropascals
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
21:17:01
21:17:02
21:17:03
21:17:04
21:17:05
21:17:06
Measurement Time
LAFmax
LCFmax

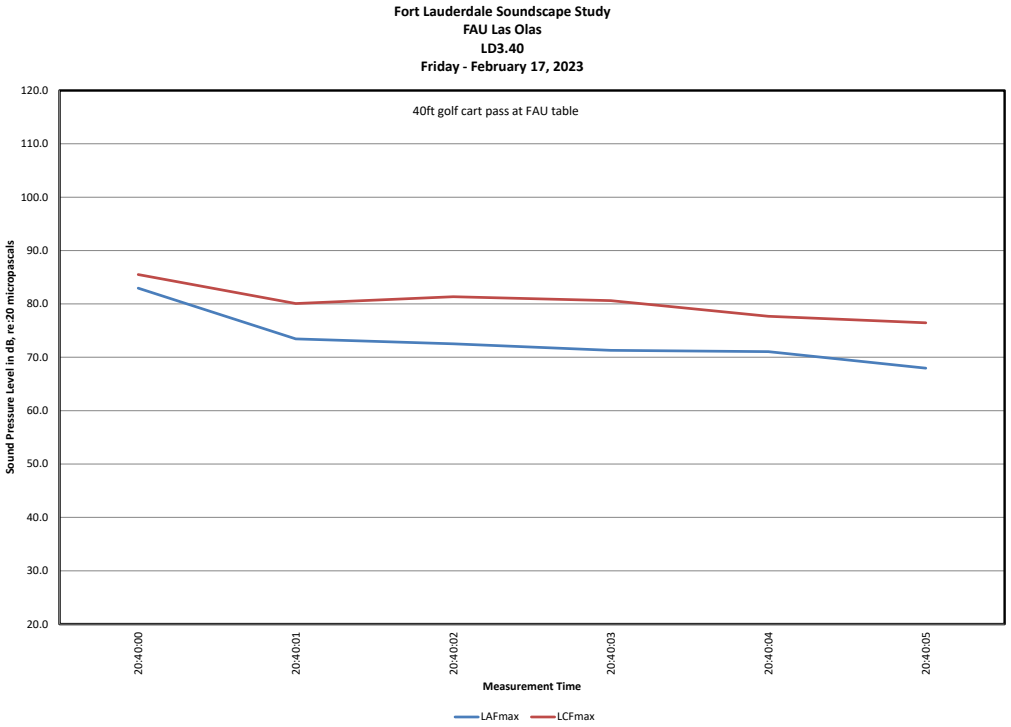

Fort Lauderdale Soundscape Study
FAU Las Olas
LD3.37
Friday - February 17, 2023
40ft from 2 cars pass with loud music at FAU table
Sound Pressure Level in dB, re:20 micropascals
120.0
100.0
80.0
60.0
40.0
20.0
0.0
21:29:23
21:29:24
21:29:25
21:29:26
21:29:27
21:29:28
21:29:29
21:29:30
21:29:31
21:29:32
21:29:33
Measurement Time
LAFmax
LCFmax

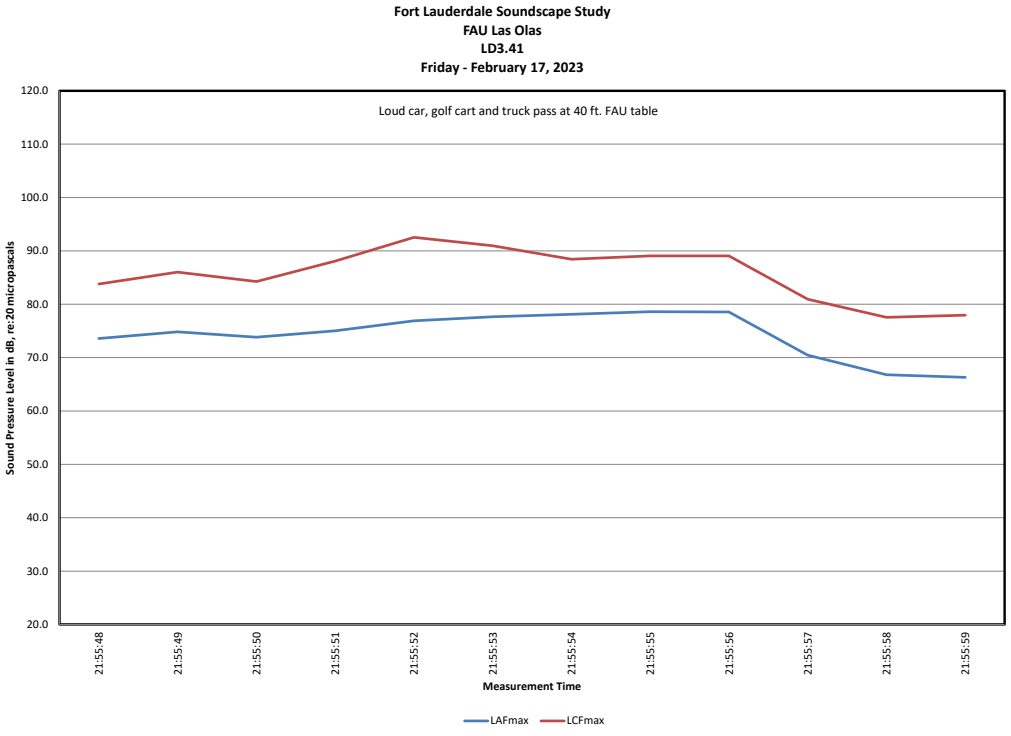
Fort Lauderdale Soundscape Study
FAU Las Olas
LD3.38
Friday - February 17, 2023

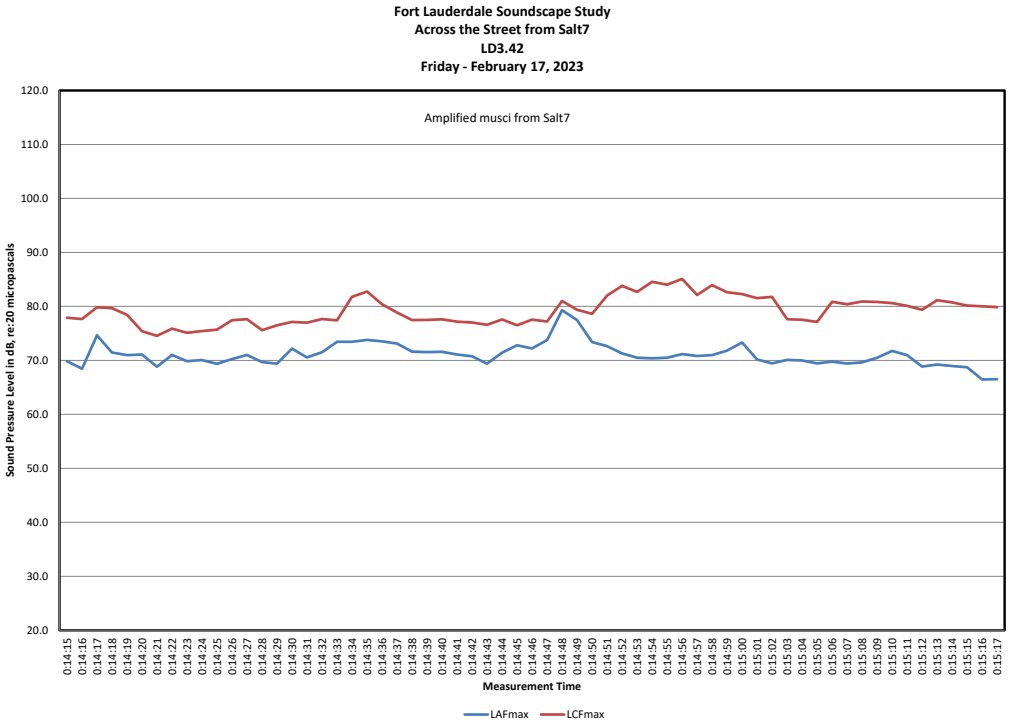


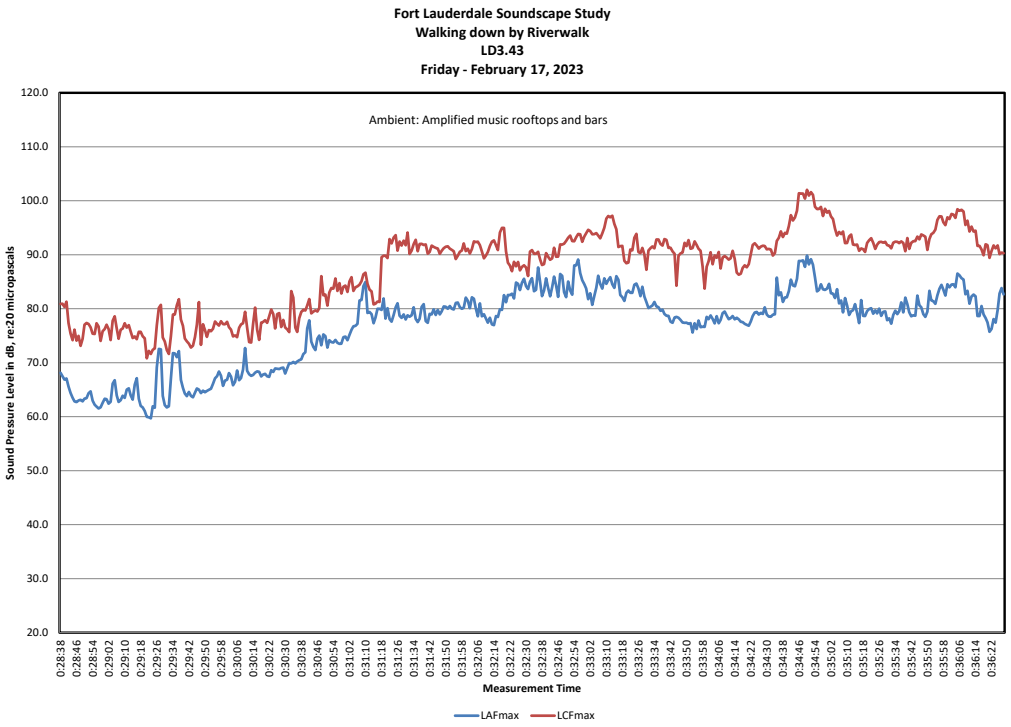
Fort Lauderdale Soundscape Study
FAU Las Olas
LD3.39
Friday - February 17, 2023



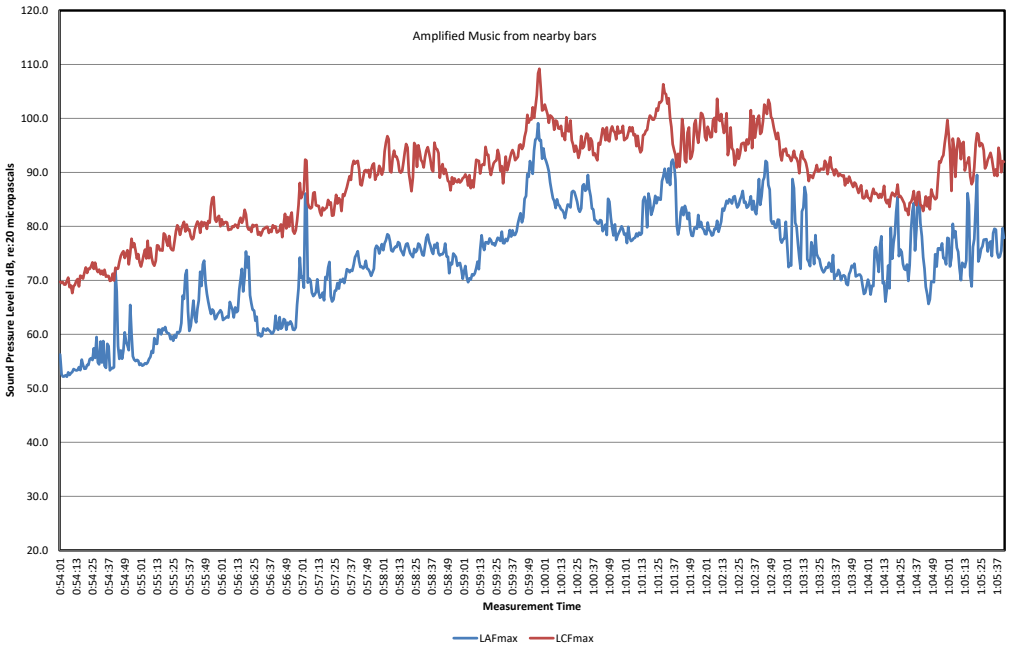

Fort Lauderdale Soundscape Study
FAU Las Olas
LD3.40
Friday - February 17, 2023
40ft golf cart pass at FAU table
Sound Pressure Level in dB, re:20 micropascals
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
20:40:00
20:40:01
20:40:02
20:40:03
20:40:04
20:40:05
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
FAU Las Olas
LD3.41
Friday - February 17, 2023
Loud car, golf cart and truck pass at 40 ft. FAU table
Sound Pressure Level in dB, re:20 micropascals
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
21:55:48
21:55:49
21:55:50
21:55:51
21:55:52
21:55:53
21:55:54
21:55:55
21:55:56
21:55:57
21:55:58
21:55:59
Measurement Time
LAFmax
LCFmax

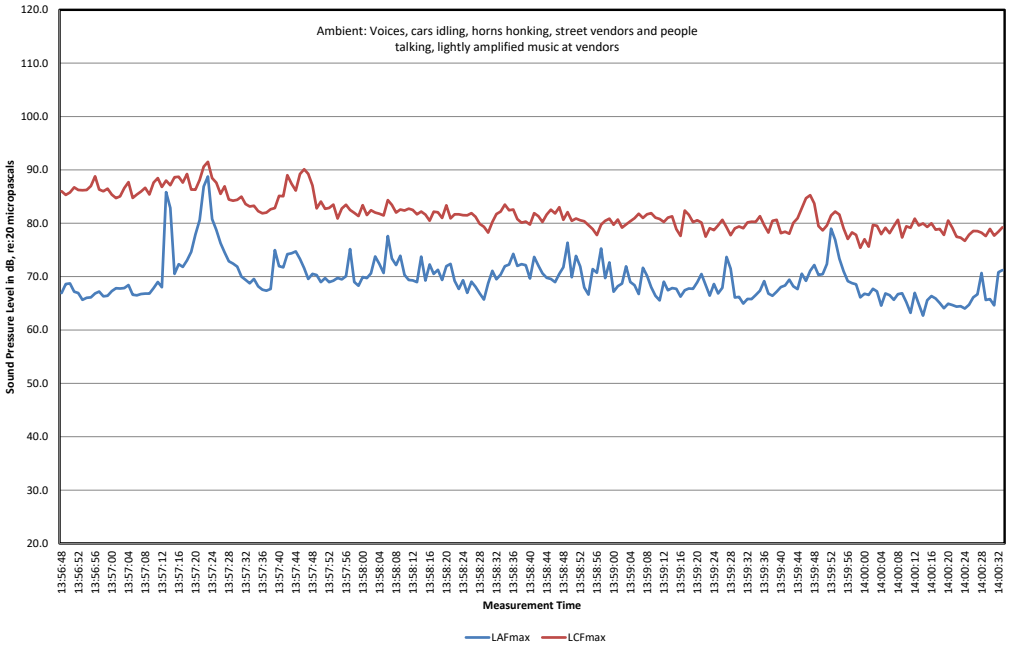

Fort Lauderdale Soundscape Study
Across the Street from Salt7
LD3.42
Friday - February 17, 2023
Amplified musci from Salt7
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
Walking down by Riverwalk
LD3.43
Friday - February 17, 2023
Ambient: Amplified music rooftops and bars
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

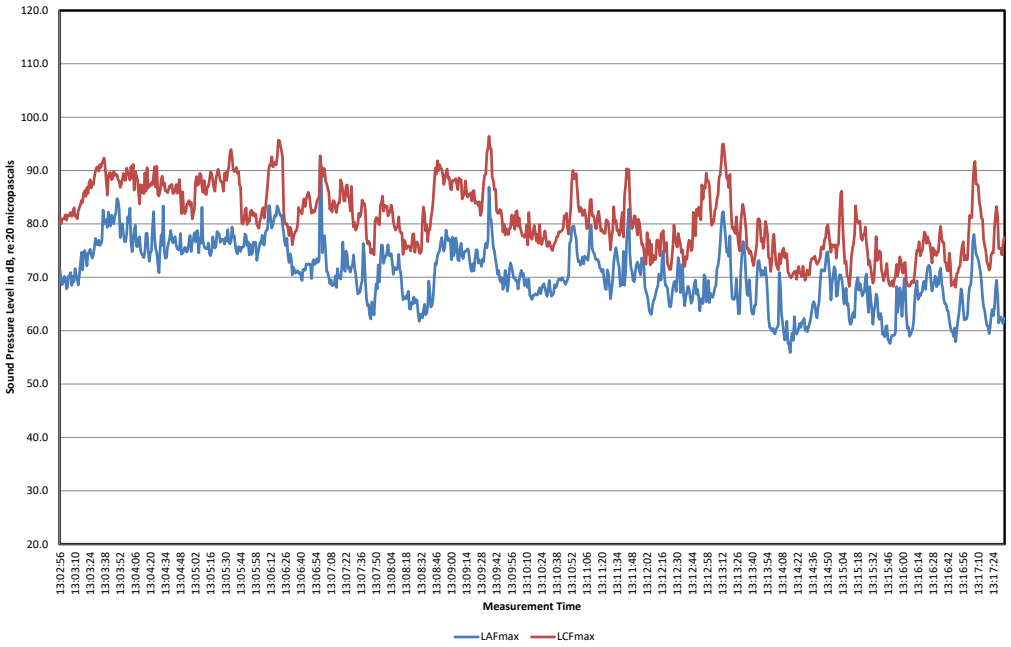
Fort Lauderdale Soundscape Study
Soundwalk Himmarshee
LD3.45
Thursday - February 17, 2023



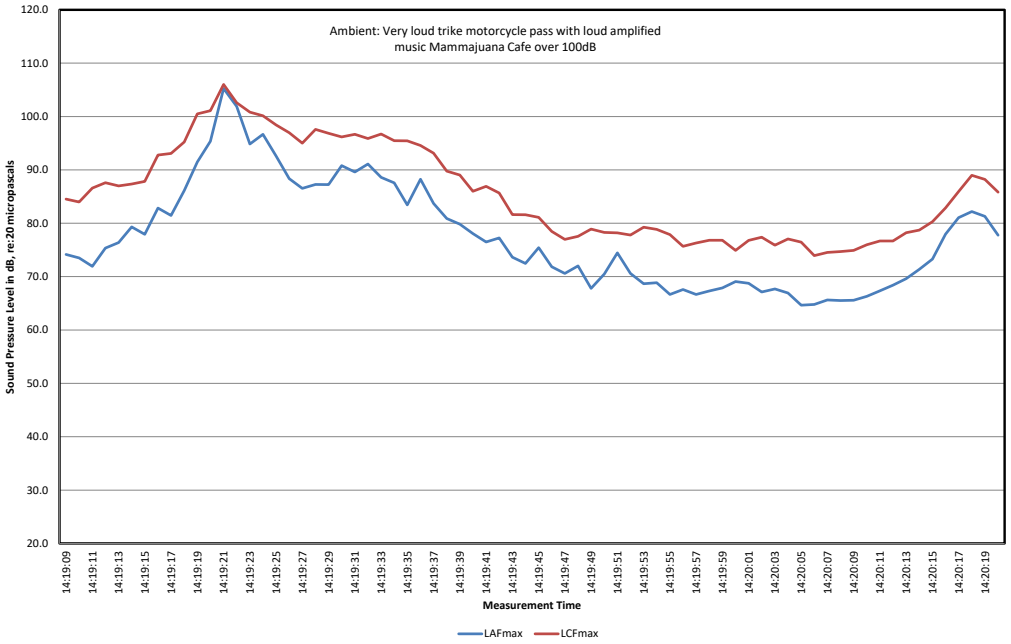
Fort Lauderdale Soundscape Study
Soundwalk to corner of Las Ola's to Farmer's Market area
LD3.46
Friday - February 18, 2023



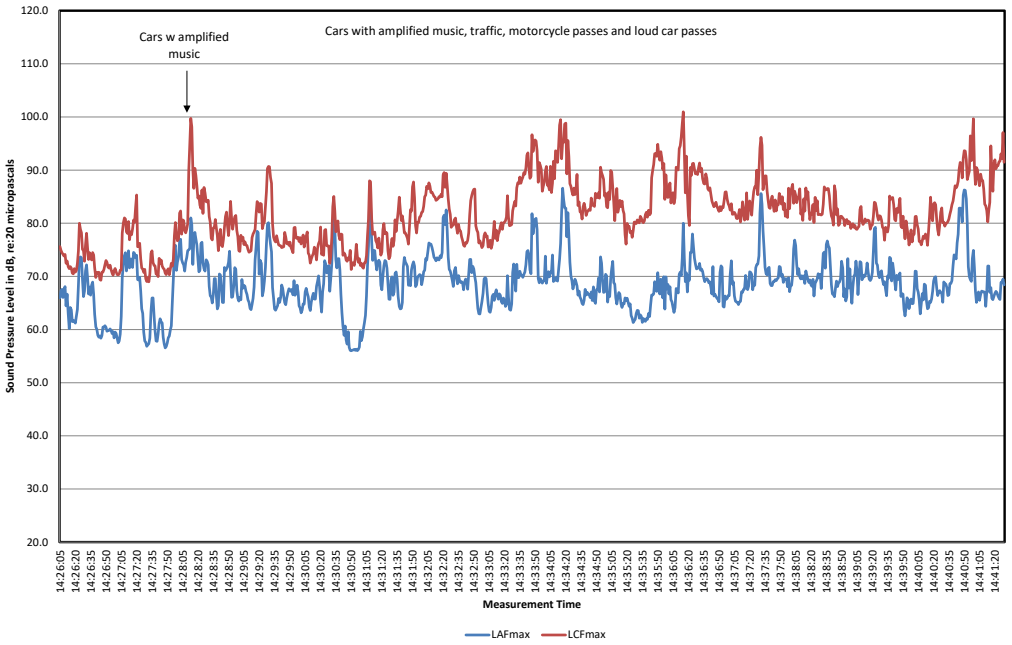
Fort Lauderdale Riverwalk
Soundwalk: Ft. Lauderdale Beach from Las Olas to Merriweather Resort
LD3.47
Friday - February 18, 2023



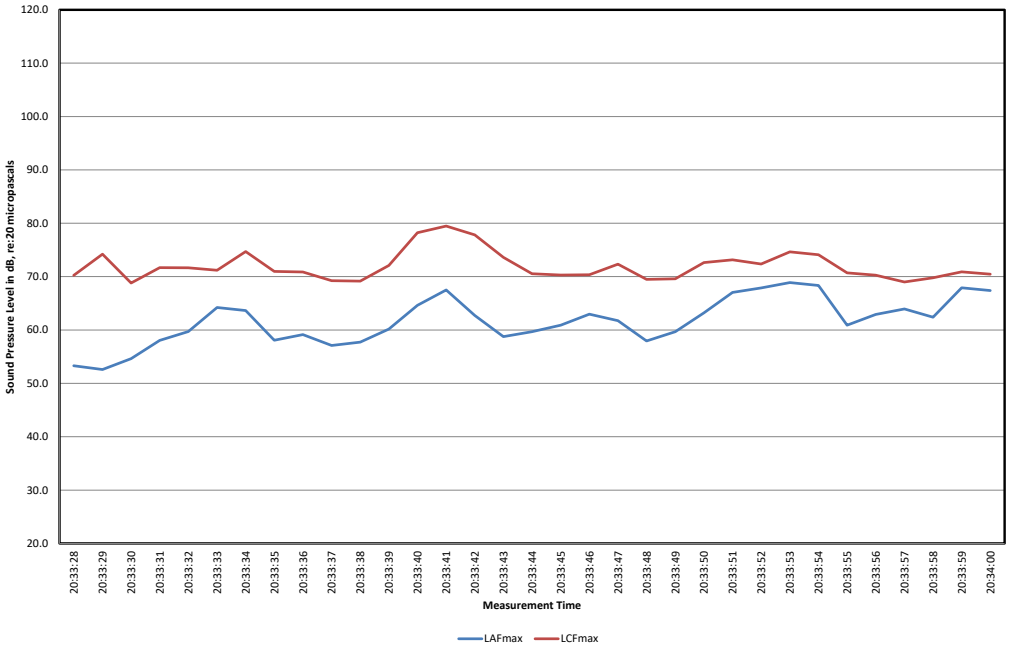
Fort Lauderdale Soundscape Study
In front of Merriweahter Resort
LD3.48
Friday - February 18, 2023



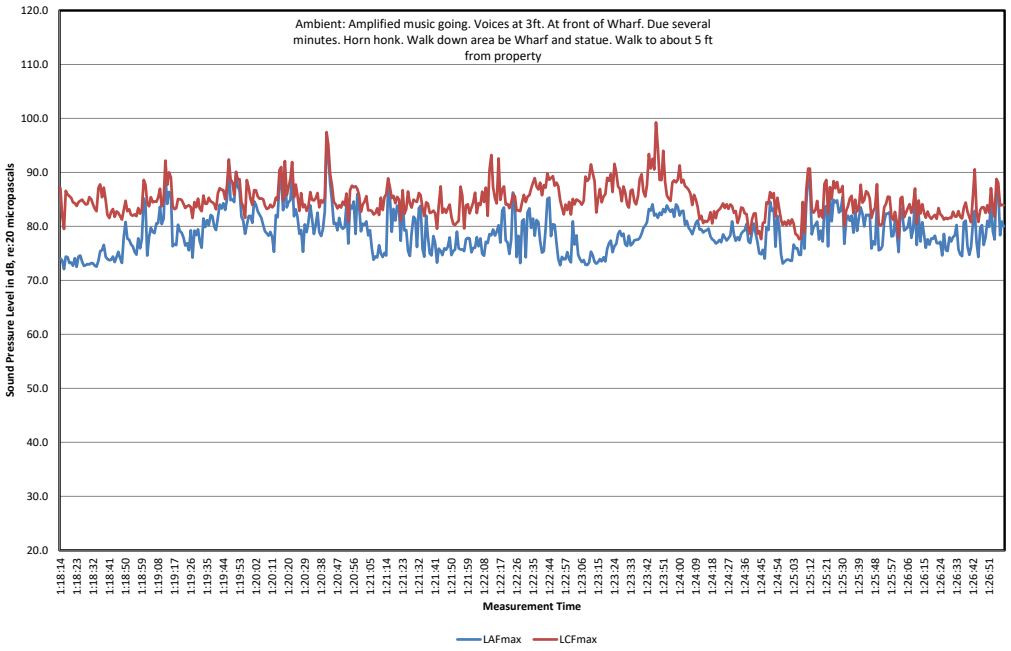
Fort Lauderdale Soundscape Study
Beach Soundwalk 1:26 up other side of A1A
LD3.49
Friday - February 18, 2023



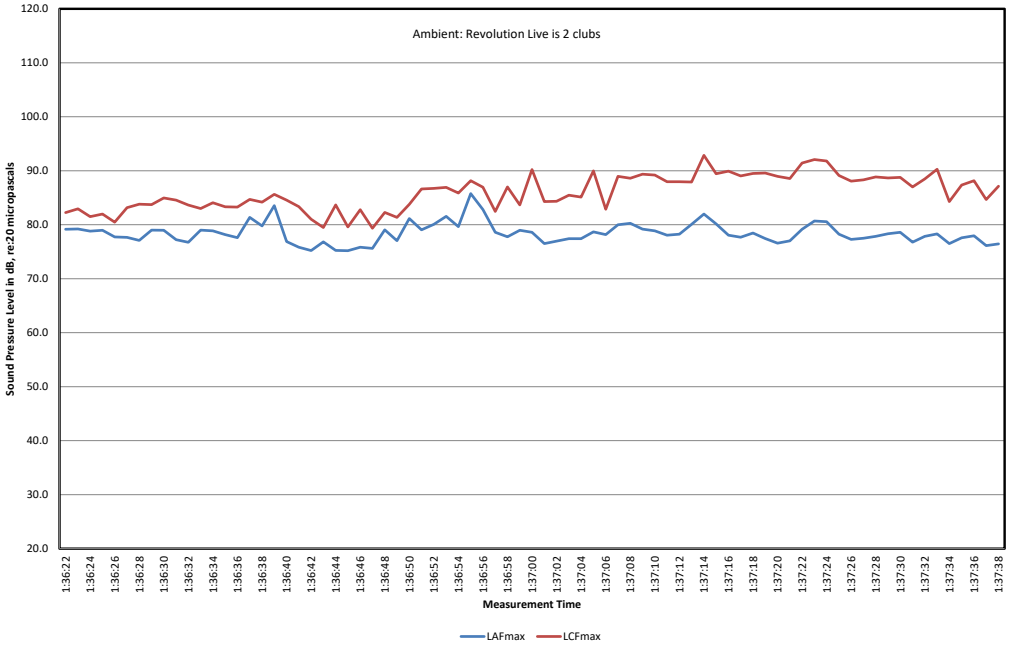
Fort Lauderdale Soundscape Study
Smittys
LD3.50
Friday - February 18, 2023

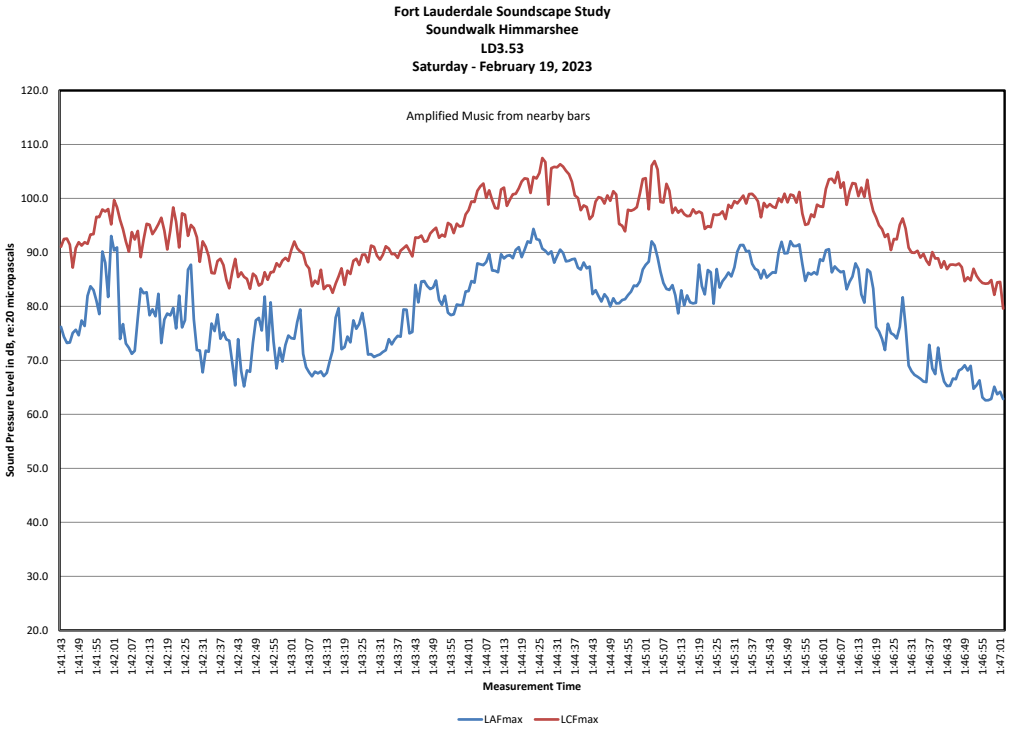


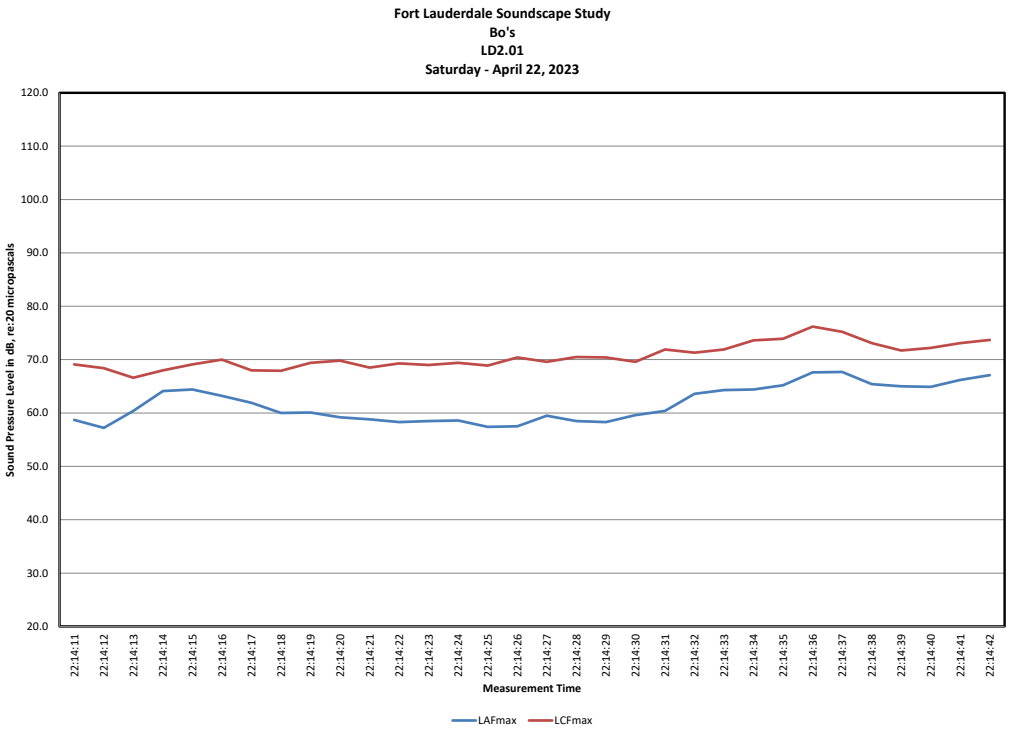
Fort Lauderdale Soundscape Study
Sounds walk from back of Wharf
LD3.51
Saturday - February 19, 2023

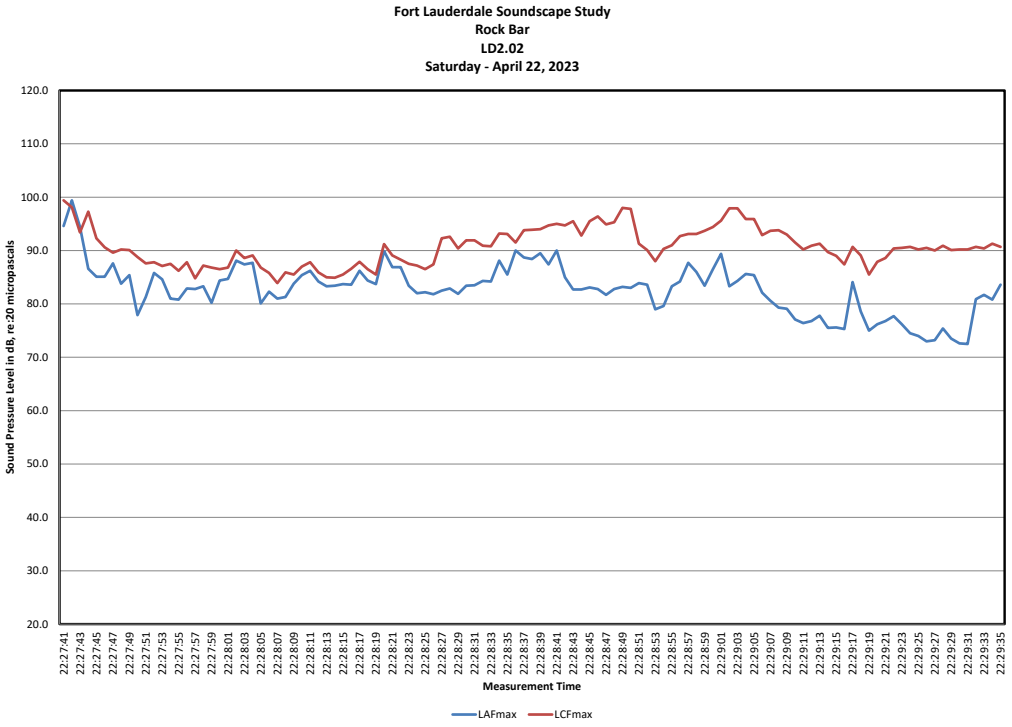


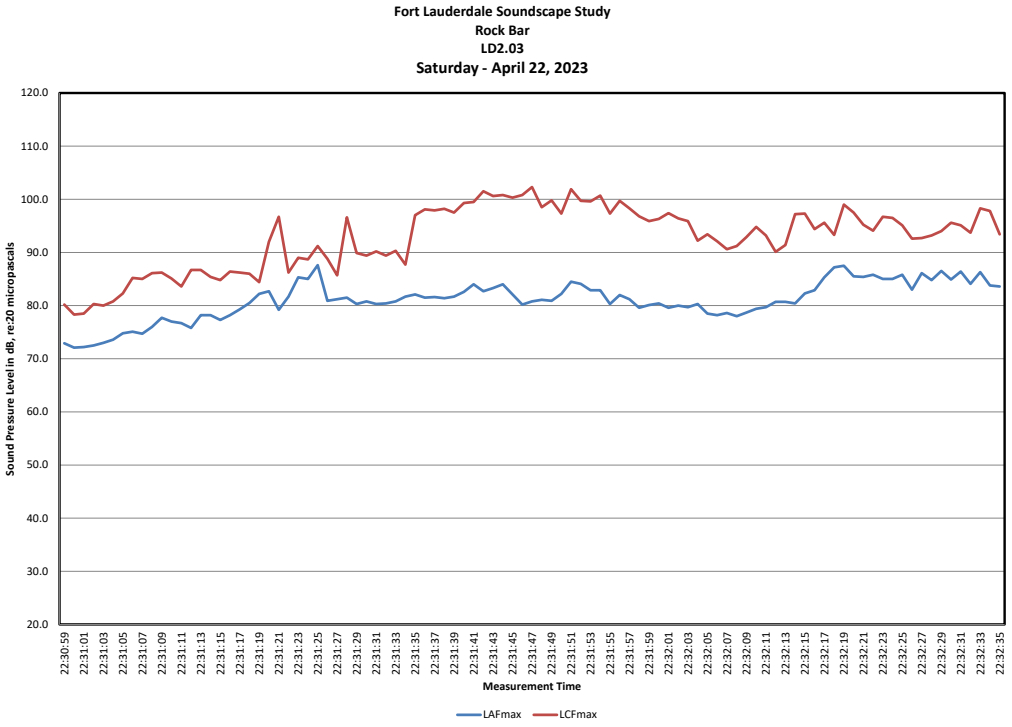
Fort Lauderdale Soundscape Study
Soundwalk Himmarshee
LD3.52
Saturday - February 19, 2023

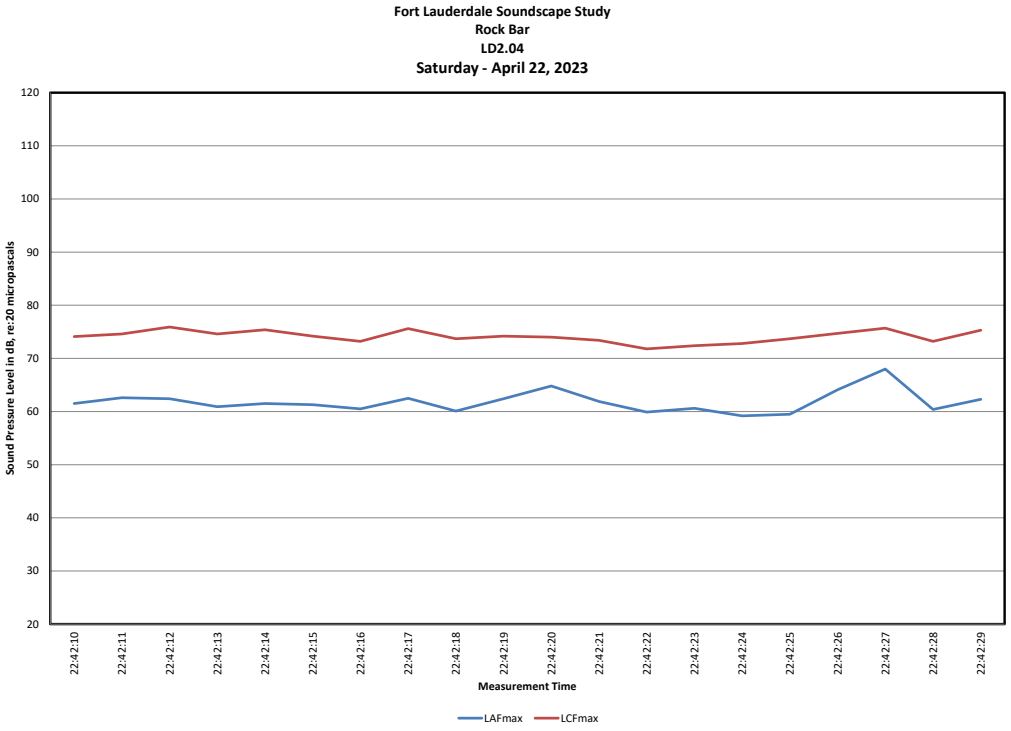


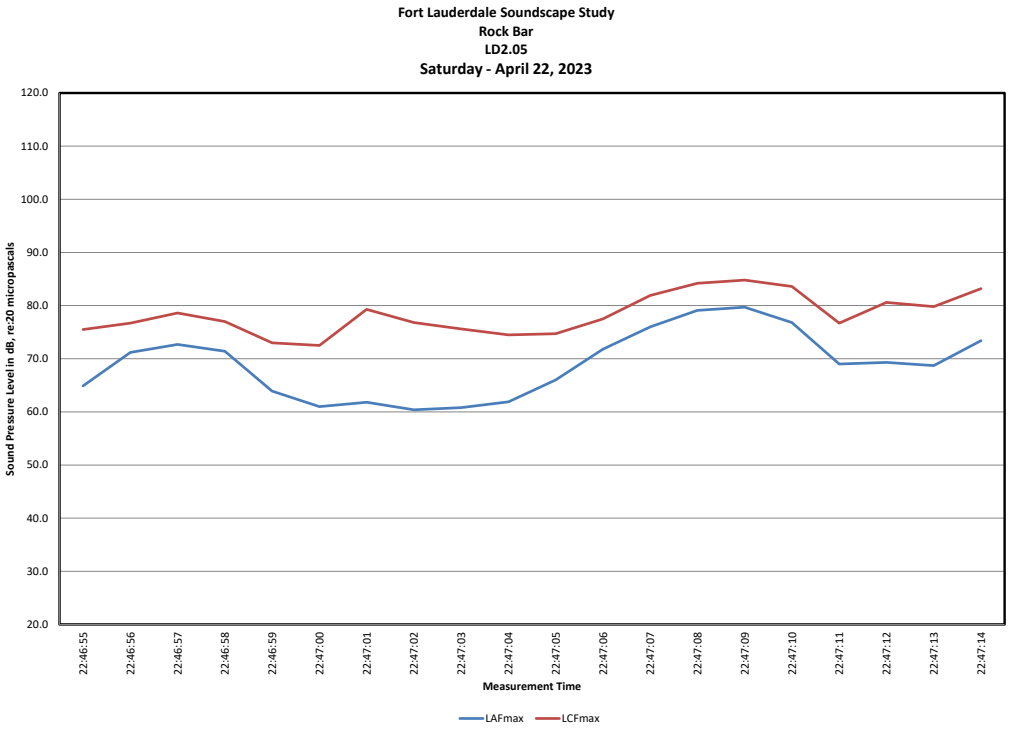

Fort Lauderdale Soundscape Study
Soundwalk Himmarshee
LD3.53
Saturday - February 19, 2023
Amplified Music from nearby bars
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

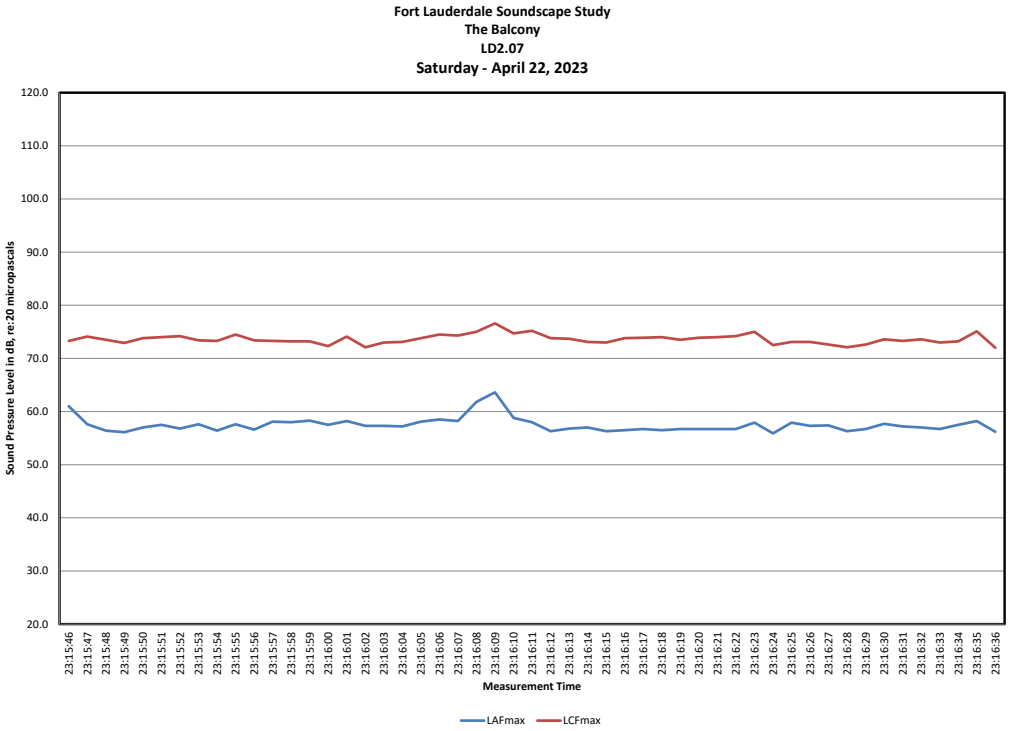

Fort Lauderdale Soundscape Study
Bo's
LD2.01
Saturday - April 22, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

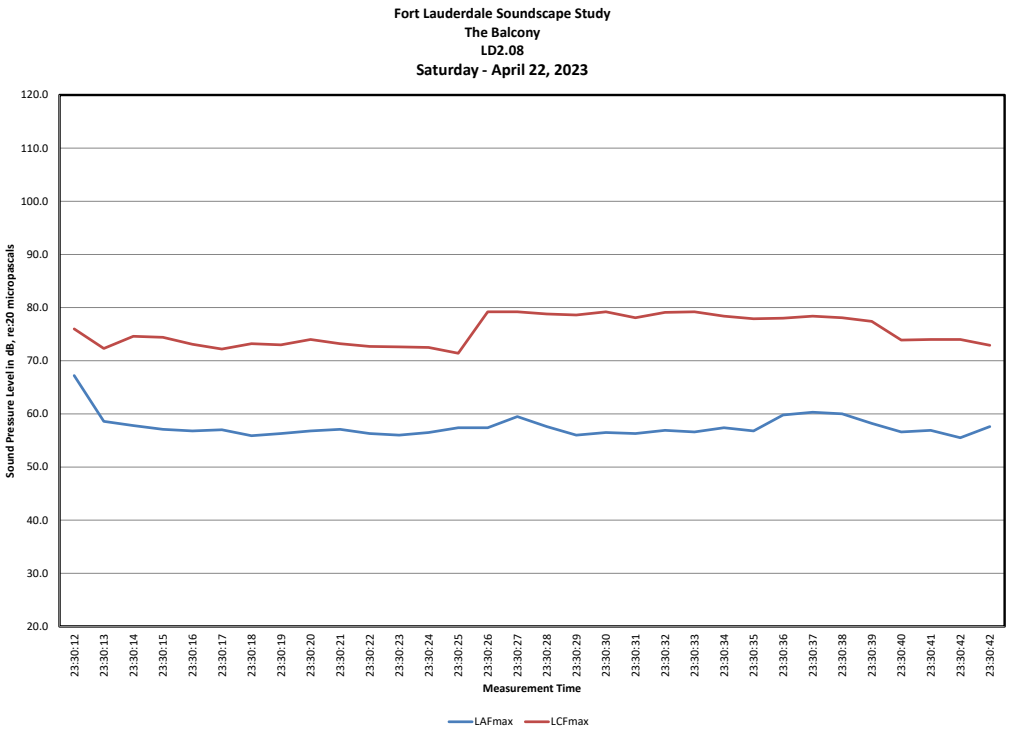

Fort Lauderdale Soundscape Study
Rock Bar
LD2.02
Saturday - April 22, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

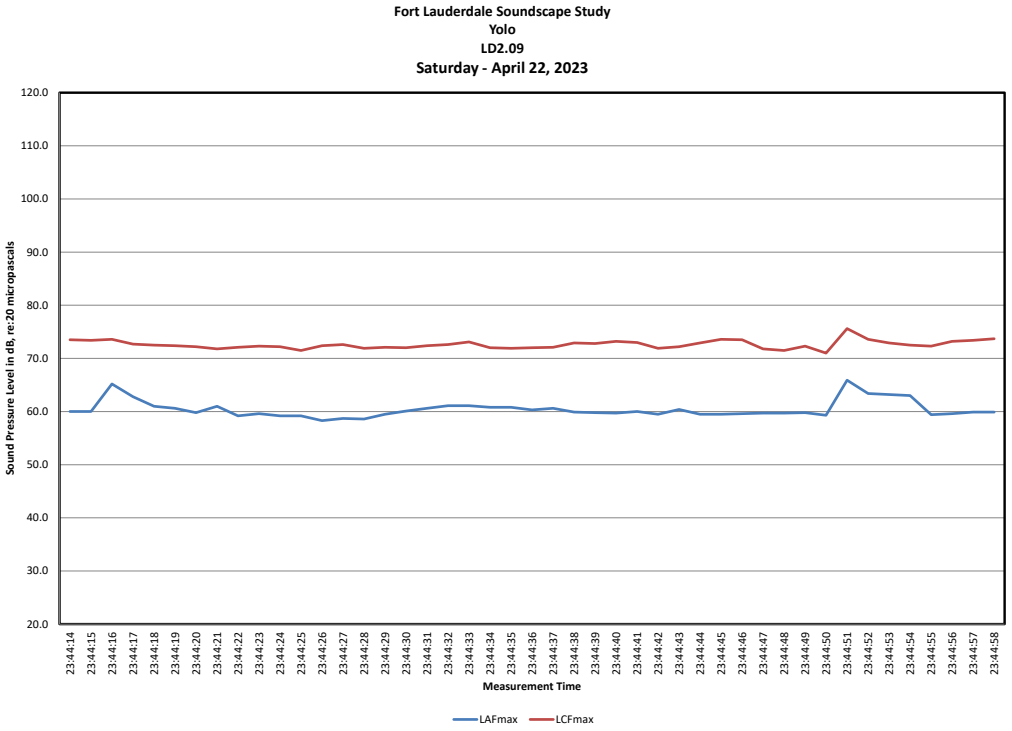

Fort Lauderdale Soundscape Study
Rock Bar
LD2.03
Saturday - April 22, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

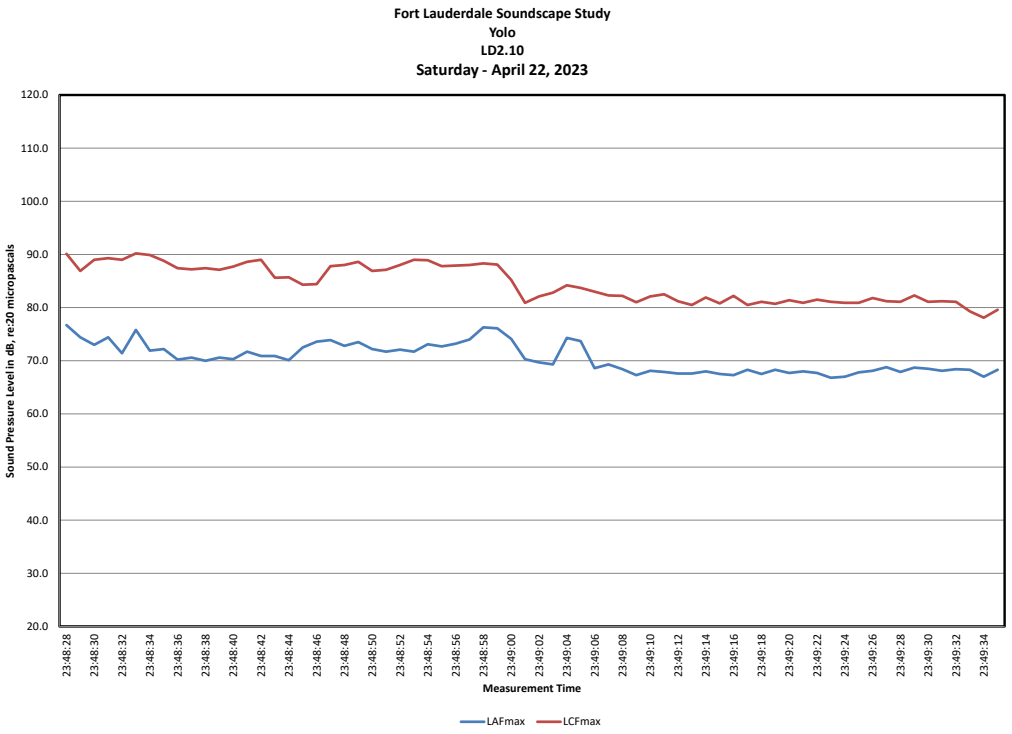

Fort Lauderdale Soundscape Study
Rock Bar
LD2.04
Saturday - April 22, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

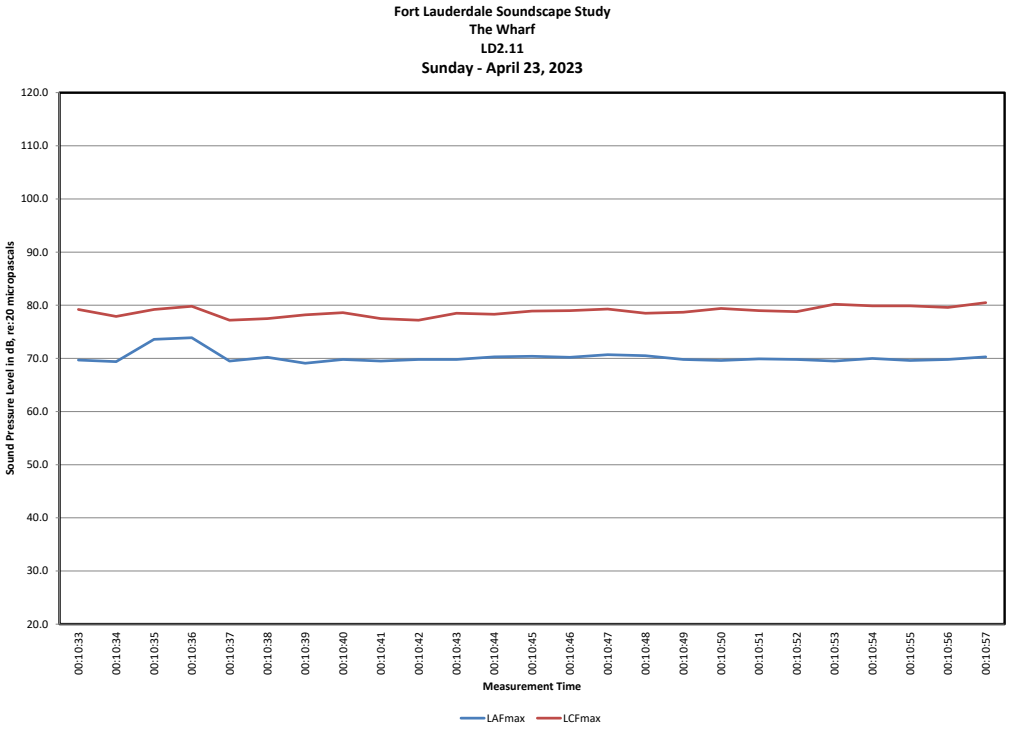

Fort Lauderdale Soundscape Study
Rock Bar
LD2.05
Saturday - April 22, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

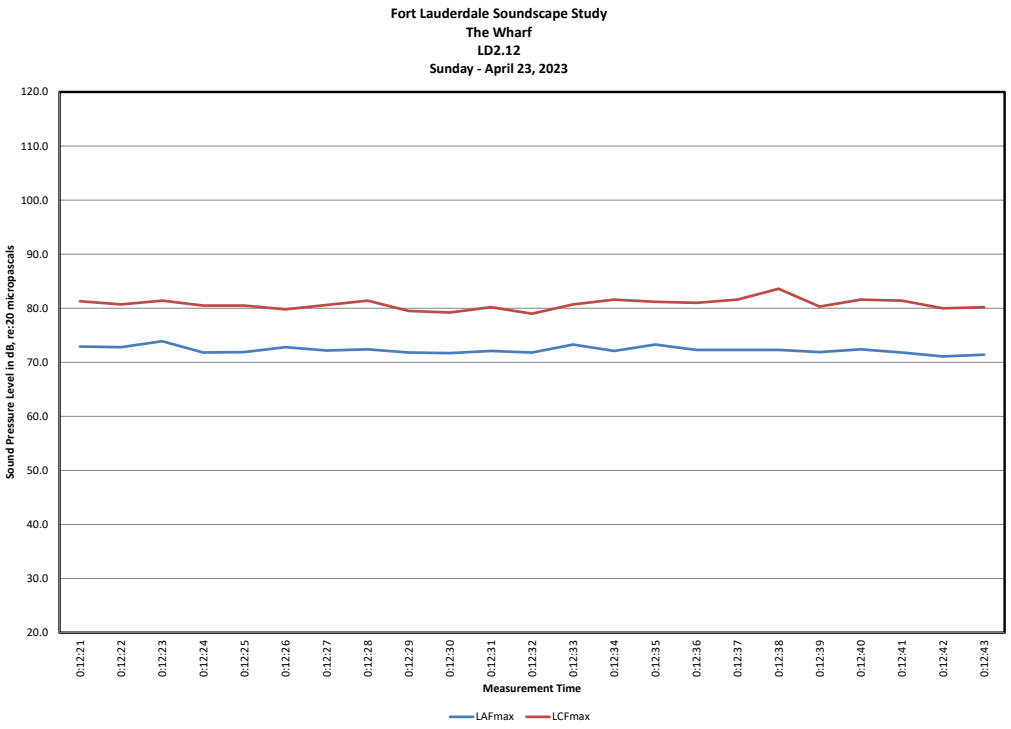

Fort Lauderdale Soundscape Study
The Balcony
LD2.07
Saturday - April 22, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

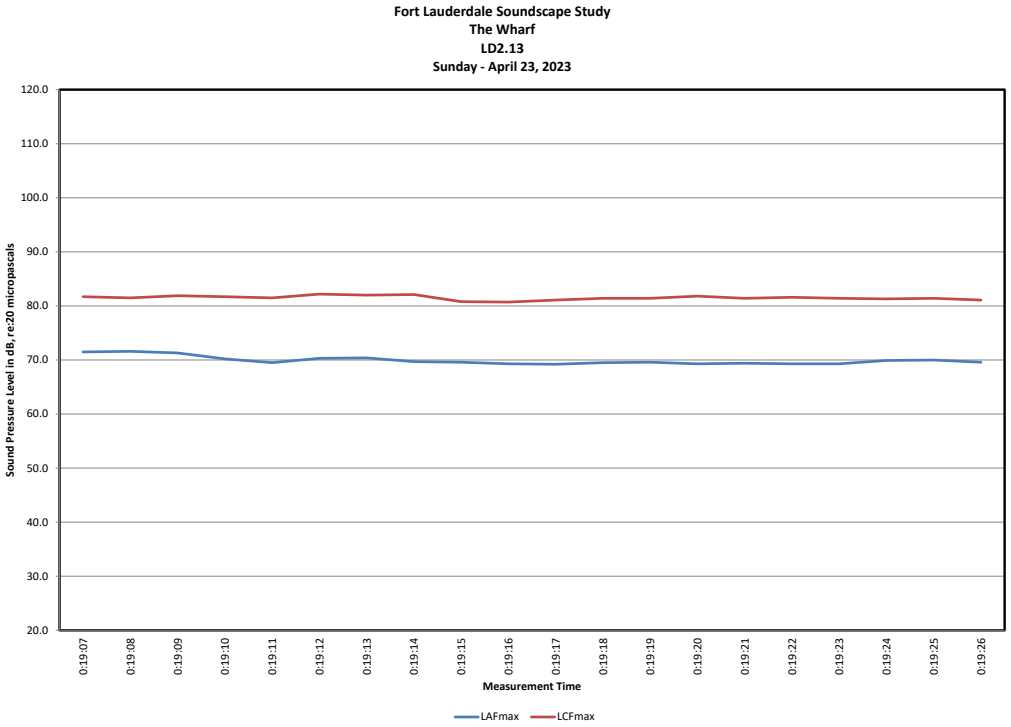

Fort Lauderdale Soundscape Study
The Balcony
LD2.08
Saturday - April 22, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

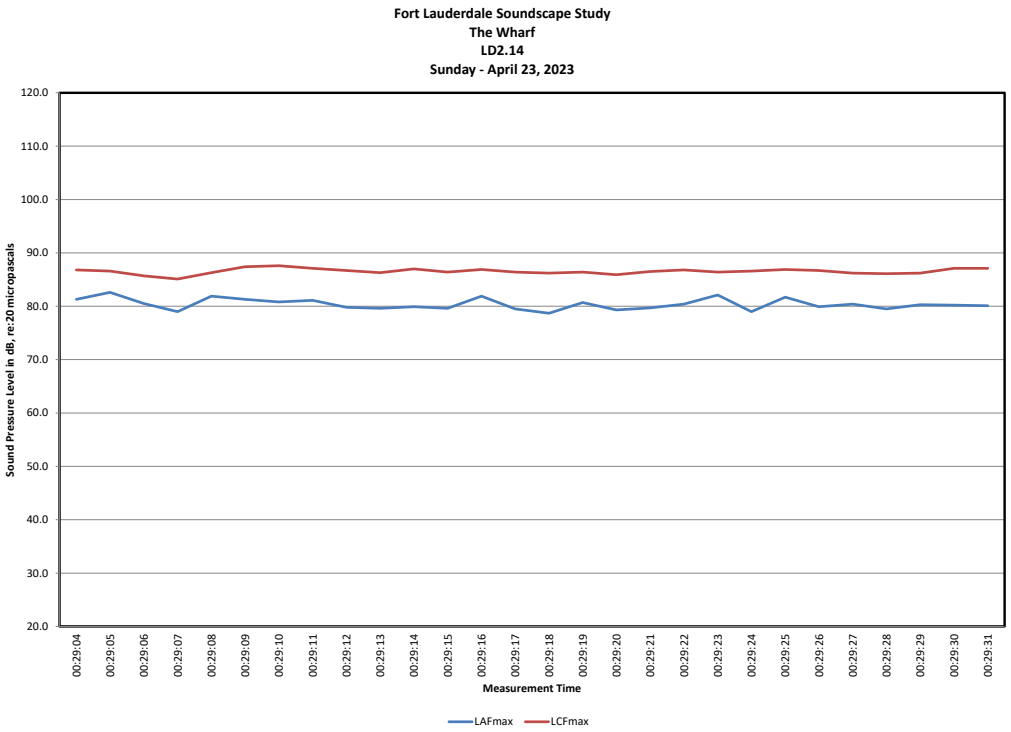

Fort Lauderdale Soundscape Study
Yolo
LD2.09
Saturday - April 22, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

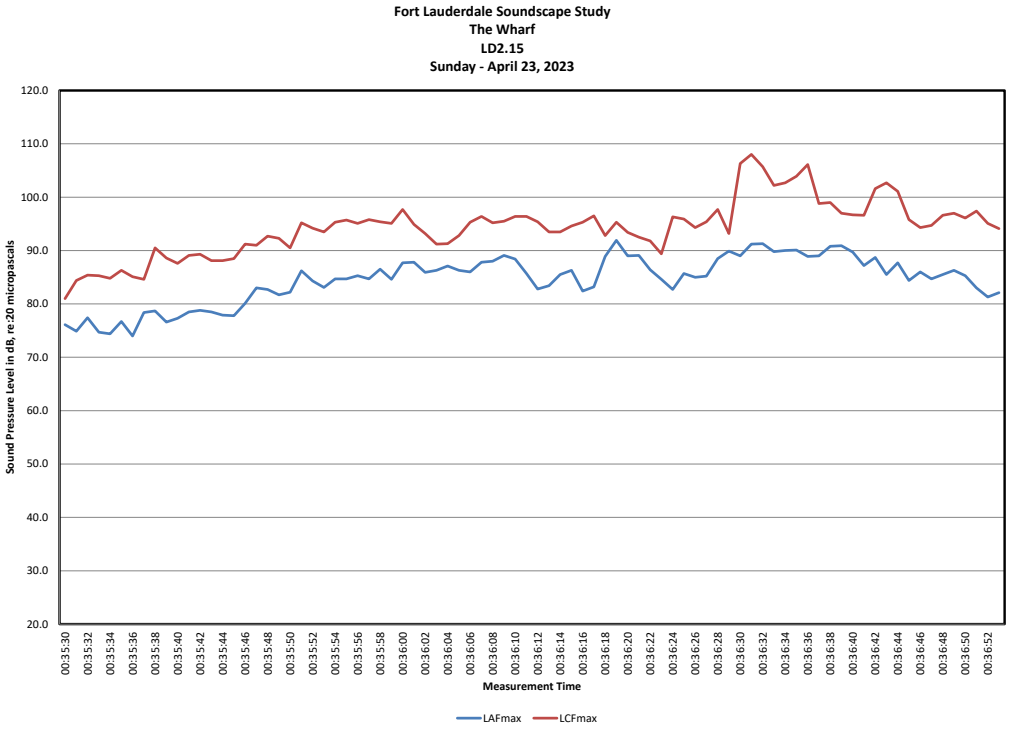

Fort Lauderdale Soundscape Study
Yolo
LD2.10
Saturday - April 22, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

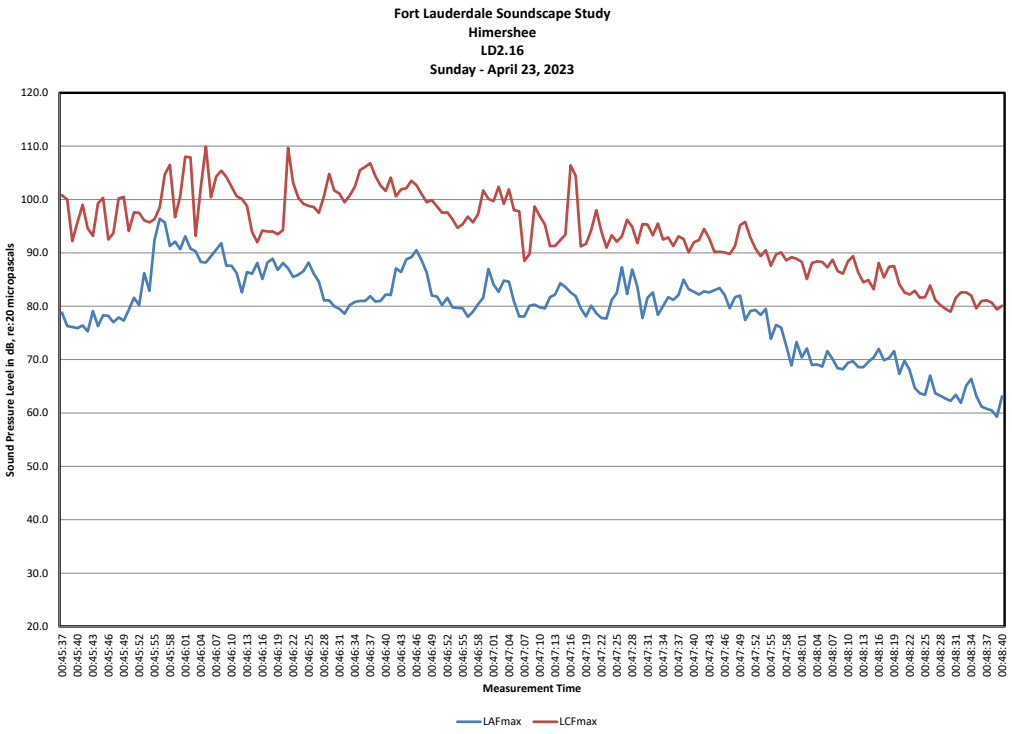

Fort Lauderdale Soundscape Study
The Wharf
LD2.11
Sunday - April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
00:10:33
00:10:34
00:10:35
00:10:36
00:10:37
00:10:38
00:10:39
00:10:40
00:10:41
00:10:42
00:10:43
00:10:44
00:10:45
00:10:46
00:10:47
00:10:48
00:10:49
00:10:50
00:10:51
00:10:52
00:10:53
00:10:54
00:10:55
00:10:56
00:10:57
Measurement Time
LAFmax
LCFmax

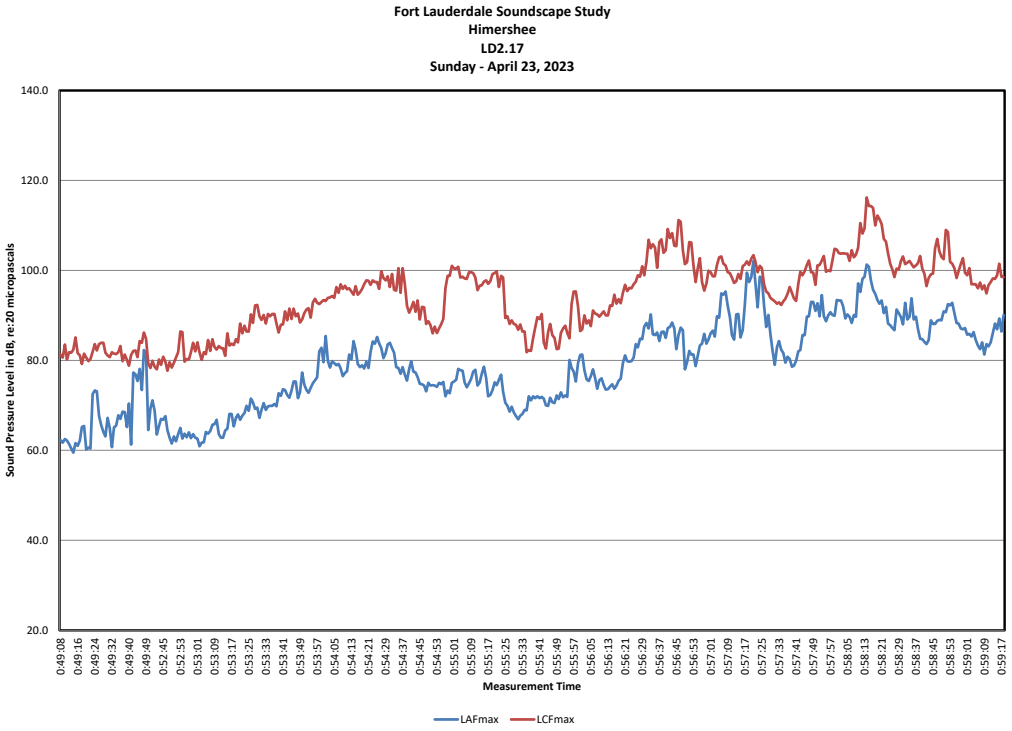

Fort Lauderdale Soundscape Study
The Wharf
LD2.12
Sunday - April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
0:12:21
0:12:22
0:12:23
0:12:24
0:12:25
0:12:26
0:12:27
0:12:28
0:12:29
0:12:30
0:12:31
0:12:32
0:12:33
0:12:34
0:12:35
0:12:36
0:12:37
0:12:38
0:12:39
0:12:40
0:12:41
0:12:42
0:12:43
Measurement Time
LAFmax
LCFmax

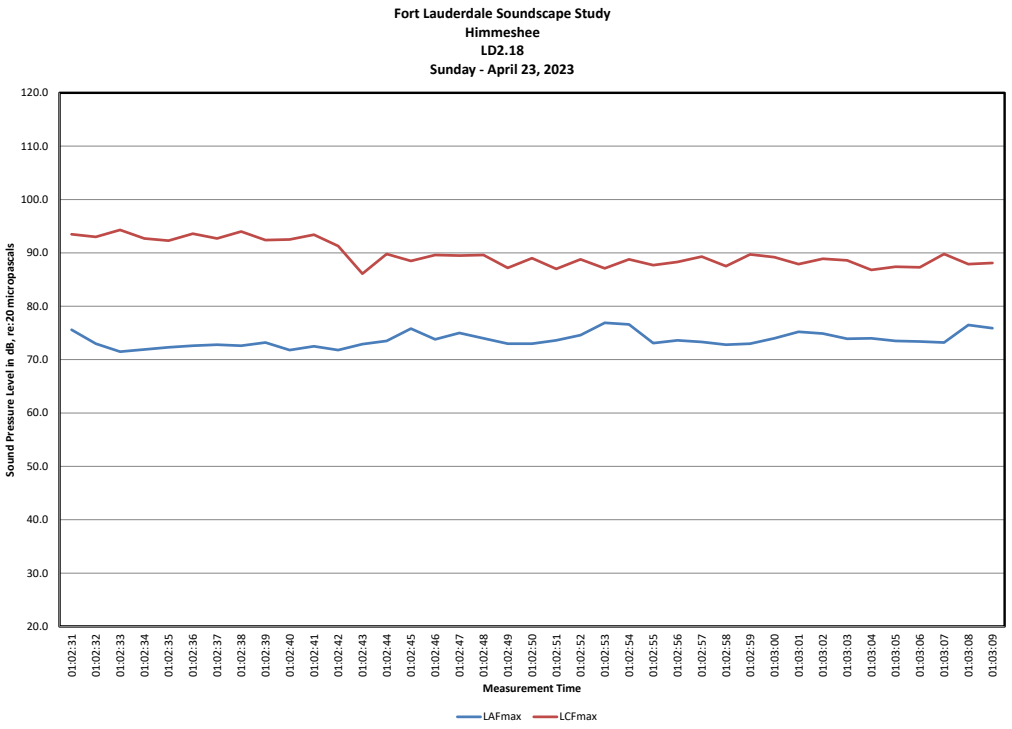

Fort Lauderdale Soundscape Study
The Wharf
LD2.13
Sunday - April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
0:19:07
0:19:08
0:19:09
0:19:10
0:19:11
0:19:12
0:19:13
0:19:14
0:19:15
0:19:16
0:19:17
0:19:18
0:19:19
0:19:20
0:19:21
0:19:22
0:19:23
0:19:24
0:19:25
0:19:26
Measurement Time
LAFmax
LCFmax

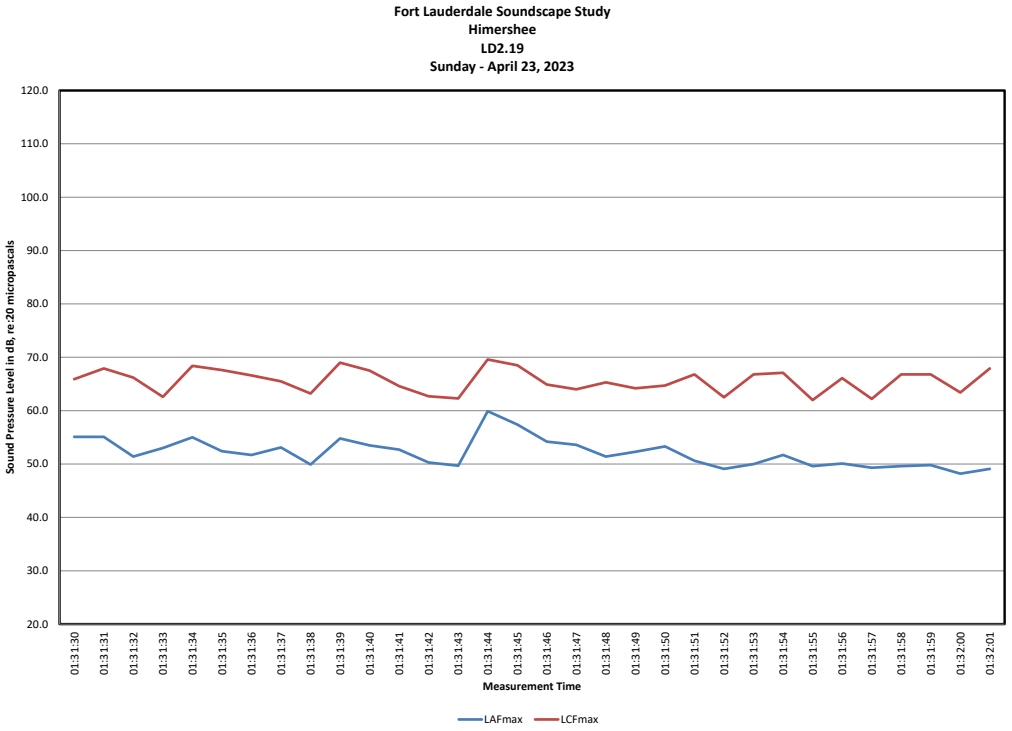

Fort Lauderdale Soundscape Study
The Wharf
LD2.14
Sunday - April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
00:29:04
00:29:05
00:29:06
00:29:07
00:29:08
00:29:09
00:29:10
00:29:11
00:29:12
00:29:13
00:29:14
00:29:15
00:29:16
00:29:17
00:29:18
00:29:19
00:29:20
00:29:21
00:29:22
00:29:23
00:29:24
00:29:25
00:29:26
00:29:27
00:29:28
00:29:29
00:29:30
00:29:31
Measurement Time
LAFmax
LCFmax

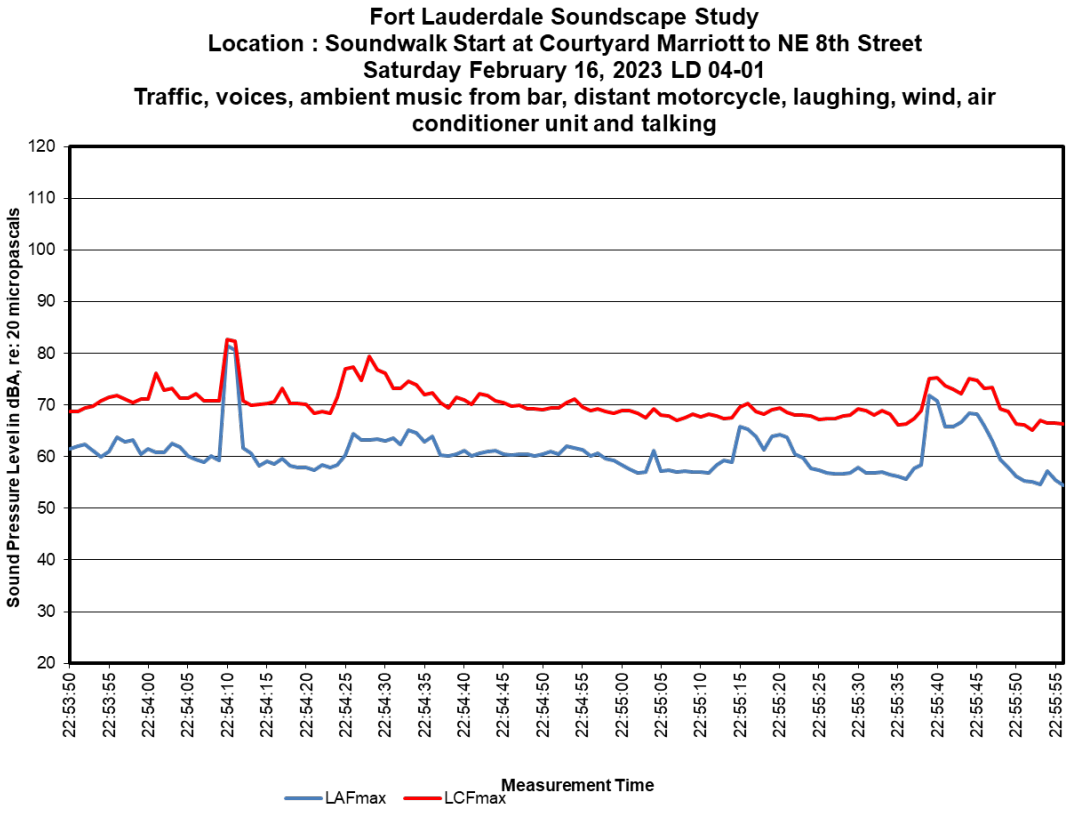

Fort Lauderdale Soundscape Study
The Wharf
LD2.15
Sunday - April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
Himershee
LD2.16
Sunday - April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

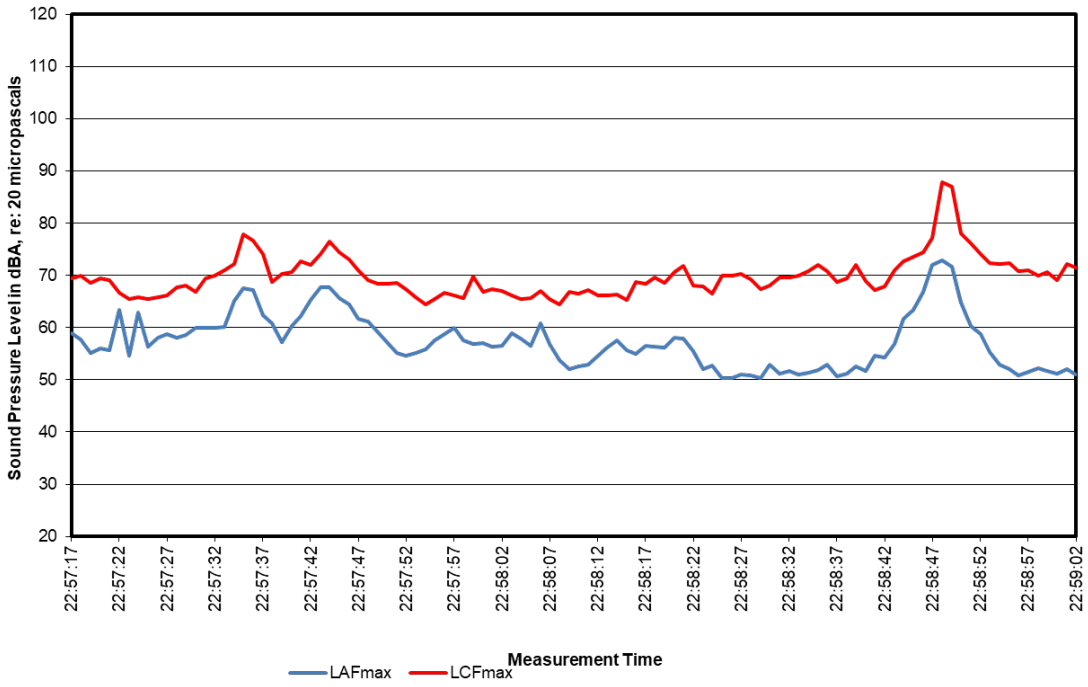

Fort Lauderdale Soundscape Study
Himershee
LD2.17
Sunday - April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
Himmeshee
LD2.18
Sunday - April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
Measurement Time
LAFmax
LCFmax

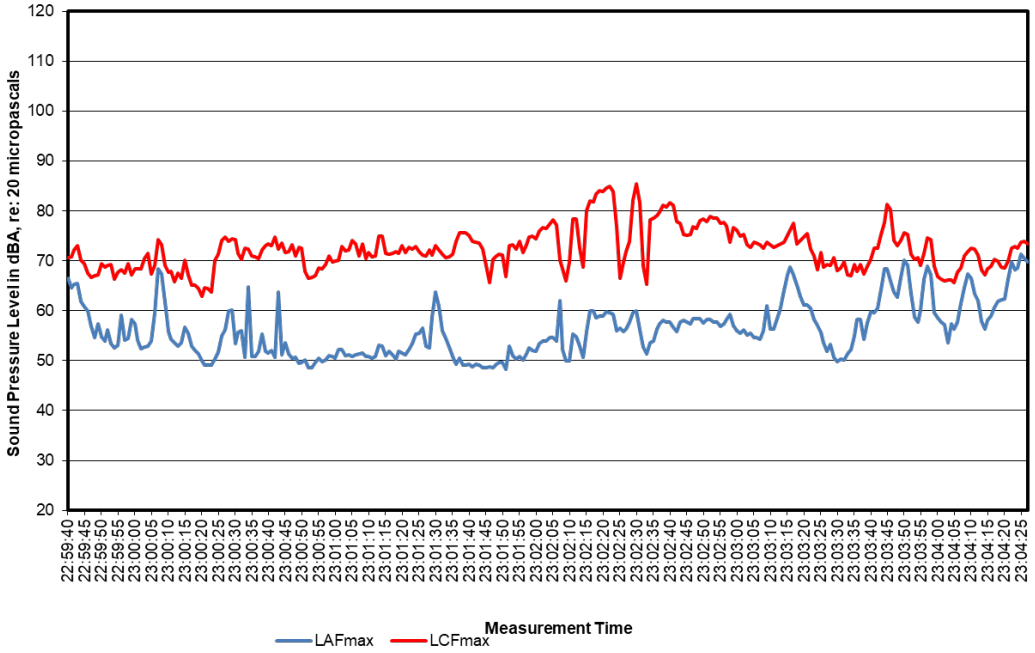

Fort Lauderdale Soundscape Study
Himershee
LD2.19
Sunday - April 23, 2023
Sound Pressure Level in dB, re:20 micropascals
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
01:31:30
01:31:31
01:31:32
01:31:33
01:31:34
01:31:35
01:31:36
01:31:37
01:31:38
01:31:39
01:31:40
01:31:41
01:31:42
01:31:43
01:31:44
01:31:45
01:31:46
01:31:47
01:31:48
01:31:49
01:31:50
01:31:51
01:31:52
01:31:53
01:31:54
01:31:55
01:31:56
01:31:57
01:31:58
01:31:59
01:32:00
01:32:01
Measurement Time
LAFmax
LCFmax


Fort Lauderdale Soundscape Study
Location : Soundwalk Start at Courtyard Marriott to NE 8th Street
Saturday February 16, 2023 LD 04-01
Traffic, voices, ambient music from bar, distant motorcycle, laughing, wind, air conditioner unit and talking
Sound Pressure Level in dBA, re: 20 micropascals
120
110
100
90
80
70
60
50
40
30
20
22:53:50
22:53:55
22:54:00
22:54:05
22:54:10
22:54:15
22:54:20
22:54:25
22:54:30
22:54:35
22:54:40
22:54:45
22:54:50
22:54:55
22:55:00
22:55:05
22:55:10
22:55:15
22:55:20
22:55:25
22:55:30
22:55:35
22:55:40
22:55:45
22:55:50
22:55:55
Measurement Time
LAFmax
LCFmax

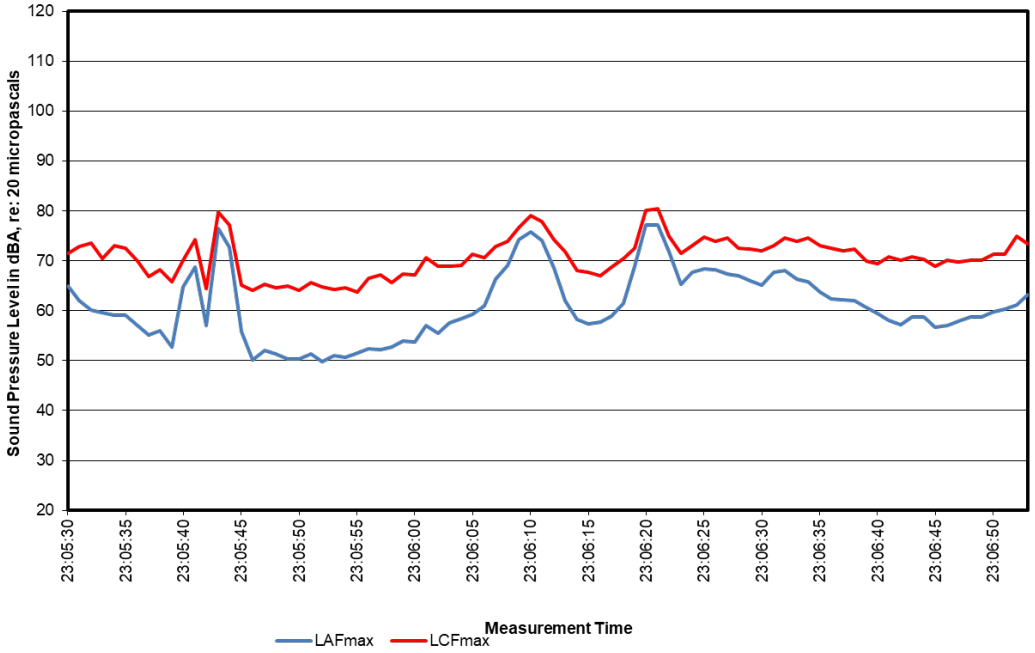
Fort Lauderdale Soundscape Study
Location : Soundwalk Start at NE 8th Street Flager Village
Saturday February 16, 2023 LD 04-02
Water going down drain, distant voices, cars on 8th, birds and music from party



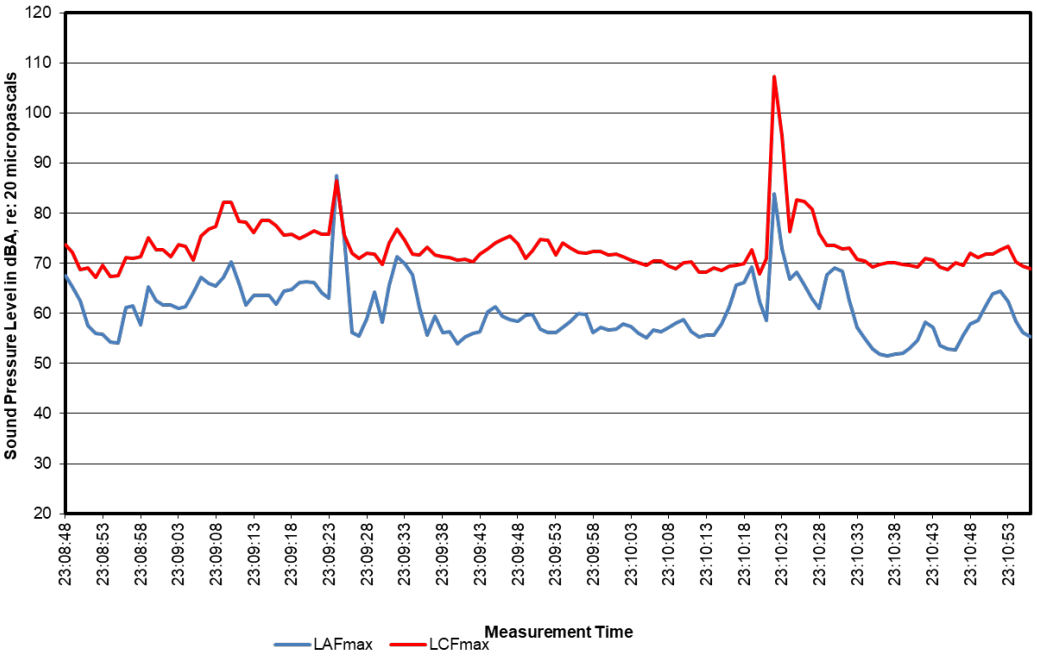
Fort Lauderdale Soundscape Study
Location : NE 8th Street Flager Village
February 16, 2023 LD 04-03
Car revving, yelling, music from party, motorcycle and cars passing, music at Rose Club



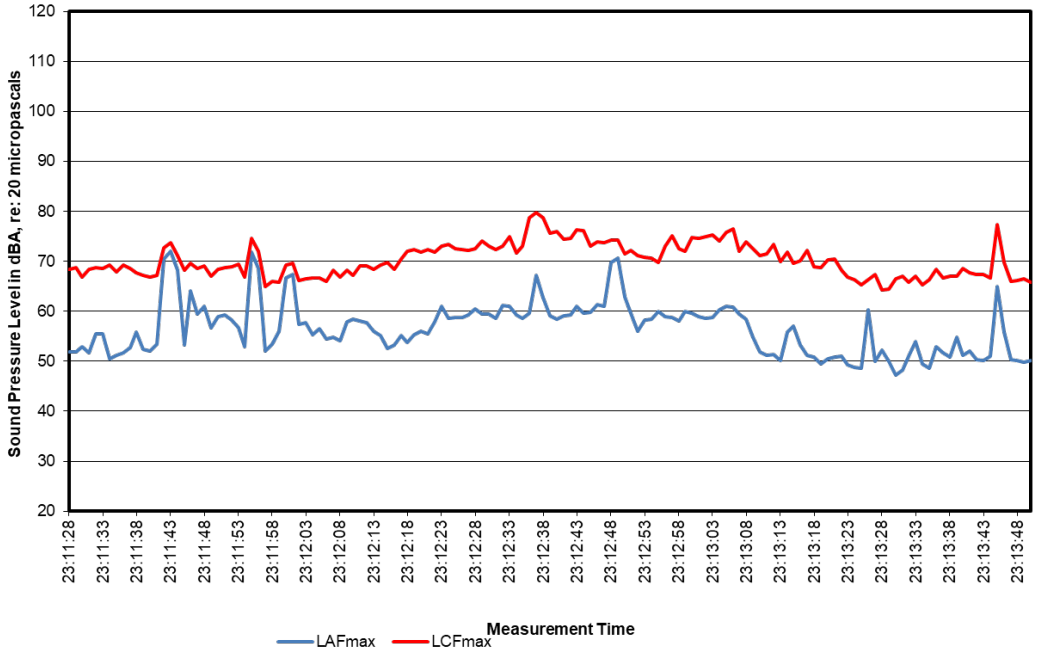
Fort Lauderdale Soundscape Study
Location : NE 8th Street Flager Village and 3rd
February 17, 2023 LD 04-04
Music from house, traffic and coughing



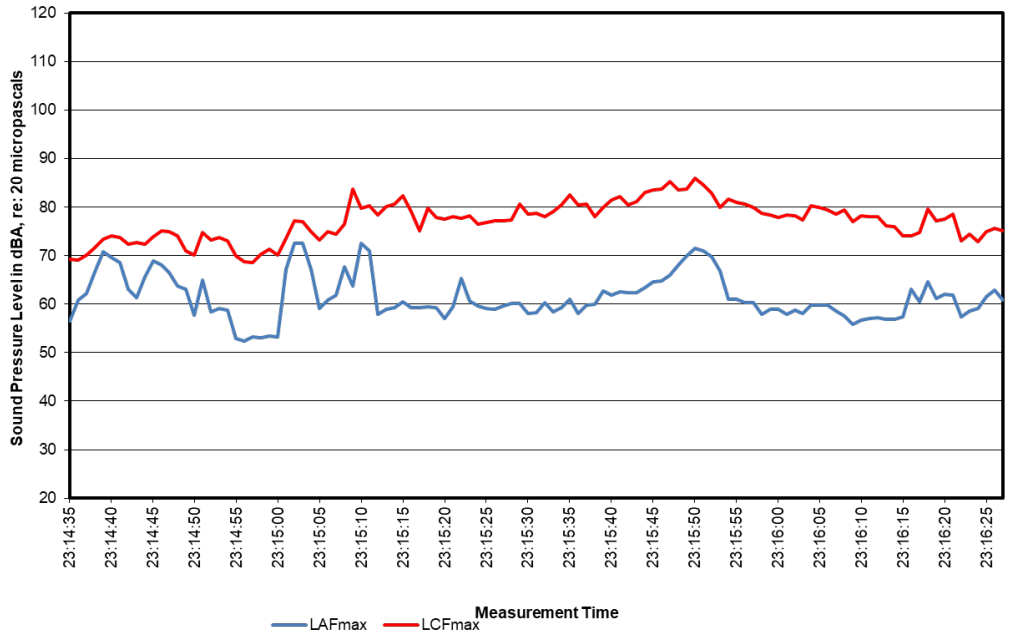
Fort Lauderdale Soundscape Study
Location : Flager Drive at NE 3rd going down Flagler Drive to NE 4th
February 17, 2023 LD 04-05
Music across train tracks, Traffic, Car Revving, airplane, voices, crickets and Music



Fort Lauderdale Soundscape Study
Location : NE 4th and North Flagler
February 17, 2023 LD 04-06
Distant music, voices, Loud distant music, Glitch bar 75 ft behind and crickets

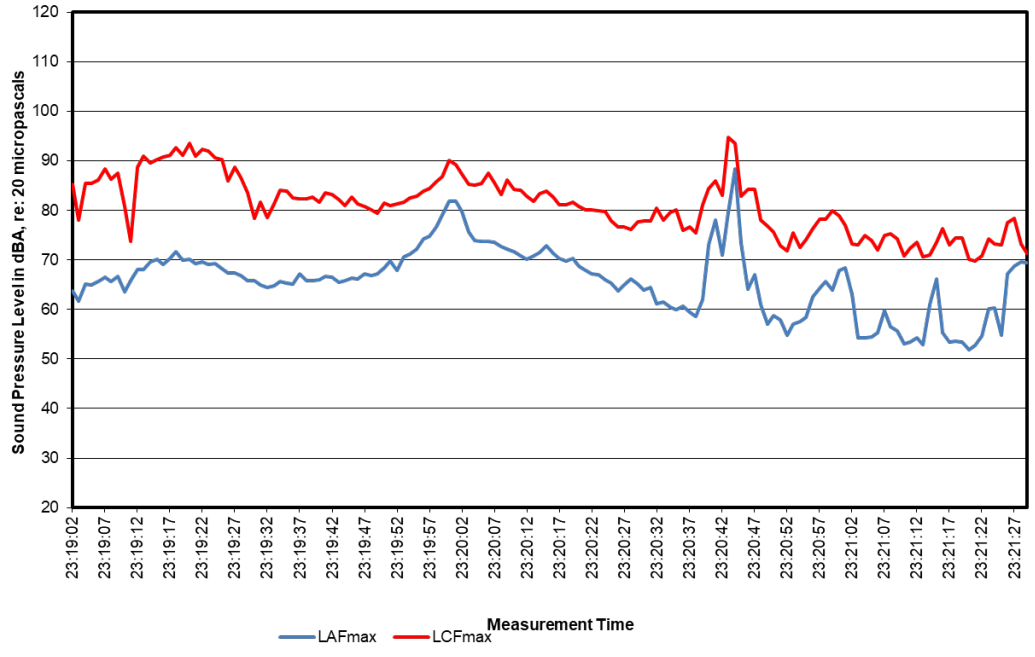


Fort Lauderdale Soundscape Study
Location : NE 4th and North Flagler
February 17, 2023 LD 04-07
Distant music, voices, Loud distant music, Glitch bar 75 ft behind and crickets

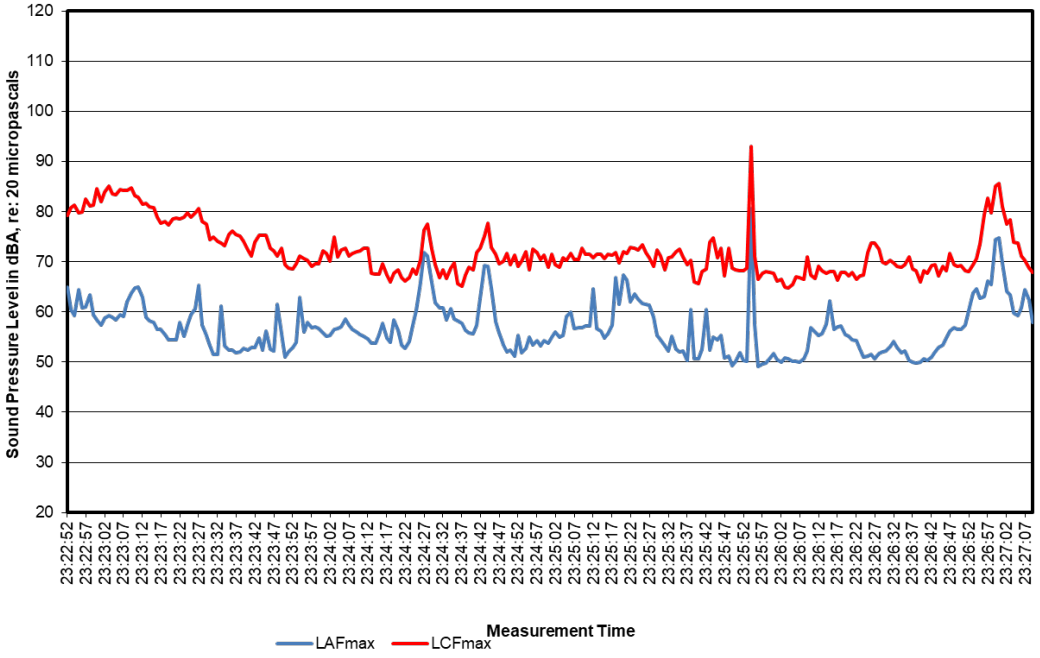


Fort Lauderdale Soundscape Study
Location : Juice Bar
February 17, 2023 LD 04-08
Voices, traffic, car revving, cough, Glitch Bar and wind

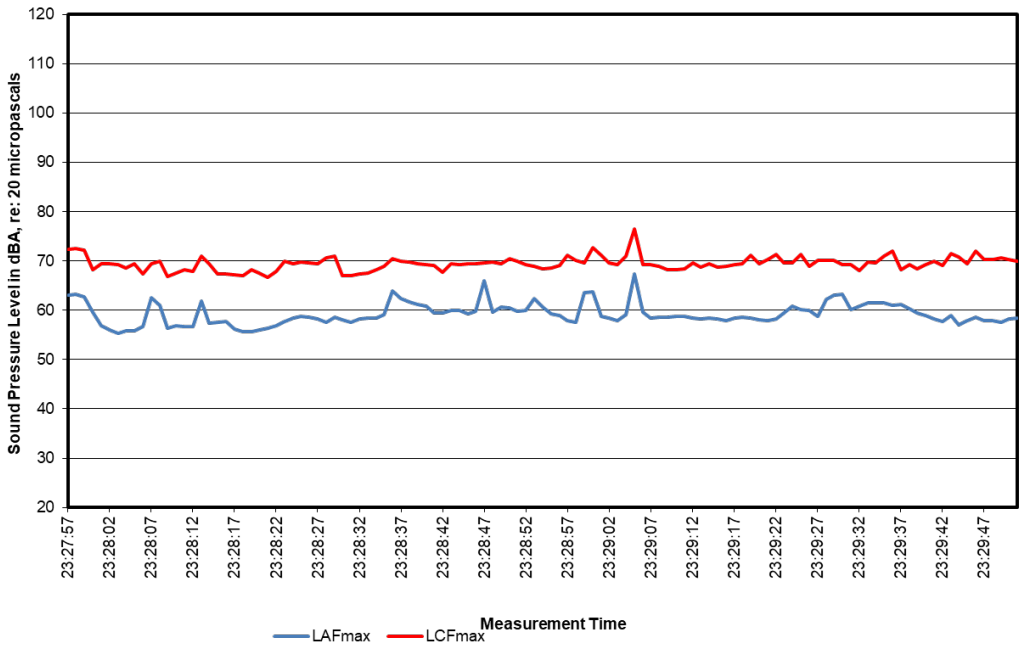
Fort Lauderdale Soundscape Study
Location : NE 5th Flager Village beyond glicth bar
February 17, 2023 LD 04-09
Voices, music from bar and traffic



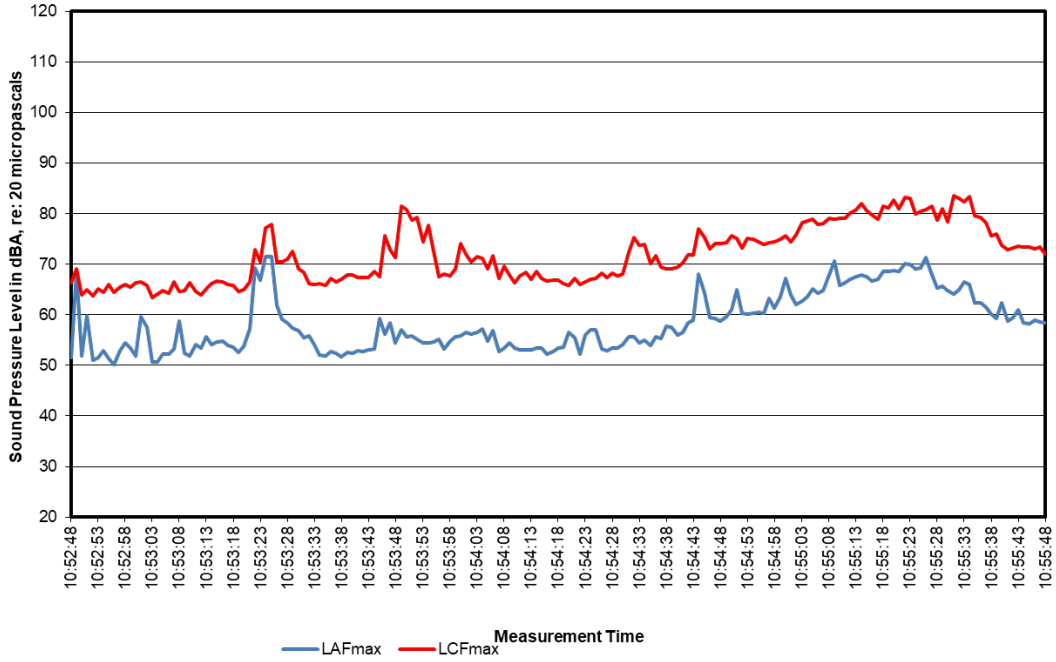
Fort Lauderdale Soundscape Study
Location : NE 8th going to courtyard
February 17, 2023 LD 04-10
Voices, Rose music get louder when door is opened, AC unit, Distant train and traffic



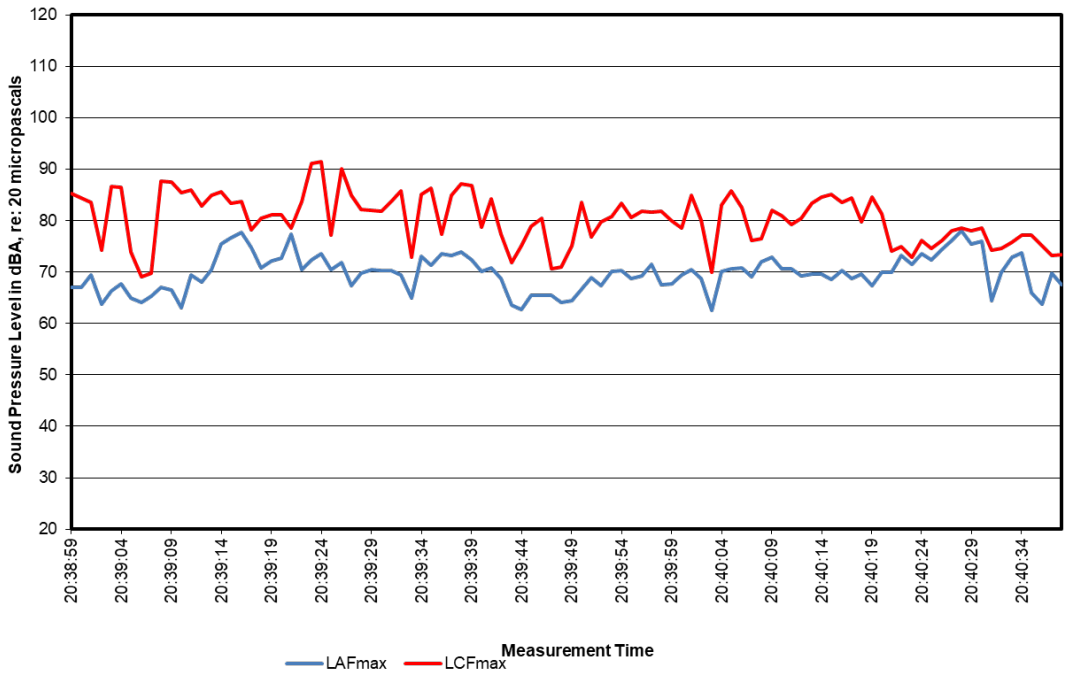
Fort Lauderdale Soundscape Study
Location : NE 5th terrace going to courtyard
February 17, 2023 LD 04-11
Motorcycle, bus stop noise, AC unit, sprinklers, voices, insects and music



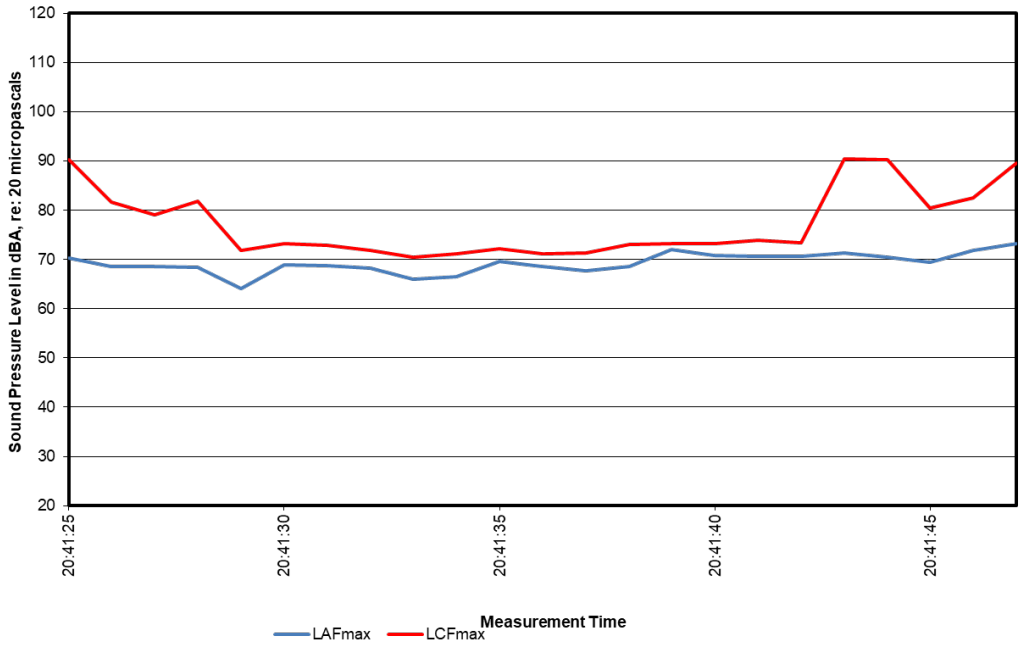
Fort Lauderdale Soundscape Study
Location : Bamboo Flats to Coner near Rose
February 17, 2023 LD 04-12
Ambient traffic on nearby roads and engine revving



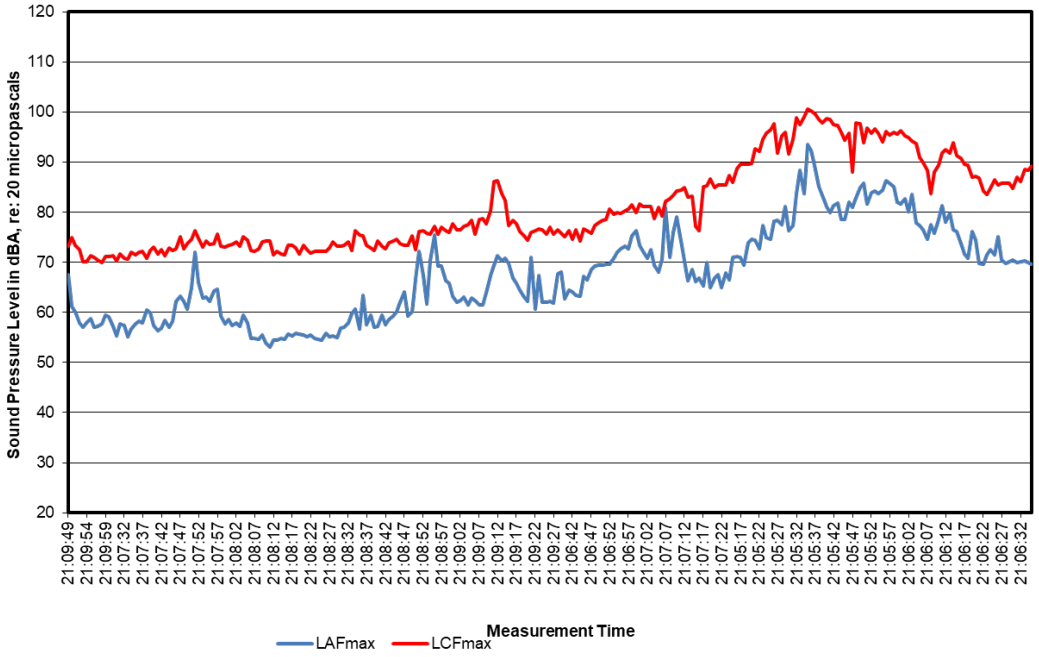
Fort Lauderdale Soundscape Study
Location : Courtyard by Marriott Downtown Rooftop Bar
February 17, 2023 LD 04-13
Music and Voices



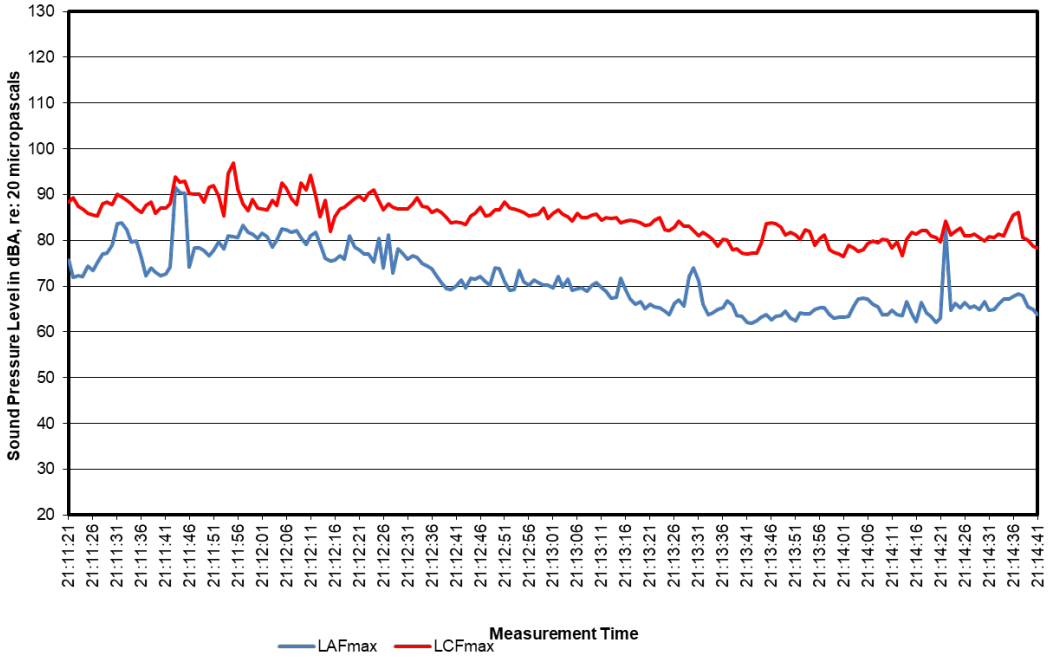
Fort Lauderdale Soundscape Study
Location : Courtyard by Marriott Downtown Rooftop Bar
February 17, 2023 LD 04-14
Music and Voices



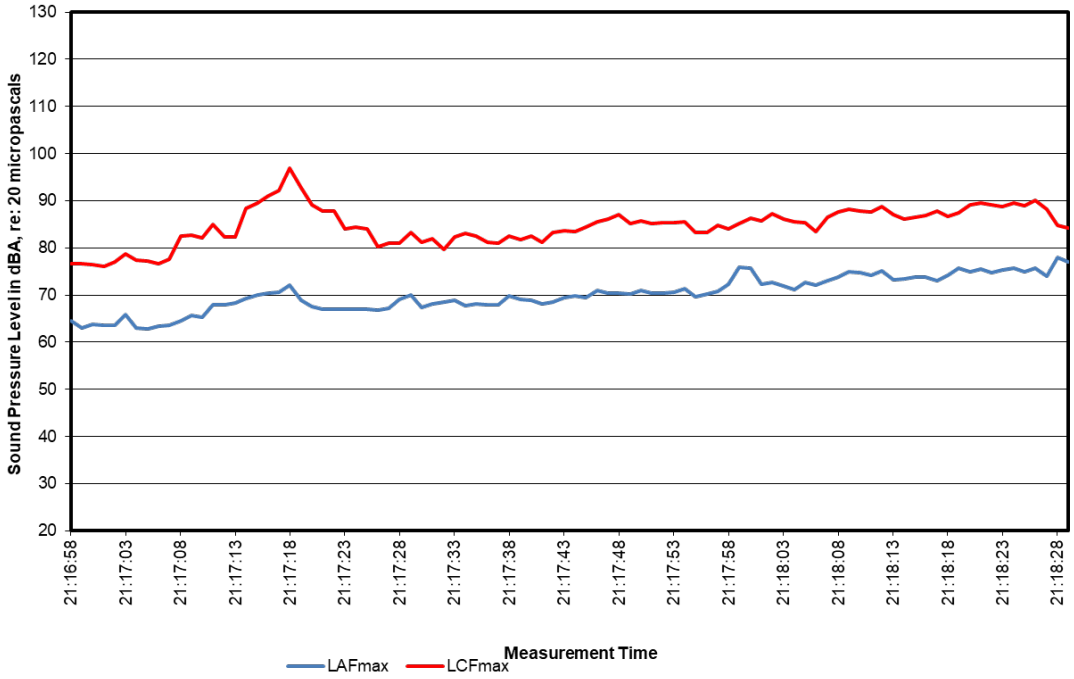
Fort Lauderdale Soundscape Study
Location : Esplande Park Starting at Commodore Brook Ave,
February 17, 2023 LD 04-15
Soundwalk, footsteps, nearby and distant traffic, distant music, Voices and music at Fat Catz



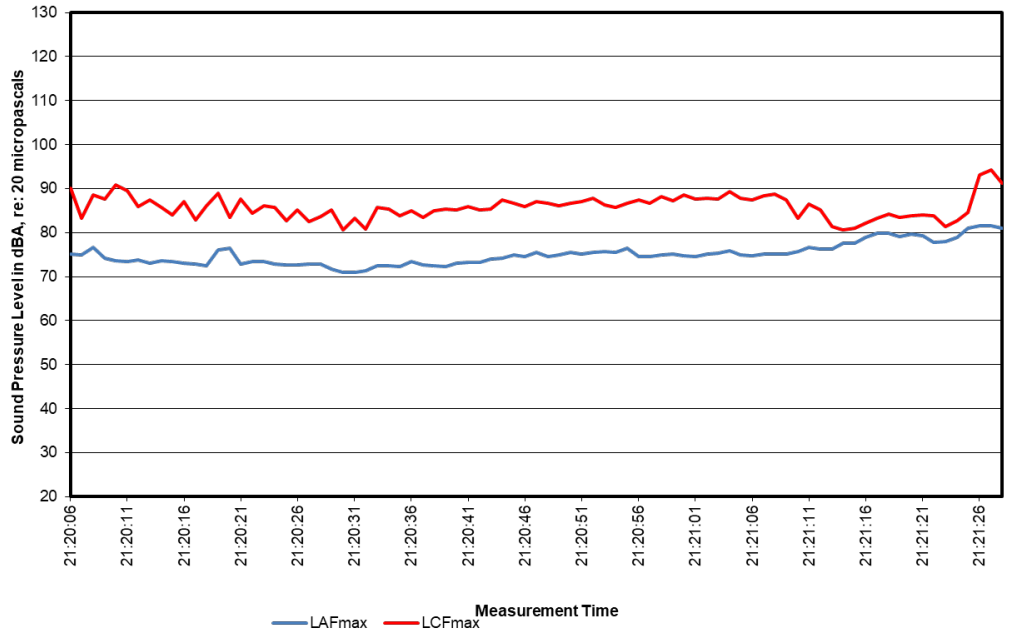
City of Fort Lauderdale Soundscape Study
Location : Crossing the street
LD 04-16
Music from Lucky's Tavern, voices, music from Wee Tacos, traffic and engine rev



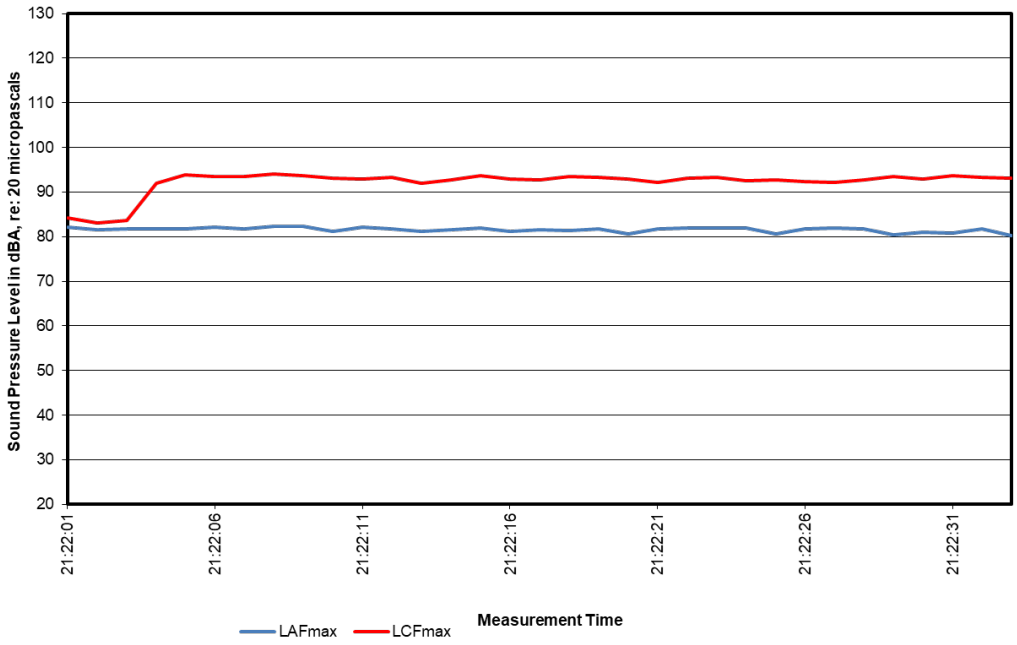
City of Fort Lauderdale Soundscape Study
Location : The Wharf
LD 04-17
Distant music, distant voices, voices and music from the Wharf Bodega



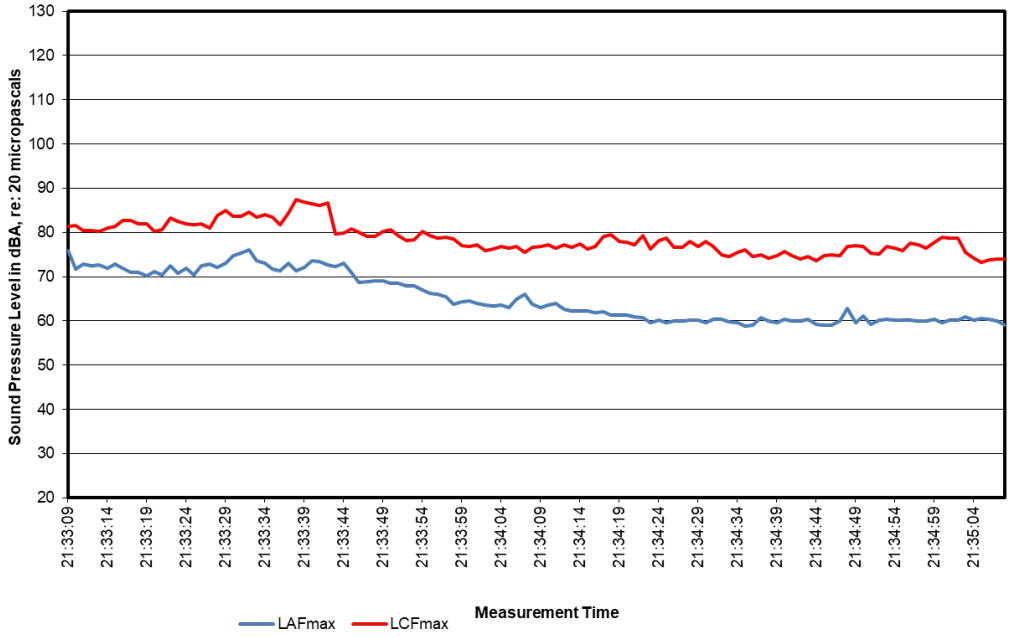
City of Fort Lauderdale Soundscape Study
Location : Brickell to the Wharf
LD 04-19
Distant music and cars, voices and Music from the Wharf Bodega



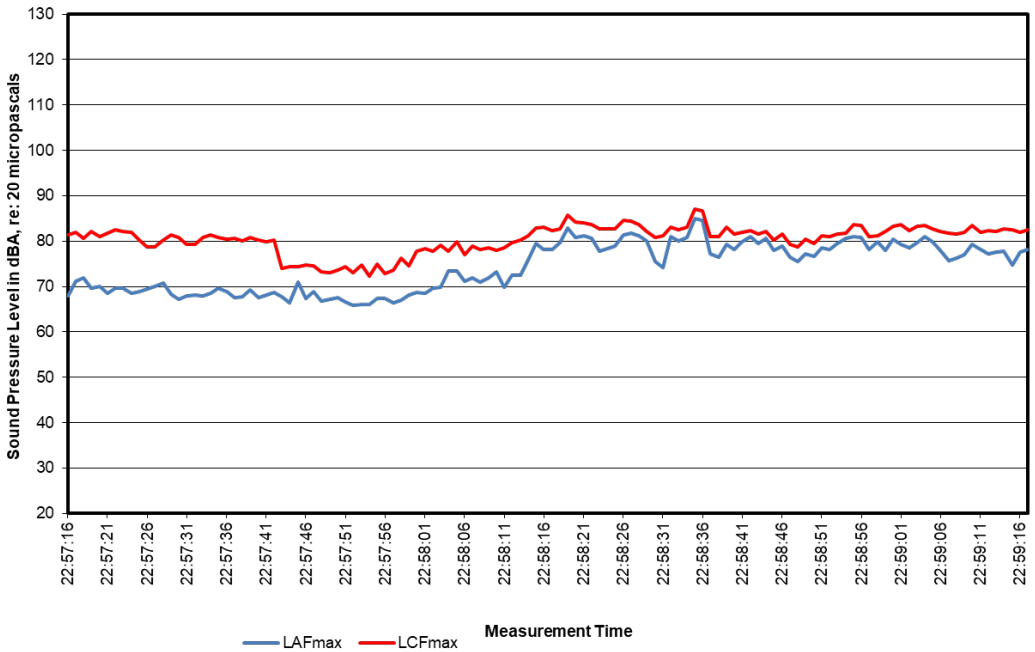
City of Fort Lauderdale Soundscape Study
Location : 6' from Wharf
LD 04-20
Loud voices and Music from the Wharf Bodega



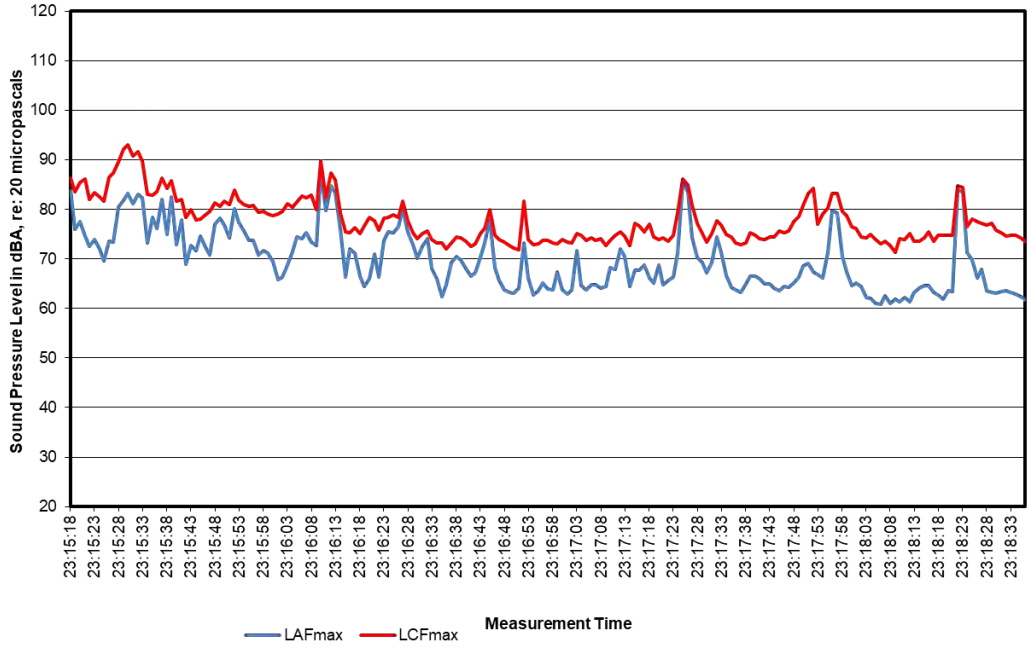
City of Fort Lauderdale Soundscape Study
Location : Riverwalk to Automation Stage
LD 04-21
Boats, distant music, quiet waves, distant bass and distant talking



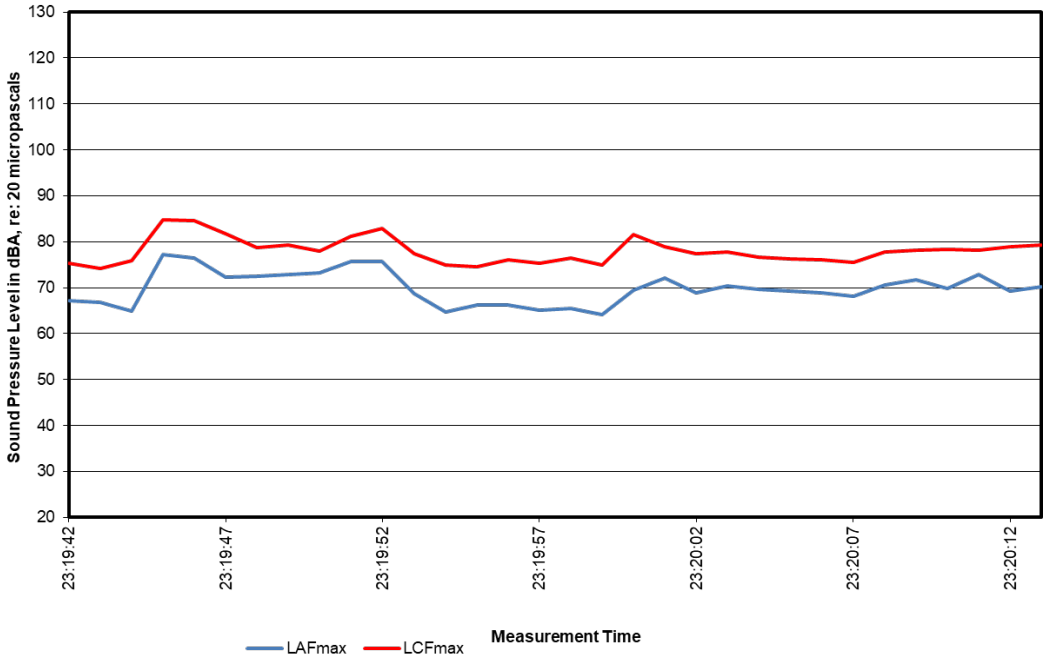
City of Fort Lauderdale Soundscape Study
Location : Soundwalk New River Drive to Salt Seven
LD 04-23
Music, voices and crickets



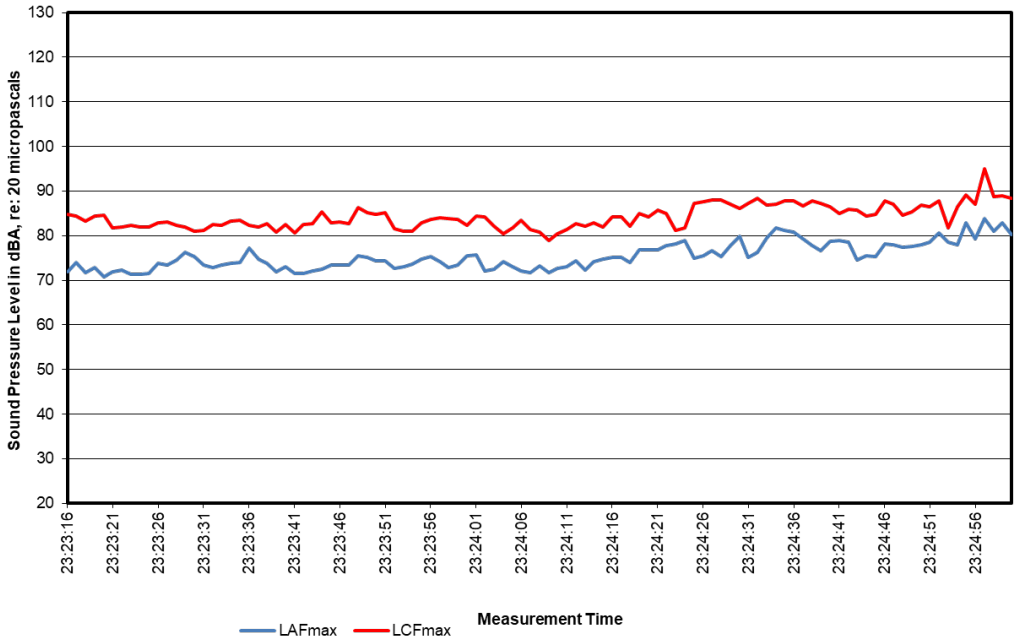
Fort Lauderdale Soundscape Study
Location : Soundwalk New River Drive to Salt Seven
February 17, 2023 LD 04-26
Car Rev, Voices at Fogo De Chao, distant music from Eddie V's, yelling and distant music



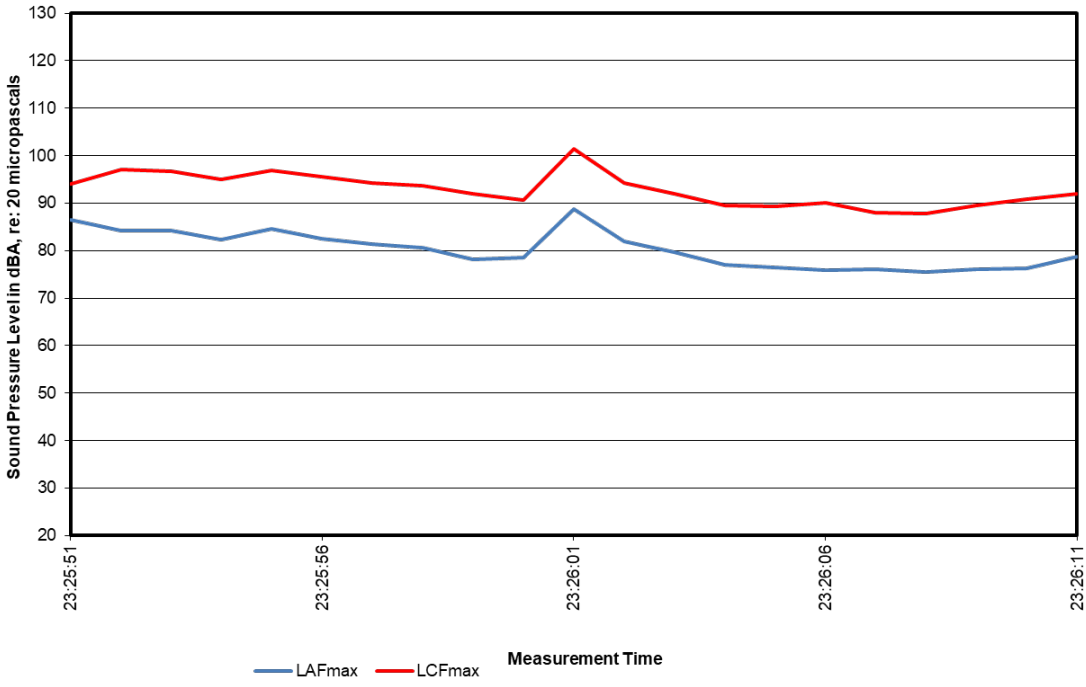
Fort Lauderdale Soundscape Study
Location : Outside Hyatt Centric
February 17, 2023 LD 04-27
Music, voices and traffic



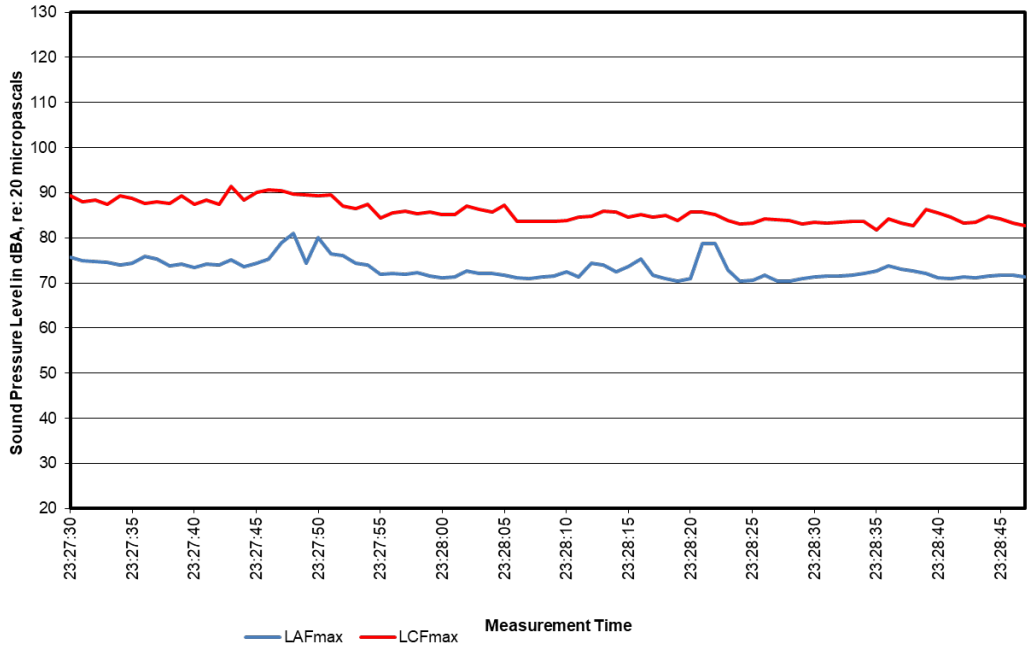
Fort Lauderdale Soundscape Study
Location : Andres Ave to The Wharf
February 17, 2023 LD 04-28
Music, voices and traffic



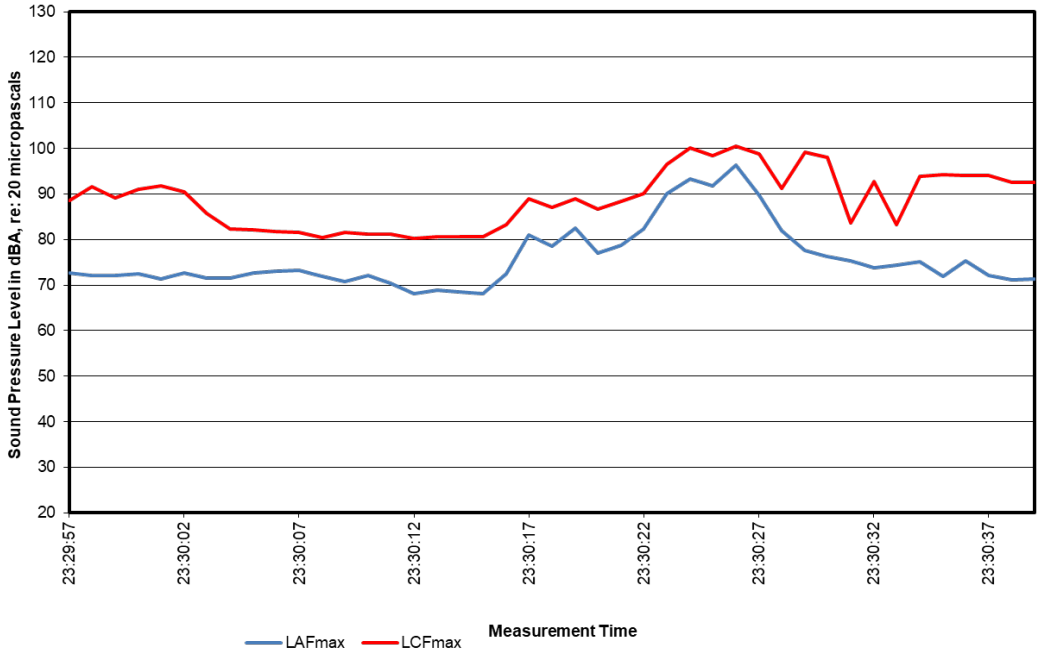
Fort Lauderdale Soundscape Study
Location : The Wharf
February 17, 2023 LD 04-29
Music, voices, Lamborgini and Bentley Revving



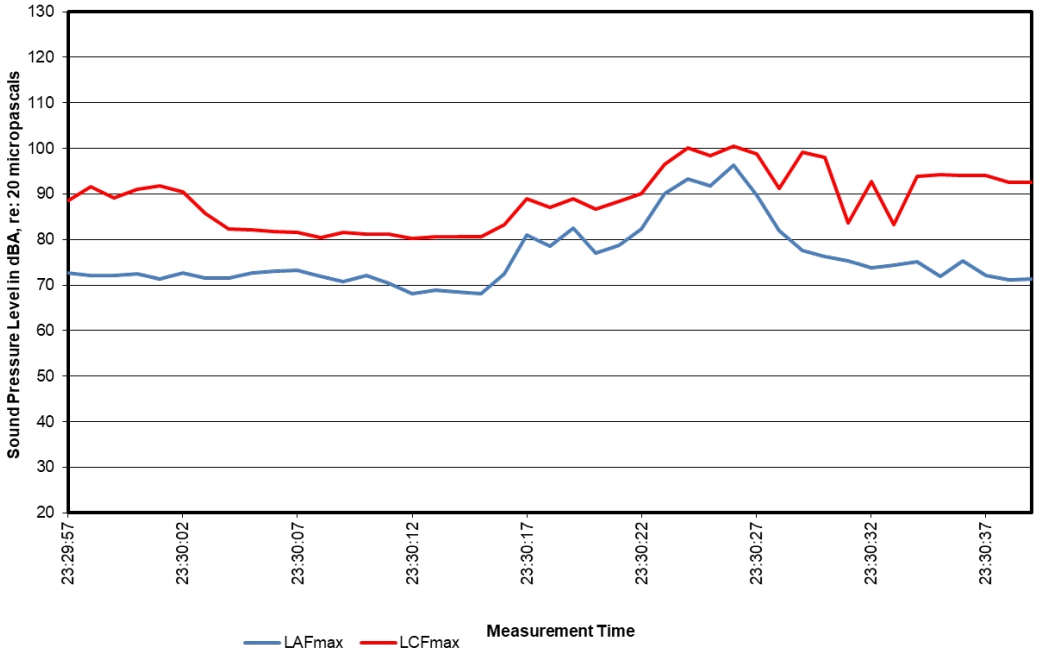
Fort Lauderdale Soundscape Study
Location : Corner of The Wharf and Bodega
February 17, 2023 LD 04-30
Music, voices, slow traffic and Car Revving



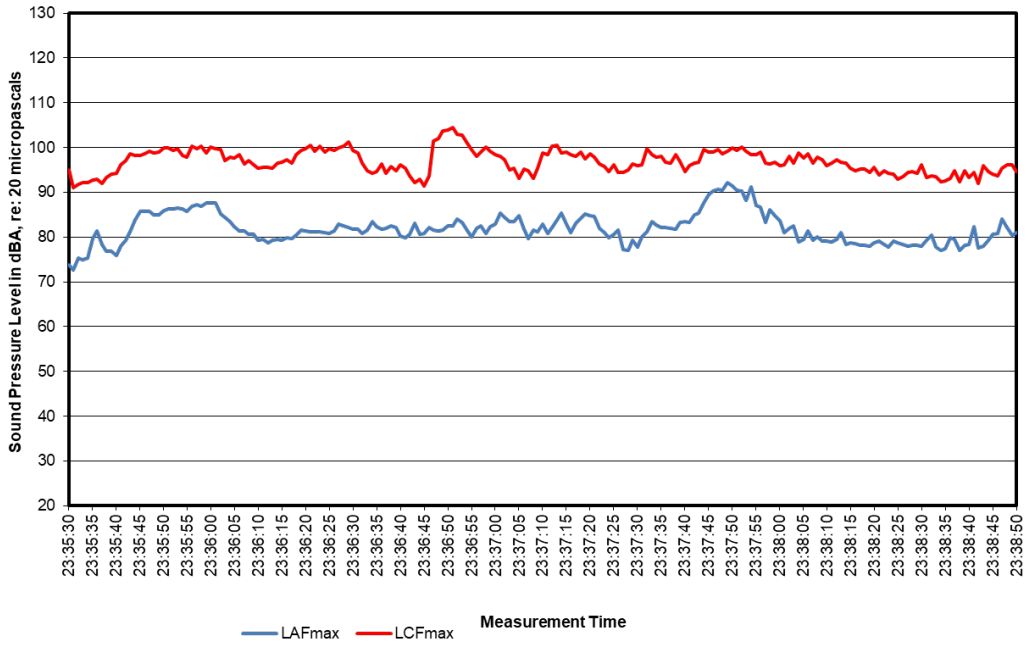
Fort Lauderdale Soundscape Study
Location : Bricklell and 2nd Ave
February 17, 2023 LD 04-31
Music, voices and Motorcycle Passing



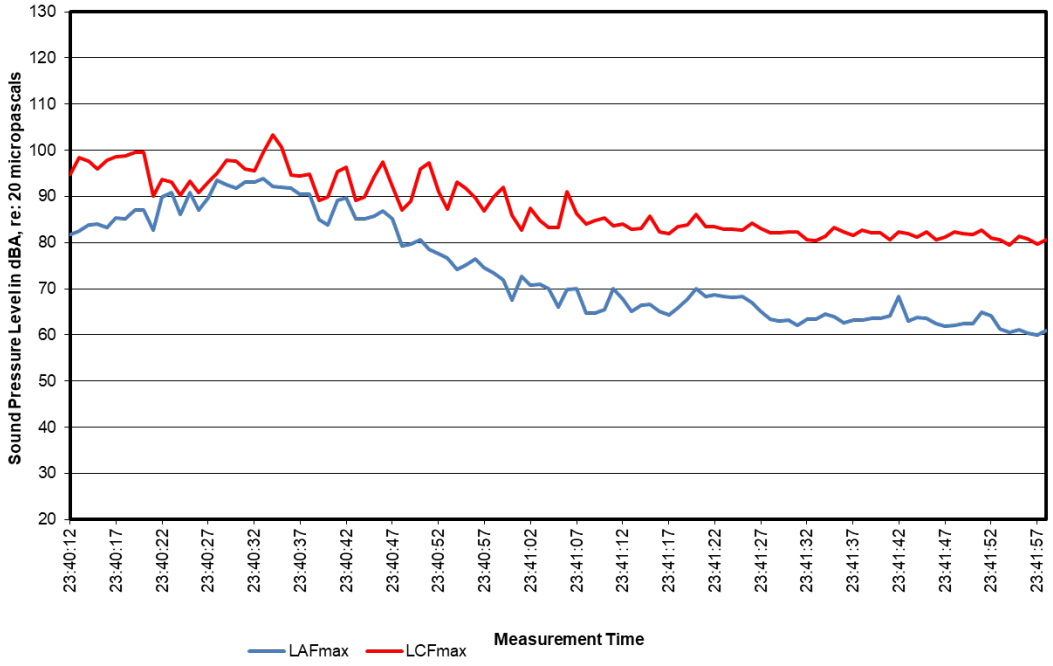
Fort Lauderdale Soundscape Study
Location : Brickell and 2nd Ave
February 17, 2023 LD 04-31
Music, voices and Motorcycle Passing



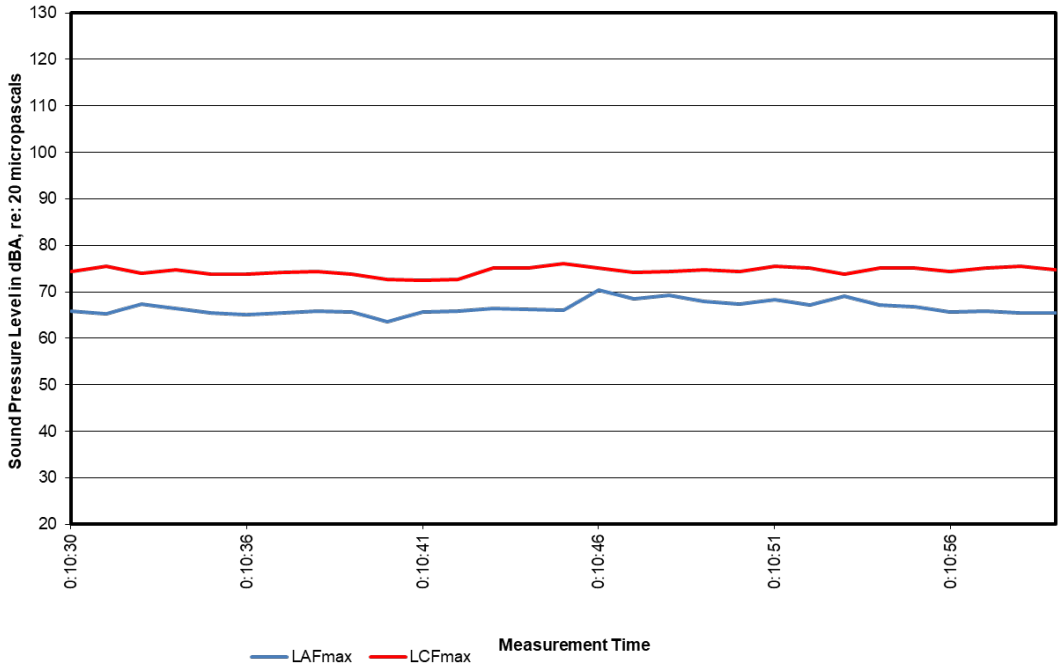
Fort Lauderdale Soundscape Study
Location : Moffat Ave walking down Himmarshee
February 17, 2023 LD 04-33
Music, bass, and voices



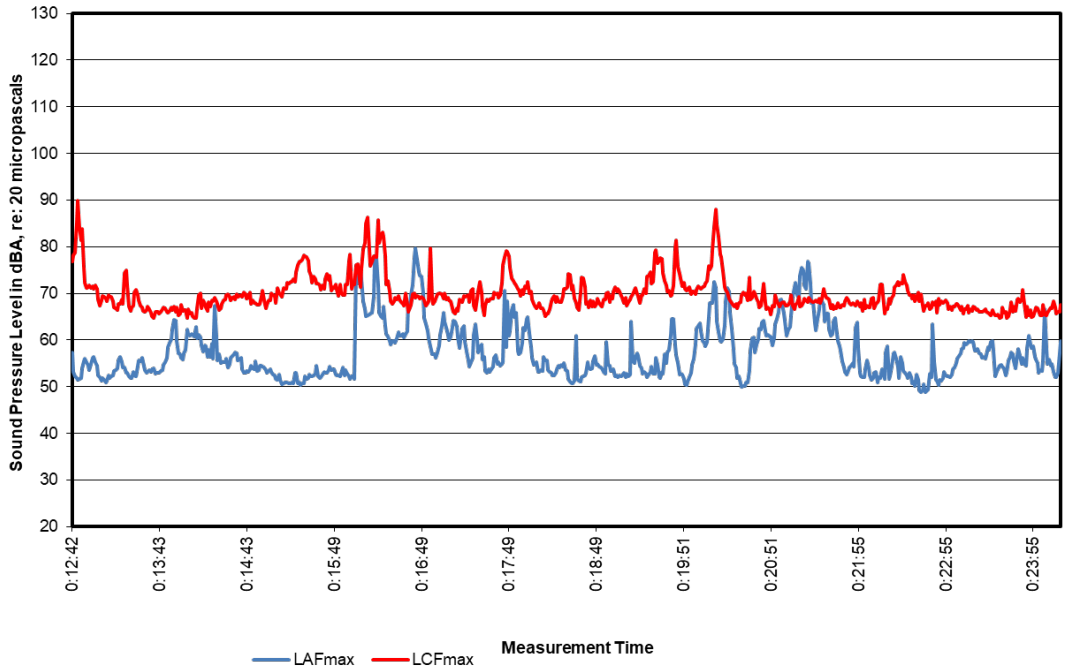
Fort Lauderdale Soundscape Study
Location : Capones to Southwest 4th
February 17, 2023 LD 04-34
Music, bass, and voices



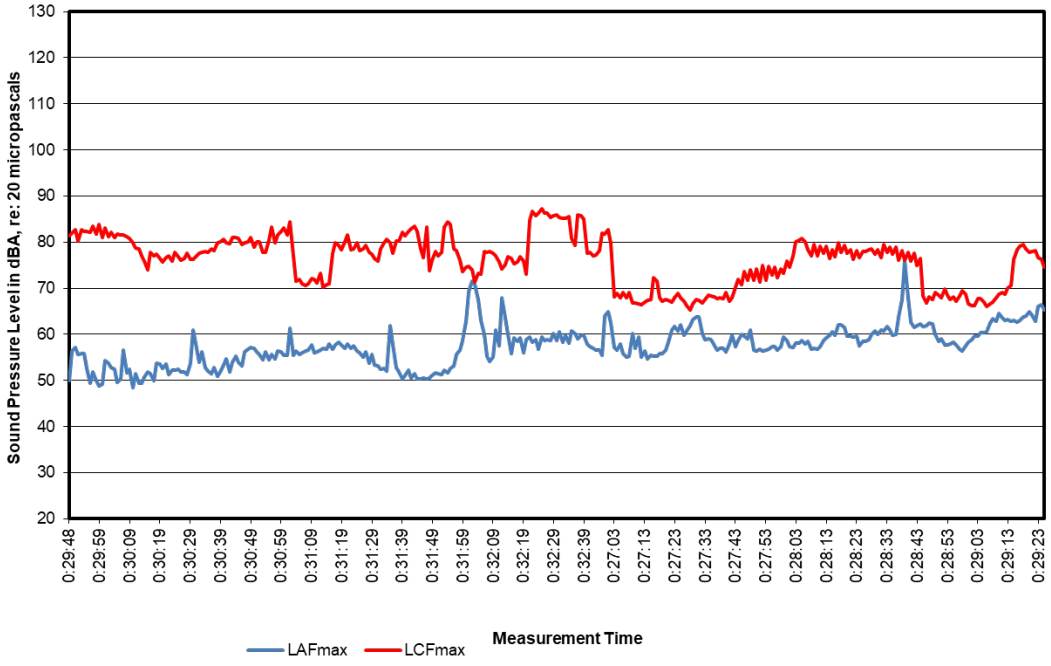
Fort Lauderdale Soundscape Study
Location : Port Cochere at Marriott
February 17, 2023 LD 04-35
Background music, traffic, and voices



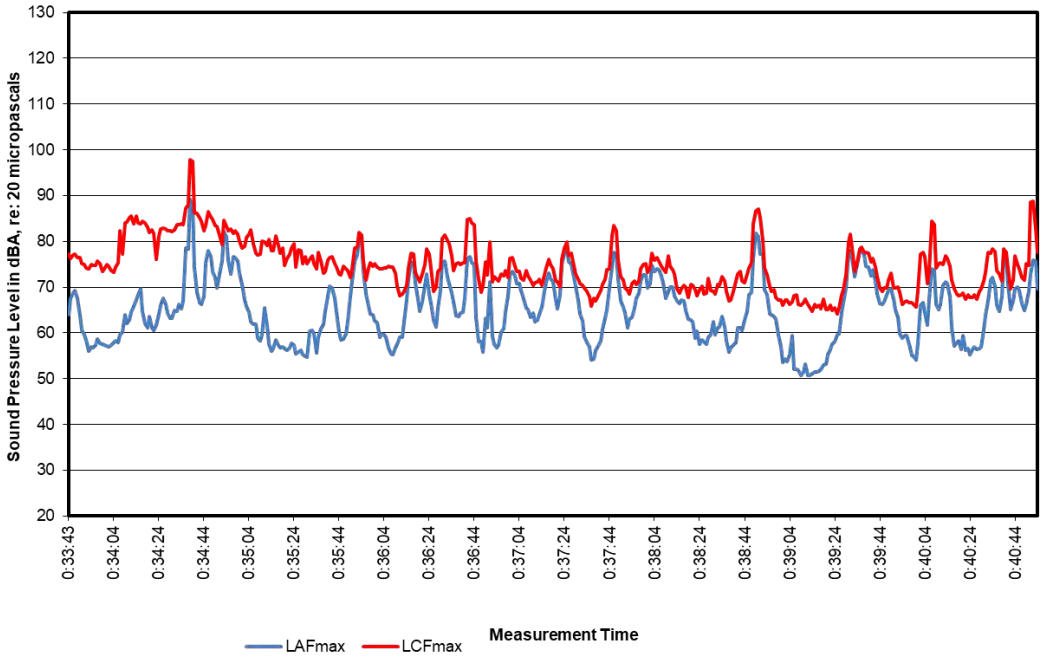
Fort Lauderdale Soundscape Study
Location : NE 7th street
February 17, 2023 LD 04-36
Siren, insects, distant plane, music, train horn, traffic, and voices



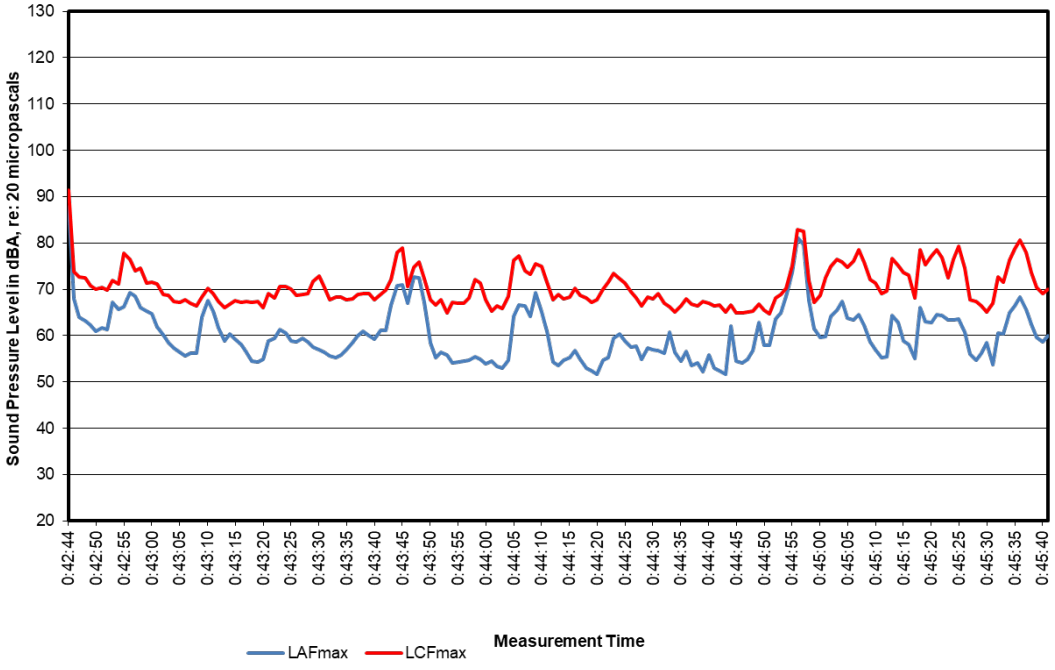
Fort Lauderdale Soundscape Study
Location : NE 1st and NE 7th Street
February 17, 2023 LD 04-37
Distant plane, music, traffic and voices



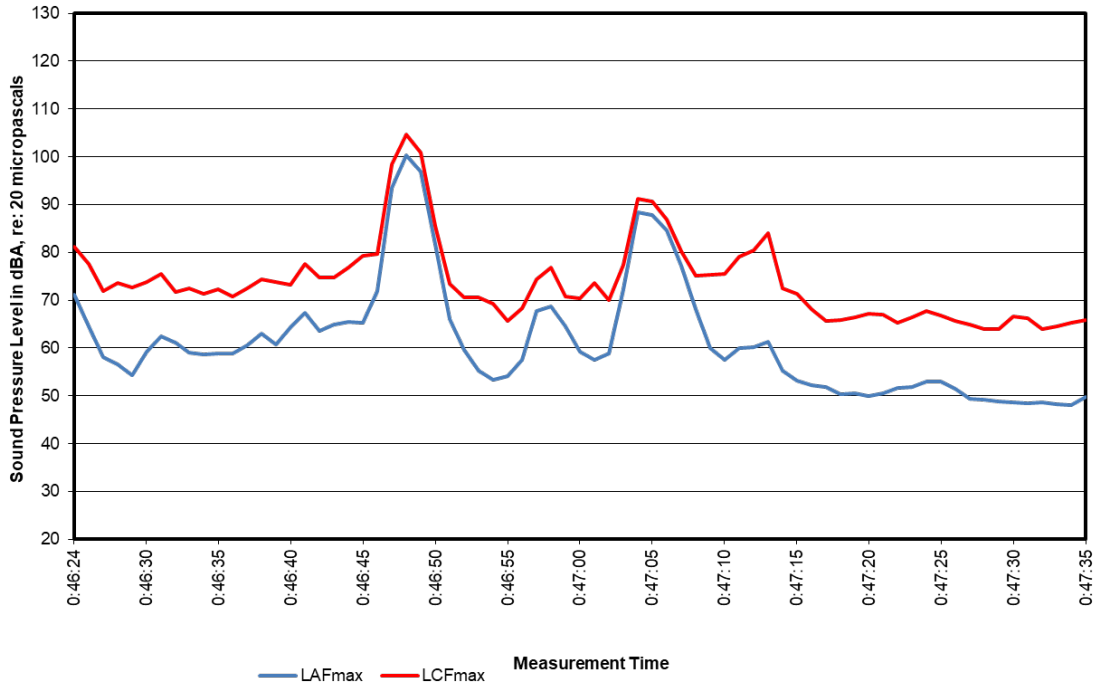
Fort Lauderdale Soundscape Study
Location : NE 7th by Ora to NE 30th Ave
February 17, 2023 LD 04-38
Music, loud traffic and voices



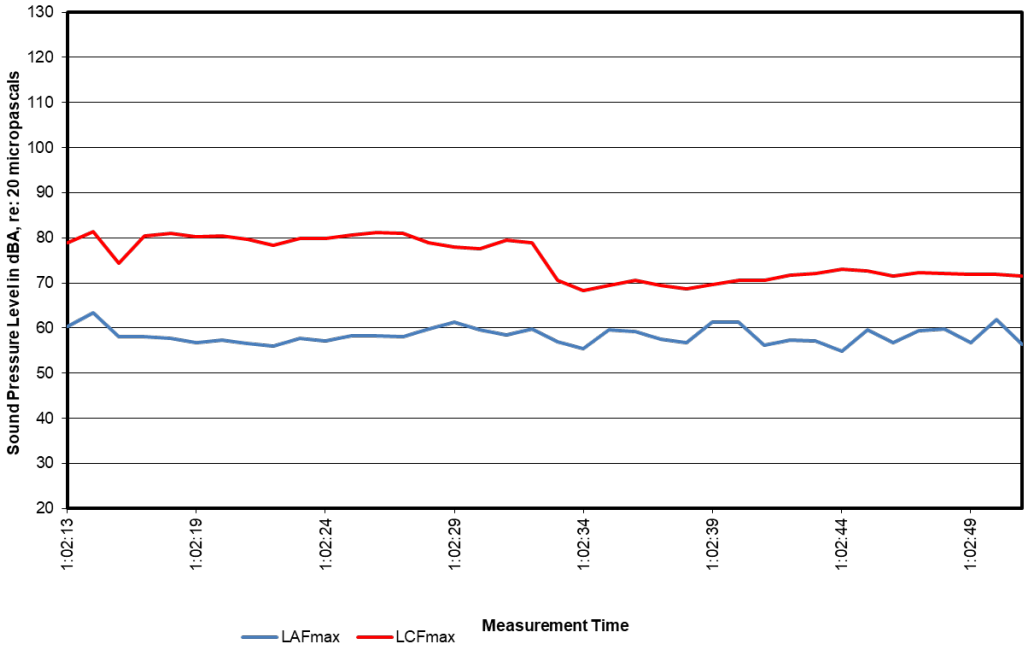
Fort Lauderdale Soundscape Study
Location : NE 6th street to NE 1st and NE 6th
February 17, 2023 LD 04-39
Music, insects, traffic and voices



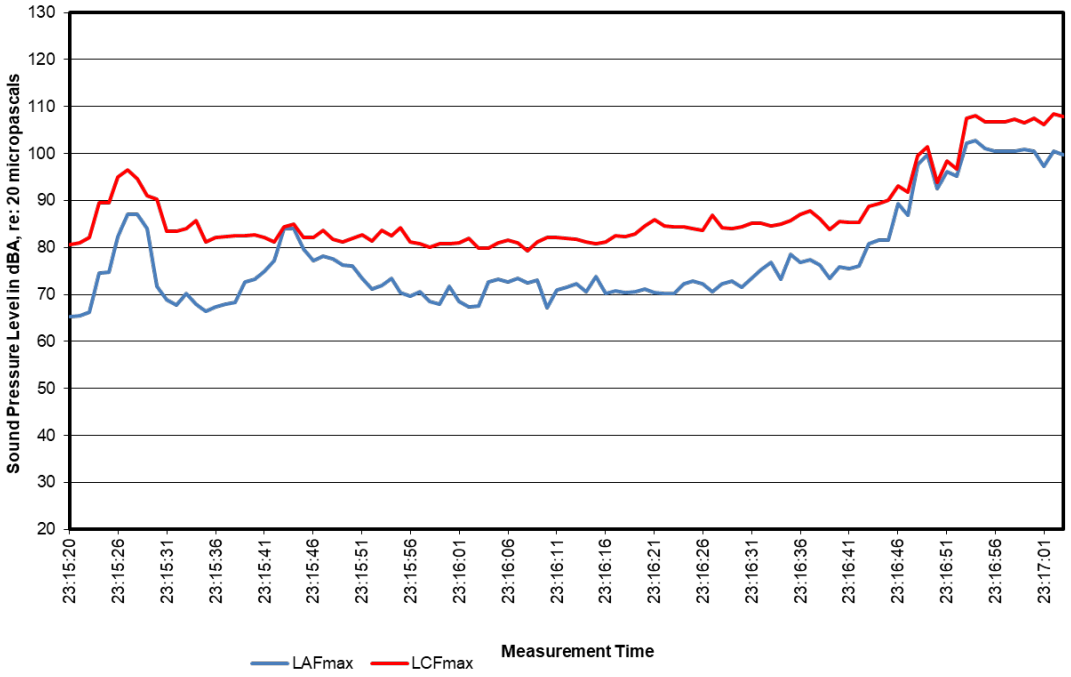
Fort Lauderdale Soundscape Study
Location : NE 6th street to NE 1st and NE 6th
February 17, 2023 LD 04-40
Engine Rev in Parking Garage



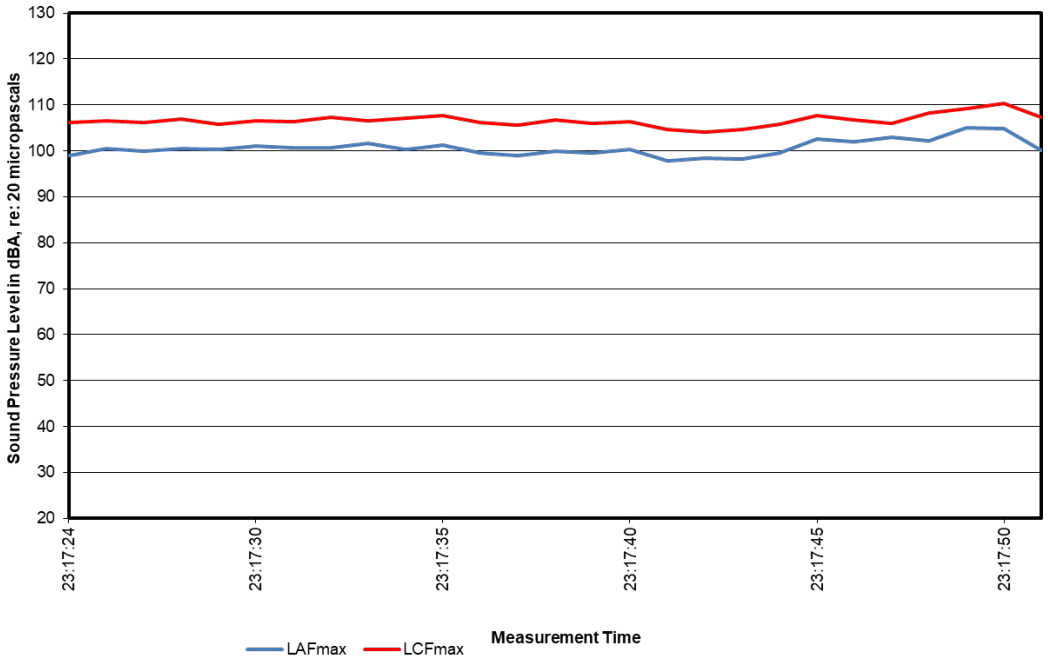
Fort Lauderdale Soundscape Study
Location : NE 6th Street to NE 1st and NE 6th
February 17, 2023 LD 04-41
Voices and Loud Cars



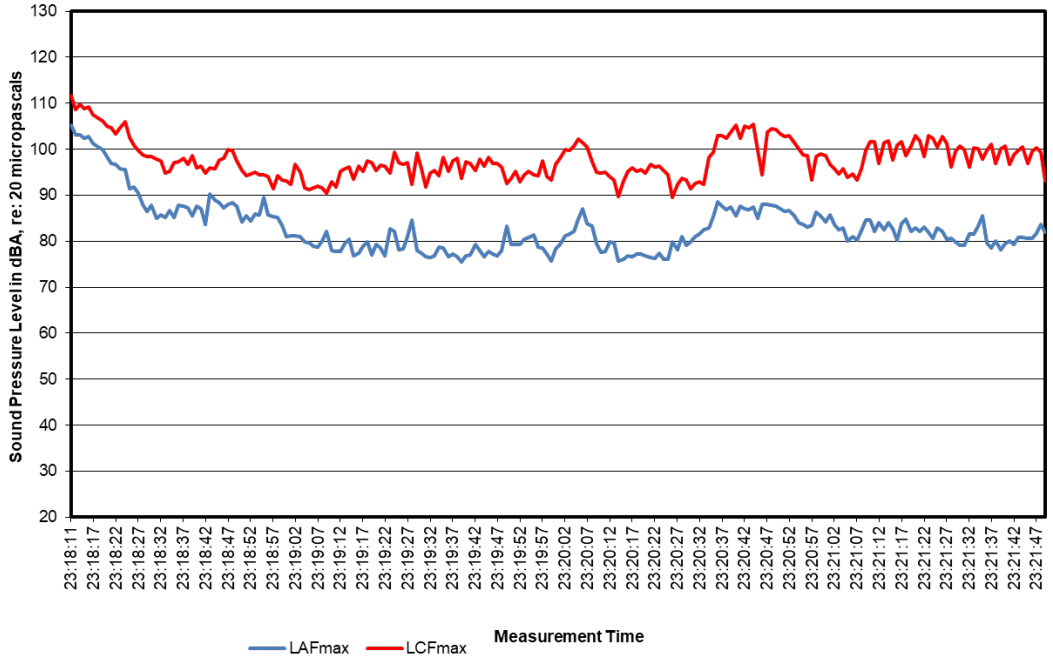
Fort Lauderdale Soundscape Study
Location : Fatcats
February 17, 2023 LD 04-52
Music, Voices and Loud Cars



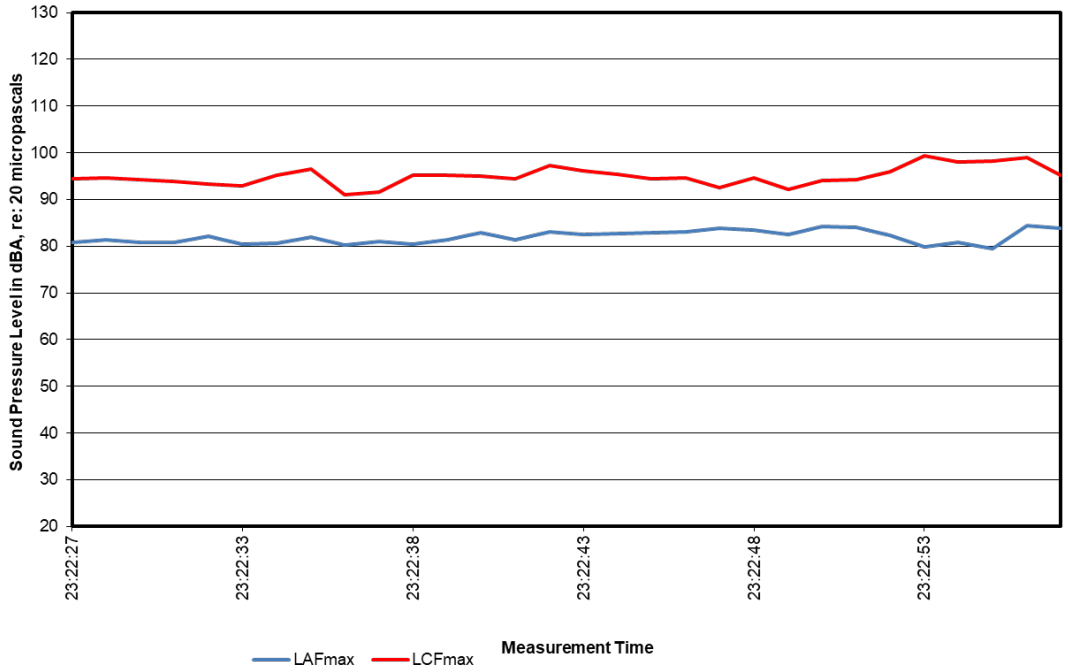
Fort Lauderdale Soundscape Study
Location : Fatcats
February 17, 2023 LD 04-53
Music, Voices and Traffic



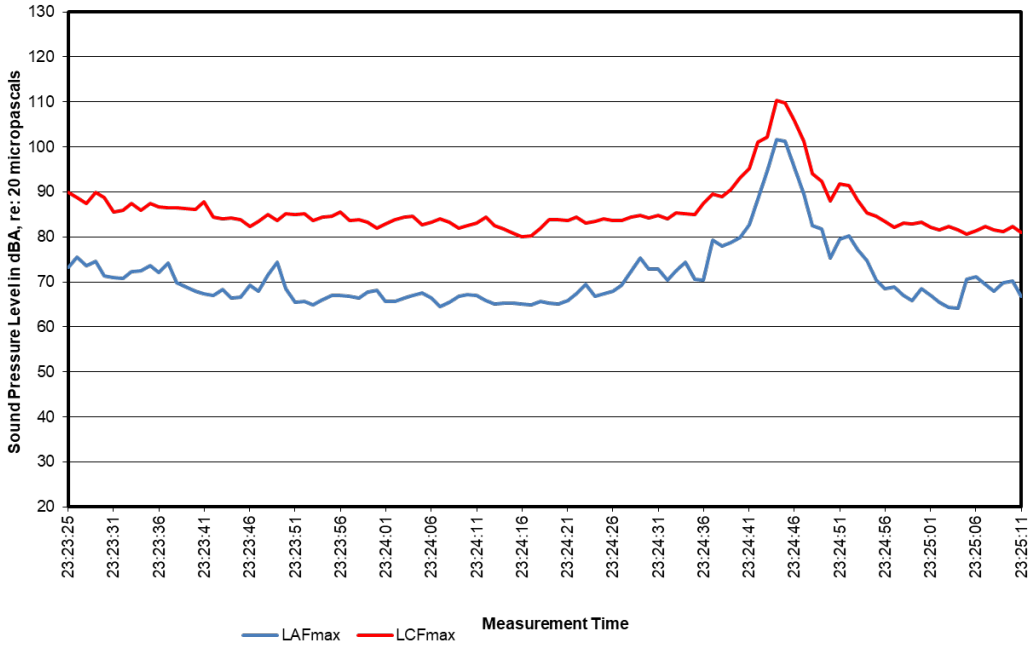
Fort Lauderdale Soundscape Study
Location : Fatcats to Rileys Irish Pub
February 17, 2023 LD 04-54
Music, Voices and Traffic



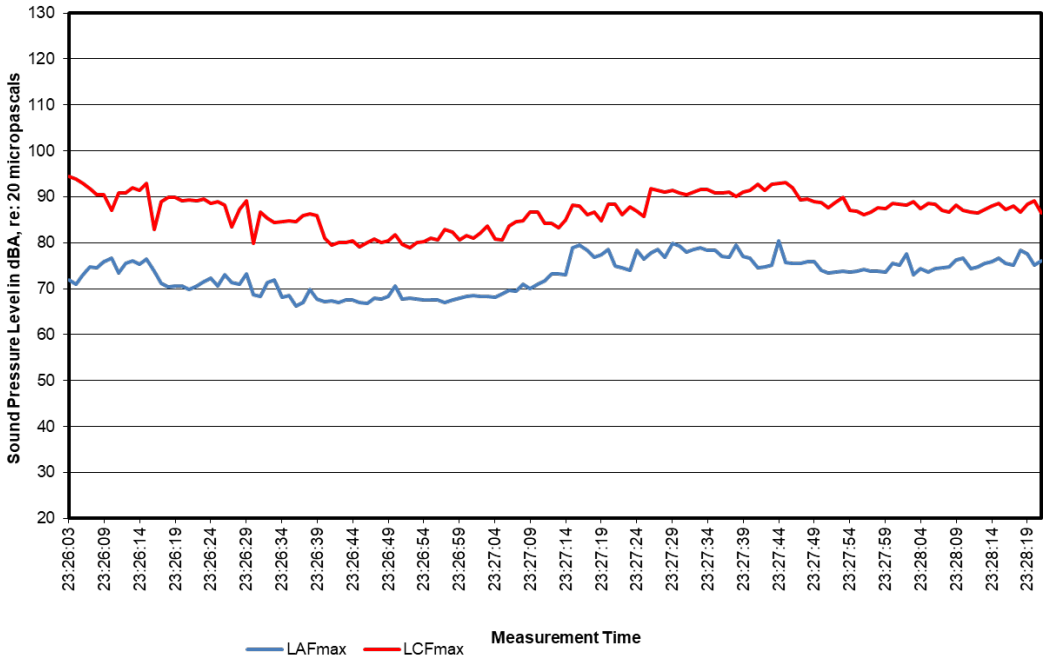
Fort Lauderdale Soundscape Study
Location : SW 2nd Ave by the Road
February 17, 2023 LD 04-55
Music, Voices and Traffic



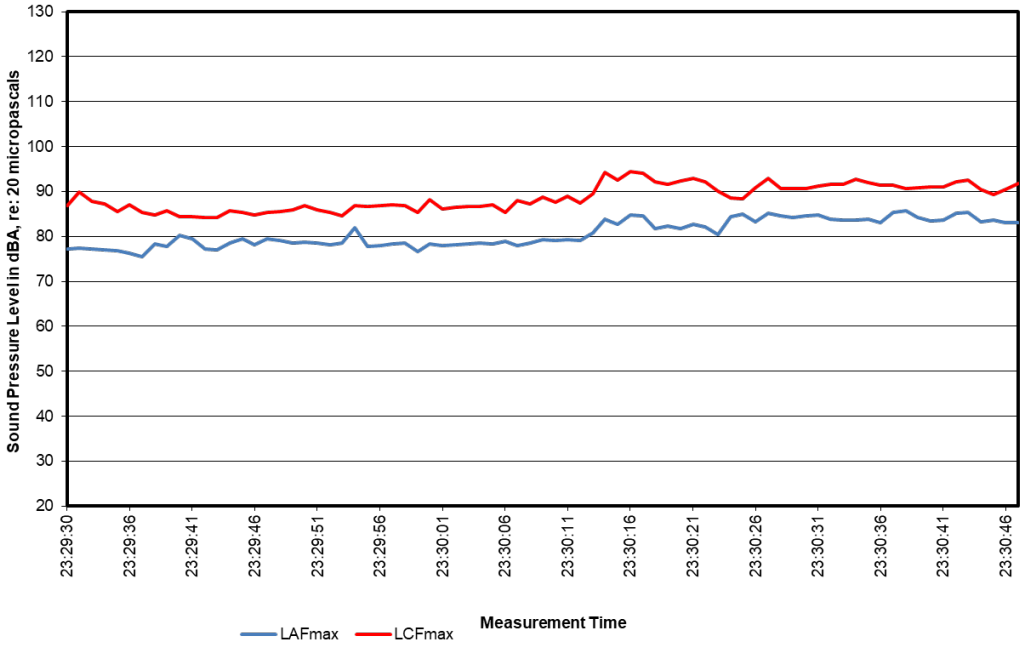
Fort Lauderdale Soundscape Study
Location : Moffat to Brickell
February 17, 2023 LD 04-56
Music, Insects, Voices, Loud Rev, Train and Traffic



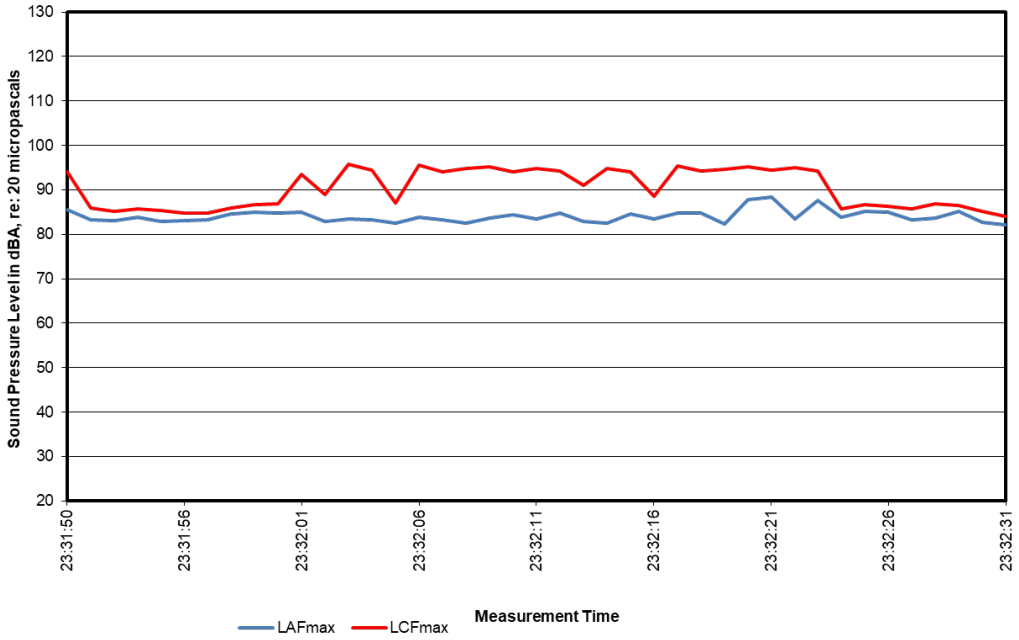
Fort Lauderdale Soundscape Study
Location : Brickell to the Wharf
February 17, 2023 LD 04-57
Music, Insects, Voices, car horn and Traffic



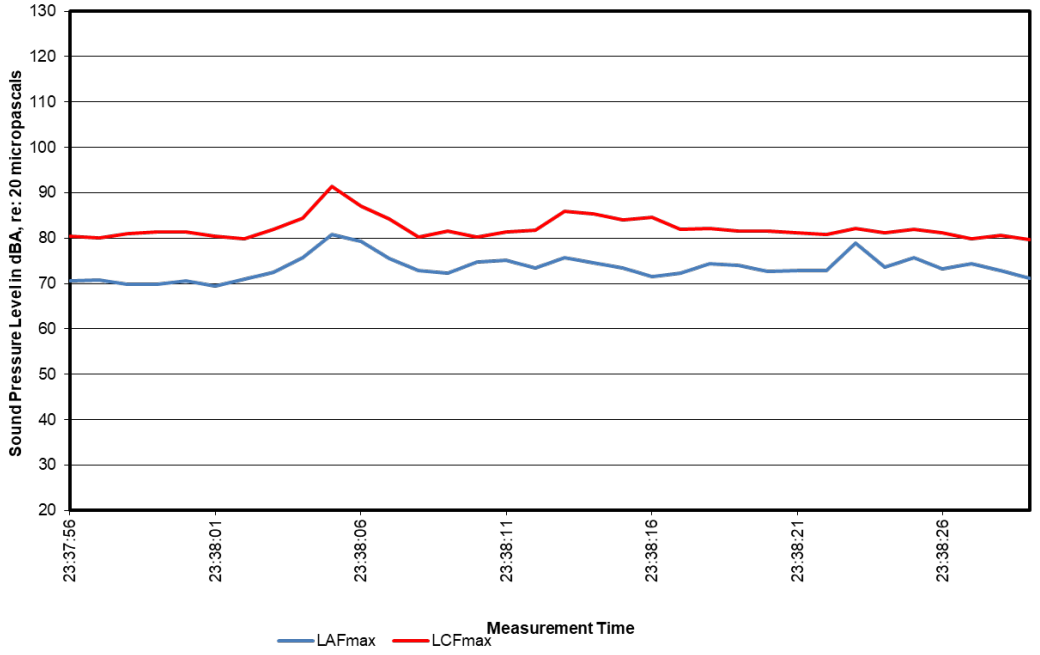
Fort Lauderdale Soundscape Study
Location : The Wharf 6' outside fence
February 17, 2023 LD 04-58
Music, Voices, motorcycIle and Traffic



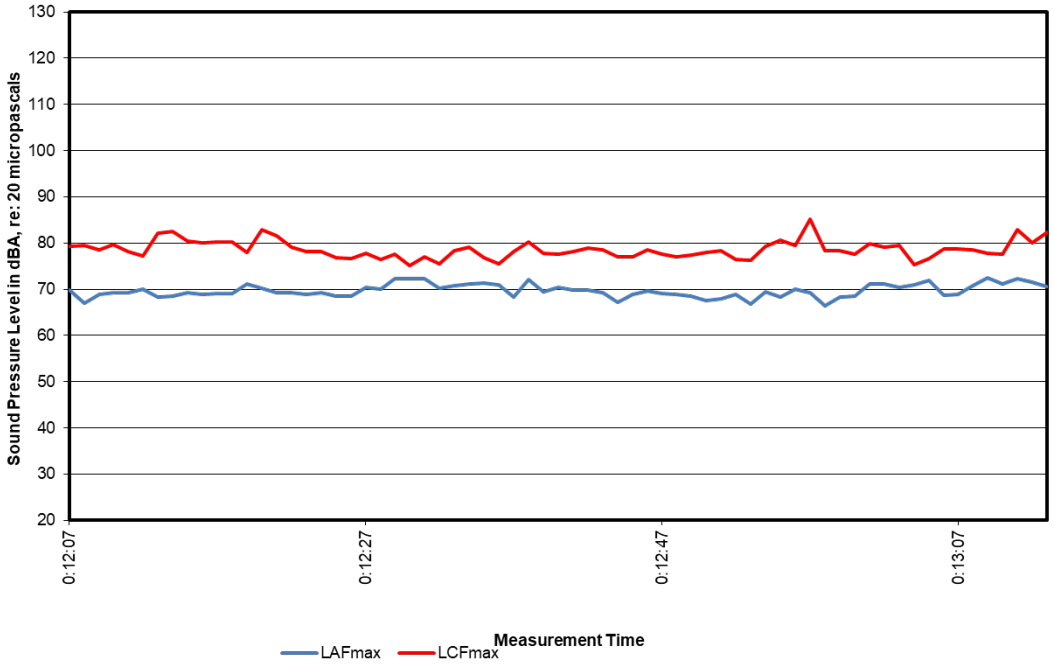
Fort Lauderdale Soundscape Study
Location : The Wharf 6' outside fence
February 17, 2023 LD 04-59
Music, Voices and Traffic



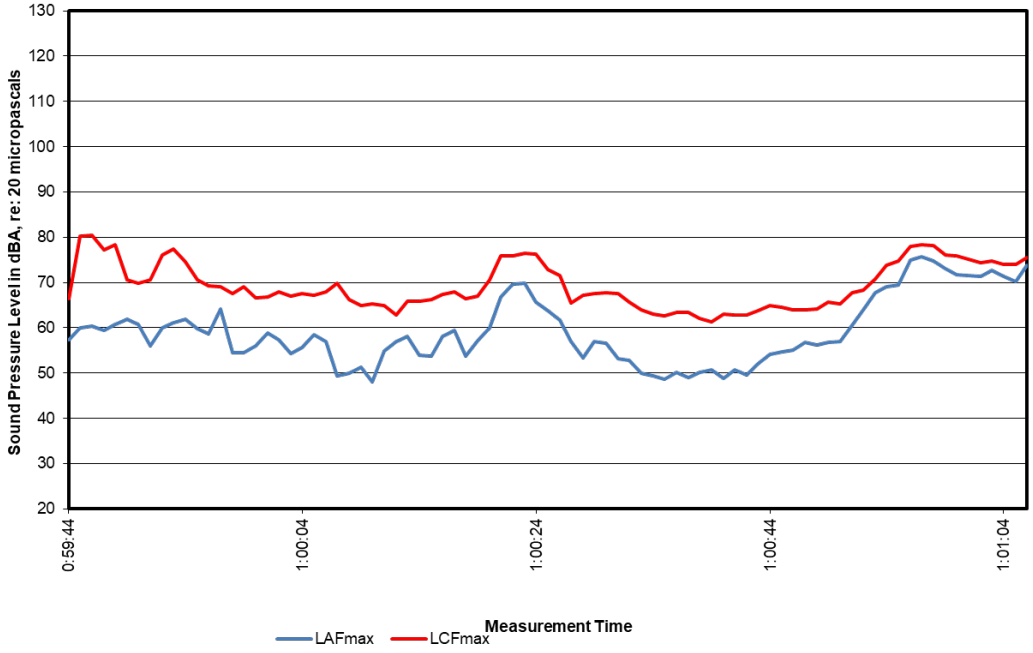
Fort Lauderdale Soundscape Study
Location : Las Olas and St. Andrews
Saturday February 19, 2023 LD 03-60
Traffic, music from bar and talking

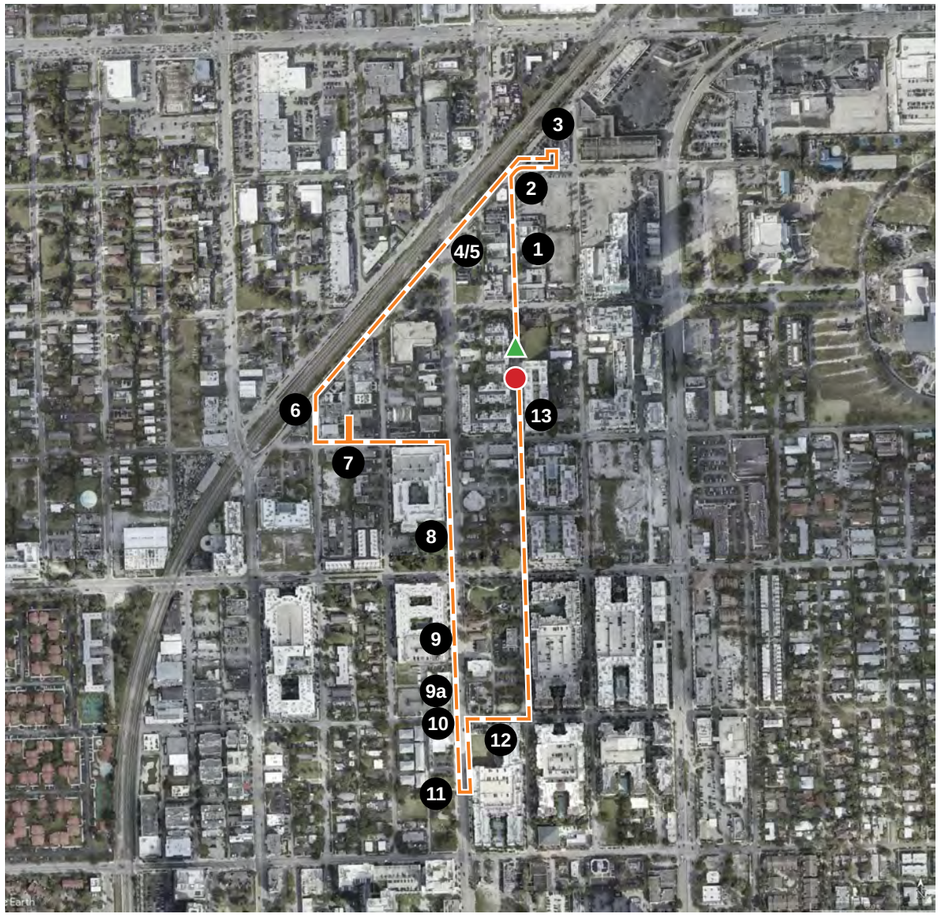


Fort Lauderdale Soundscape Study
Location : Salt 7
Saturday February 19, 2023 LD 03-64
Distant traffic, music voices and distant motorcycle



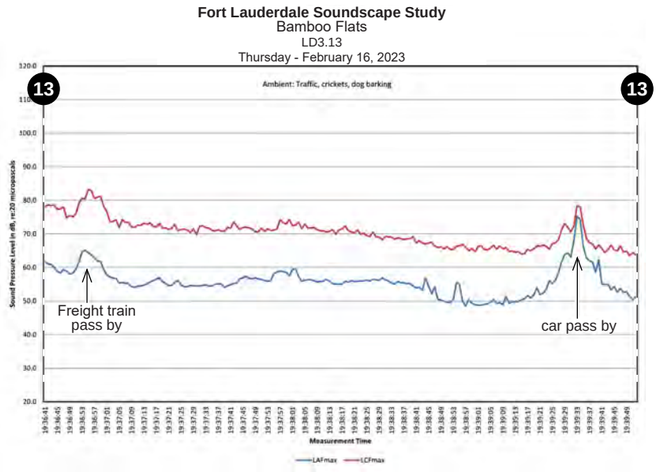
Fort Lauderdale Soundscape Study
Location : Soundwalk NE 7th to Ora at Bamboo Flats.
Saturday February 19, 2023 LD 03-66
Distant motorcycle, train signal, traffic and light music

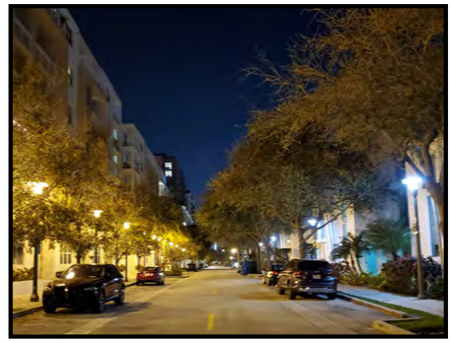




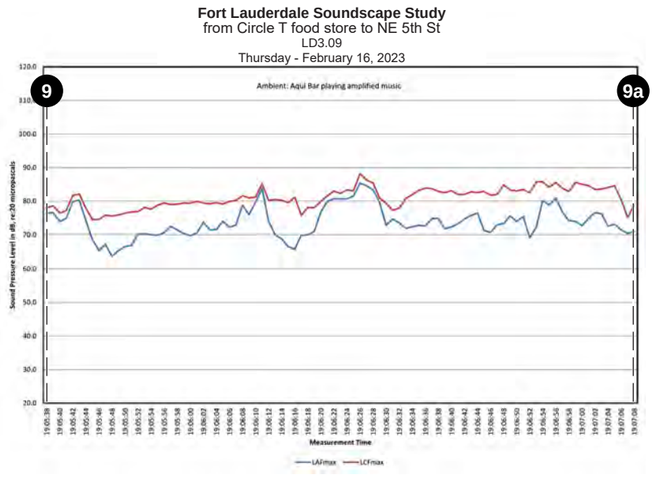
LEGEND

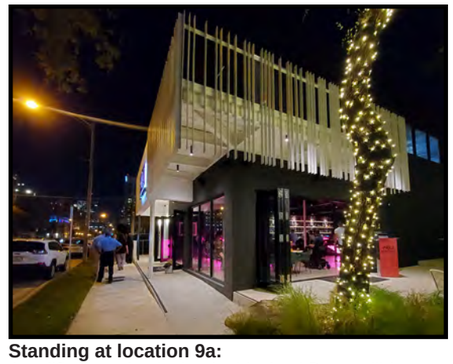
- START OF SOUNDWALK PATH
- END OF SOUNDWALK PATH
- **SOUNDWALK PATH:** 2/16/2023 6PM TO 7PM





Standing at location 13:
On NE 4th Ave, train pass by audible in the distance

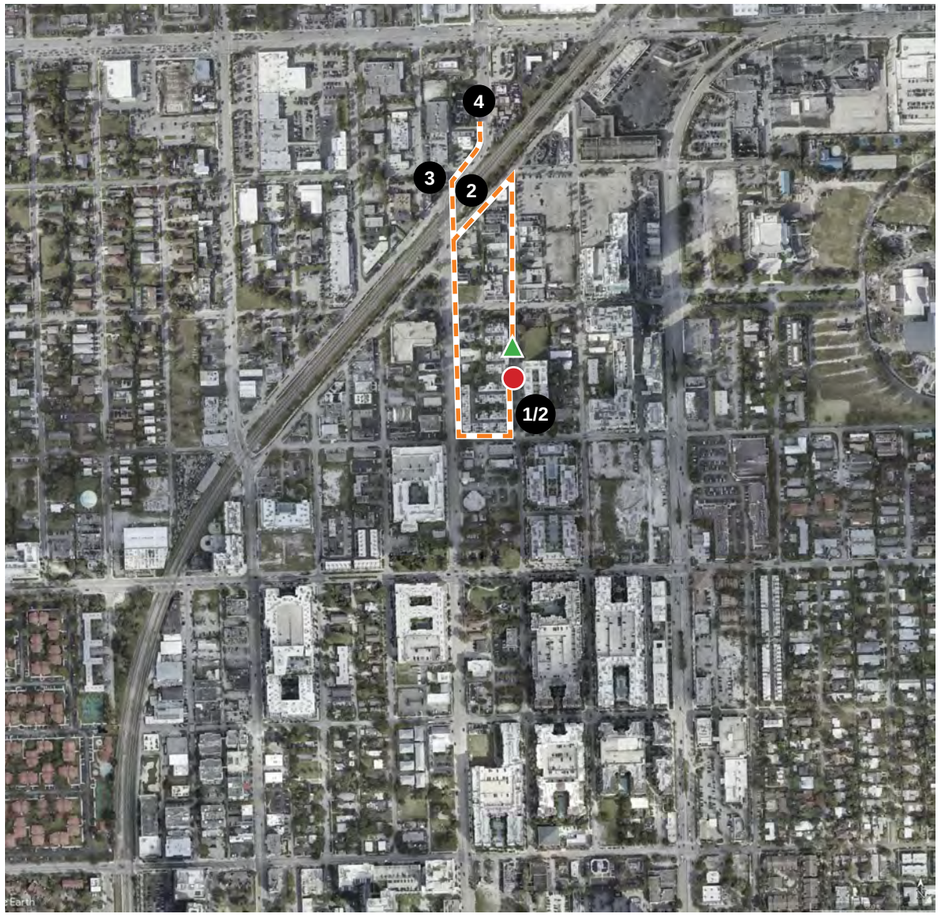


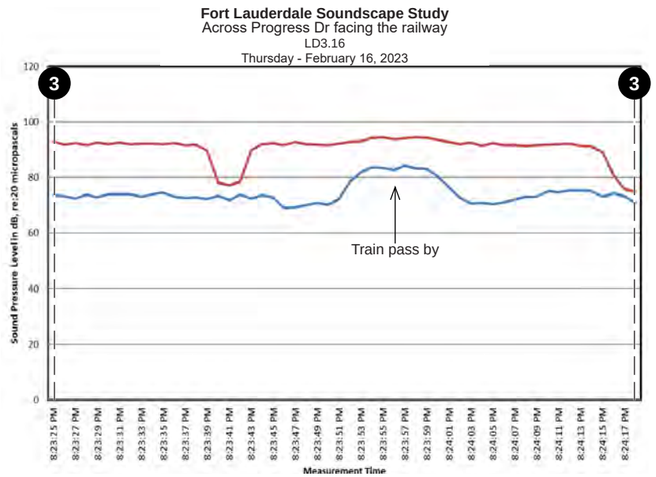


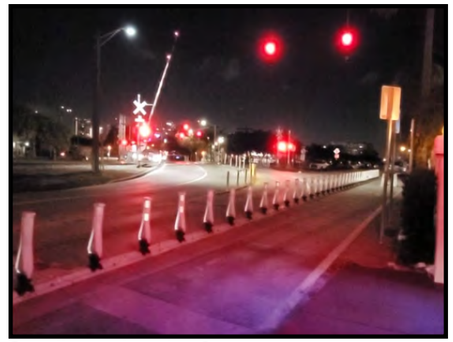
Standing at location 9a:
Amplified music playing inside Aqui Bar audible while standing on the sidewalk

SPOT SHORT TERM MEASUREMENT LOCATIONS

1. In front of the Hub, on NE 4th Ave
2. NE 9th St and NE 4th Ave; with sight line to the Glitch
3. On parking lot Glitch
4. NE 3rd Ave and NE Flagler Dr
5. NE 3rd Ave and NE Flagler Dr
6. by the Event Bliss in NE 1st Ave
7. in alley near NE7th St
8. near 615 NE 3rd Ave
9. 522 NE 3rd Ave; across Food T Stores
10. The Angeles - Night club
11. by the dining area of the Angeles
12. NE 5th St
13. In front of Bamboo Flats







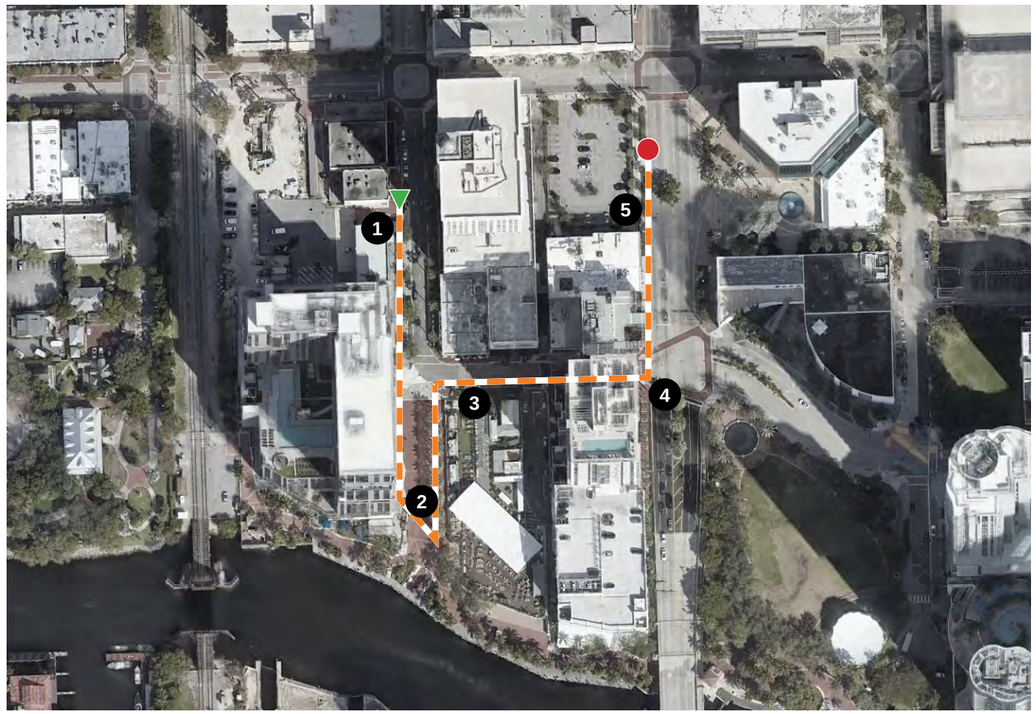
Standing at location 3:
Standing on the sidewalk by Patio Bar & Pizza

LEGEND

- START OF SOUNDWALK PATH
- END OF SOUNDWALK PATH
- **SOUNDWALK PATH:** 2/16/2023 6PM TO 7PM

SPOT SHORT TERM MEASUREMENT LOCATIONS

1. In front of Bamboo Flats
2. In front of Bamboo Flats
3. Near the railway
4. Patio Bar & Bar; Progress Dr. NE 3rd Ave
5. Seating area inside Aida Mexican Restaurant



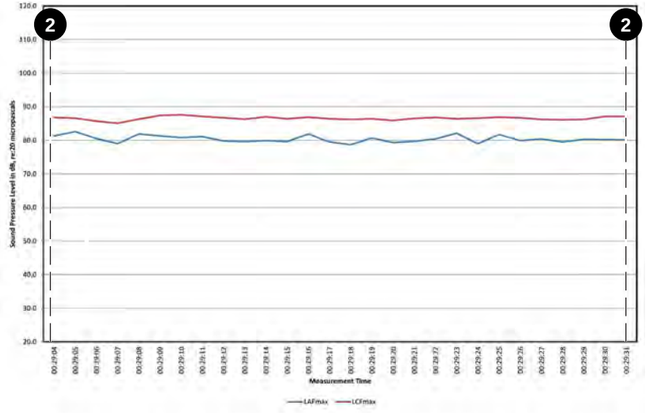
LEGEND

- START OF SOUNDWALK PATH
- END OF SOUNDWALK PATH
- **SOUNDWALK PATH:** 4/23/2023 1:25AM TO 1:37AM

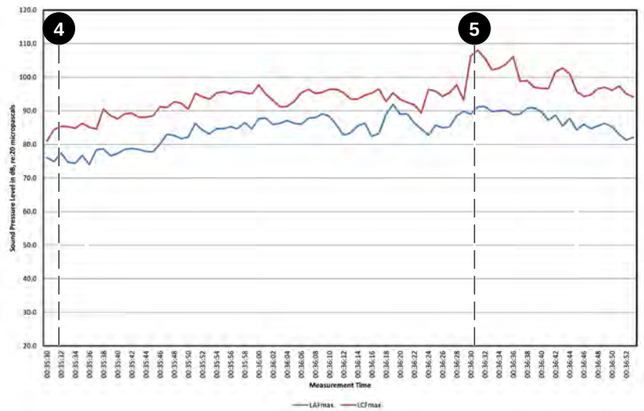
Standing at location 2:
Standing to the west of The Wharf

Standing at location 5:
Near the outdoor seating area at Tin Roof

Fort Lauderdale Soundscape Study
The Wharf
LD2.15
Sunday - April 23, 2023

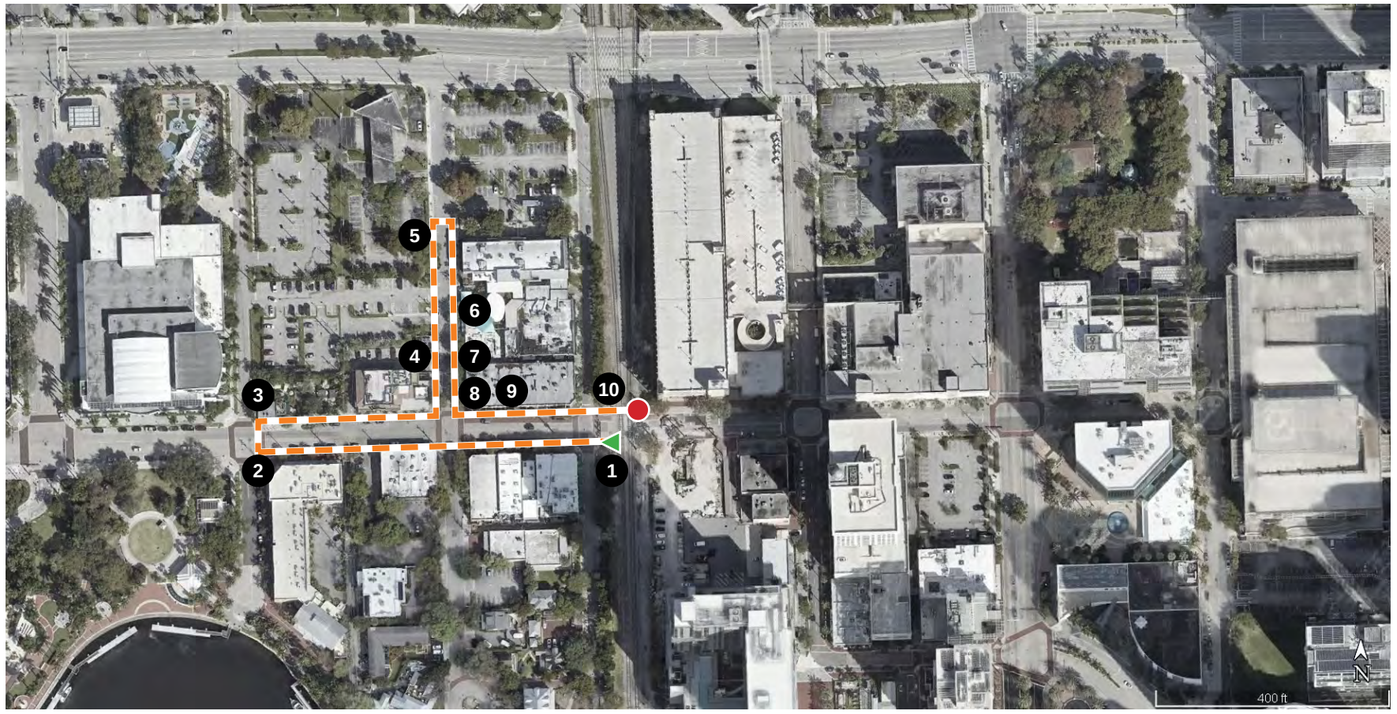


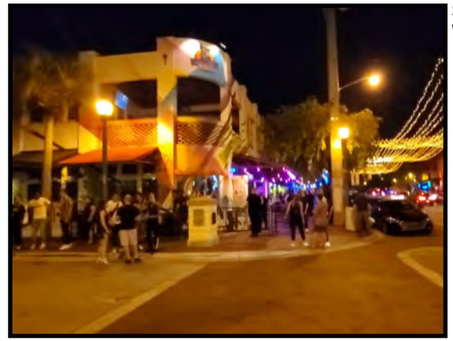
Fort Lauderdale Soundscape Study
The Wharf
LD2.15
Sunday - April 23, 2023



SPOT SHORT TERM MEASUREMENT LOCATIONS

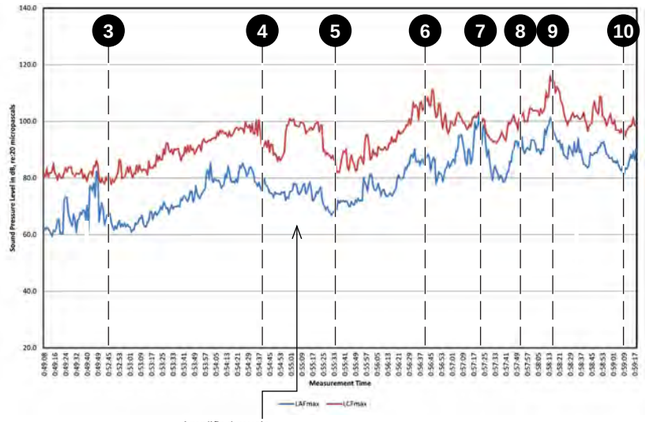
1. Walking south on SW 1st Ave
2. On walkway west of The Wharf
3. In front of the entry to the Wharf
4. S Andrew Ave and SW 2nd St
5. Tin Roof outdoor seating area





Standing at location 1:
Walking west on SW 2nd St

Fort Lauderdale Soundscape Study
Himmarshee Street
LD2.17
Sunday - April 23, 2023



Amplified music playing in The Backyard audible on sidewalk across club

LEGEND

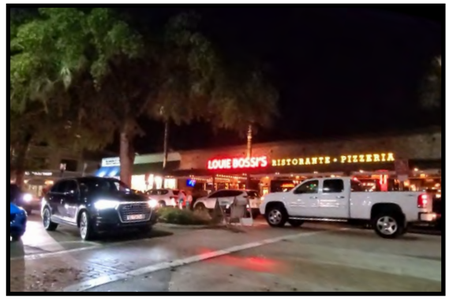
- START OF SOUNDWALK PATH
- END OF SOUNDWALK PATH
- **SOUNDWALK PATH:** 4/23/2023 1:40AM TO 1:50AM

SPOT SHORT TERM MEASUREMENT LOCATIONS

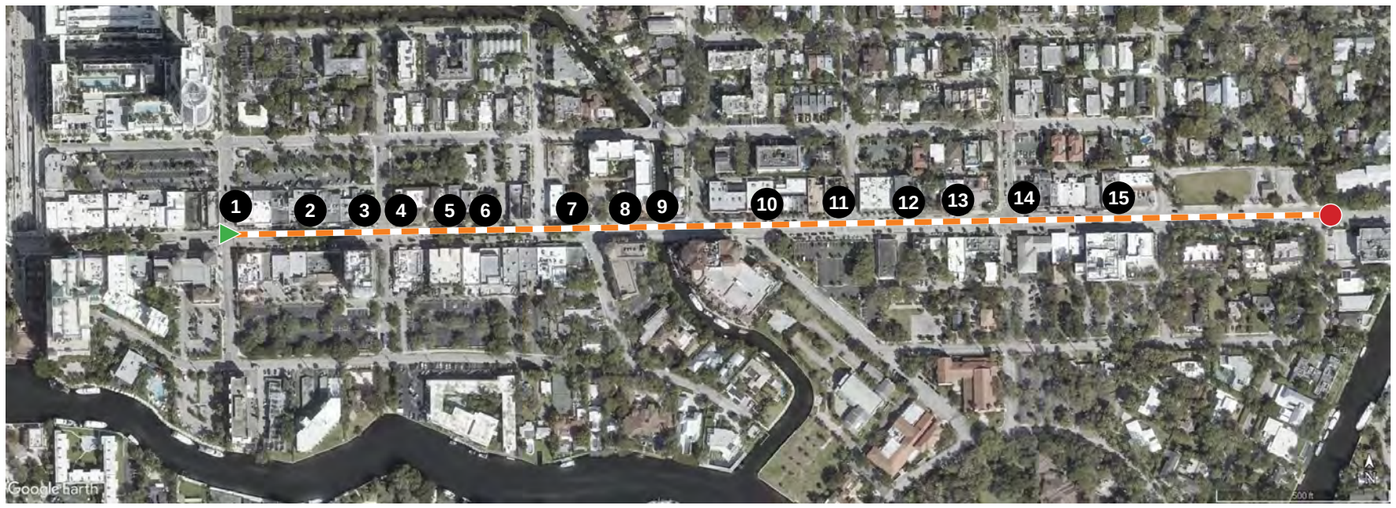
1. Walking west on SW 2nd St; starting on Moffat Ave
2. Vegan Fine Foods; SW 4th Ave and SW 2nd St
3. Breakfast House | O-B House
4. Parking lot, north of #00 Shato
5. Parking lot, west of Nugent Ave
6. The Backyard
7. Club Euro
8. Dicey Riley's Irish Pub
9. Ebar Club 13
10. west of the railway

Standing at location 1:
Amplified music and from Cuba Libre plainly audible

Standing near location 7:
Amplified music and voices from Loui Bossi's Ristorante audible



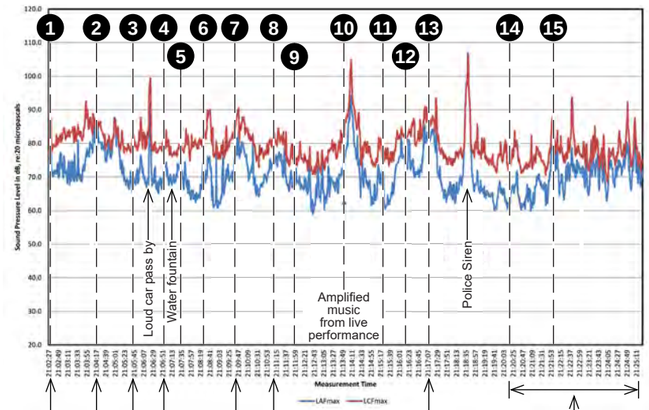
Standing near location 9:
Amplified music from outdoor seating area facing the river audible from the bridge



LEGEND

- START OF SOUNDWALK PATH
- END OF SOUNDWALK PATH
- **SOUNDWALK PATH:** 2/17/2023 9:00PM TO 9:25PM

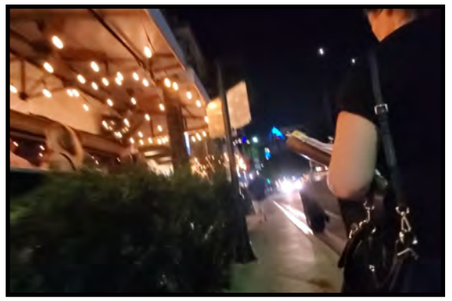
Fort Lauderdale Soundscape Study
Las Olas Soundwalk
LD3.33
Friday - February 17, 2023



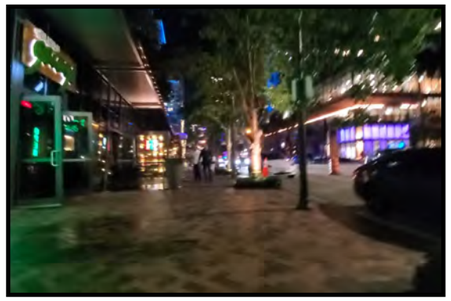
SPOT SHORT TERM MEASUREMENT LOCATIONS

1. Capital One Cafe
2. El Camino/Noodles Panini
3. Street corner: SE 9th Ave and Las Olas Blvd
4. El Edificio de Las Olas
5. Vinos Wine Bar and Cocktail Lounge
6. Ann's Florist and Coffee Bar
7. B Square Burgers
8. Ya Mas! Taverna
9. Eve on the Water
10. Macabi Havana Lounge
11. Street corner: SE 13th Ave and Las Olas Blvd
12. The Balcony
13. Rocco's Tacos and Tequila Bar
14. Street corner: SE 15th Ave and Las Olas Blvd
15. Bombay Darbar Indian Restaurant
16. Baires Grill | Argentine Steakhouse

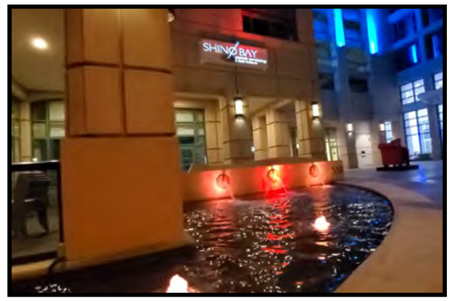
Standing at location 4:
Amplified music playing in Piazza Italia



Standing near location 14:
Amplified music propagating through open doors leading into Sushi Garage



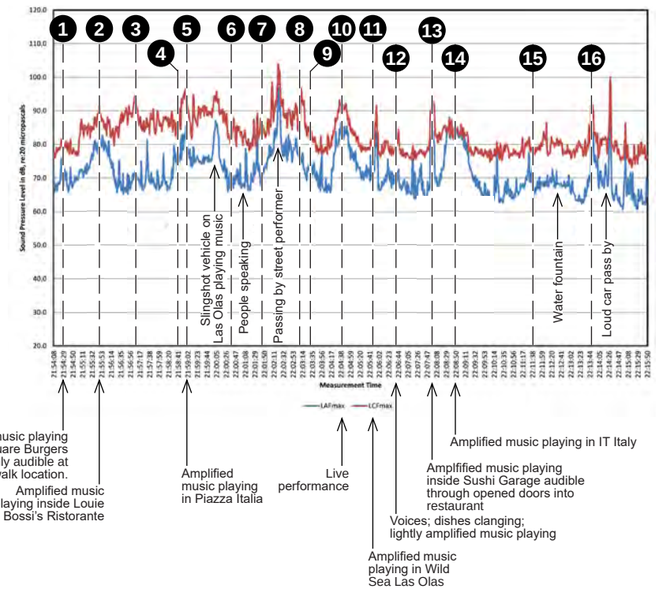
Standing near location 15:
Amplified music from YOLO's audible; water fountain sounds in the ambient



LEGEND

- START OF SOUNDWALK PATH
- END OF SOUNDWALK PATH
- **SOUNDWALK PATH:** 2/17/2023 9:50PM TO 10:15PM

Fort Lauderdale Soundscape Study
Las Olas Soundwalk
LD3.35
Friday - February 17, 2023

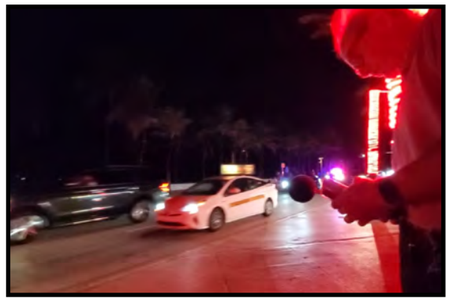


SPOT SHORT TERM MEASUREMENT LOCATIONS

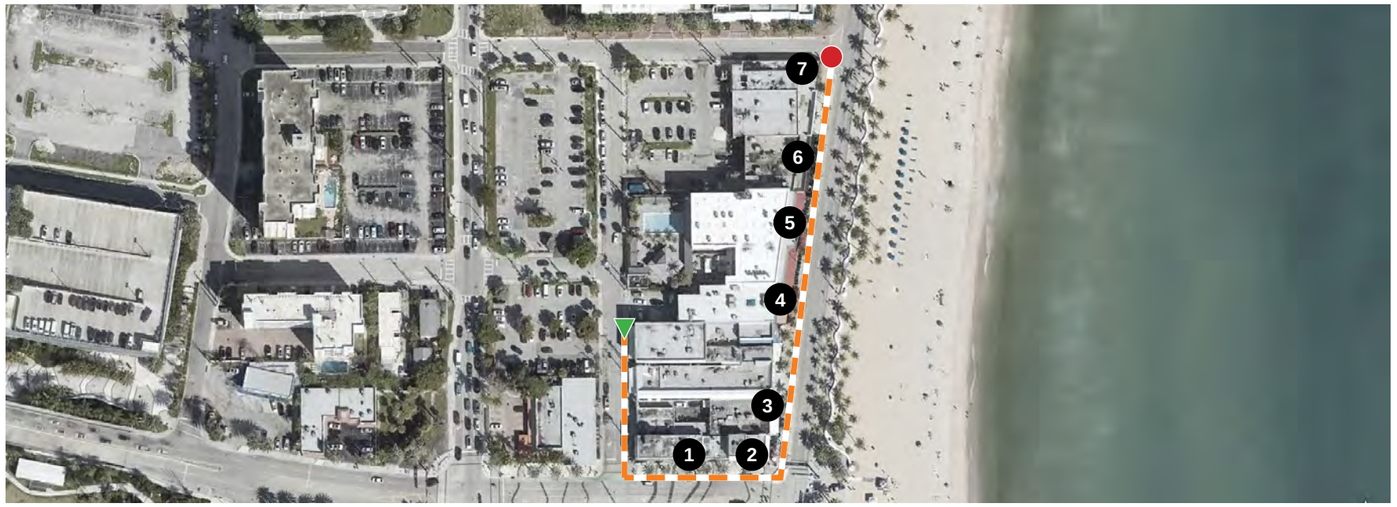
1. Street corner: SE 11th Ave and Las Olas Blvd
2. El Camino/Noodles Panini
3. Across Las Olas Blvd., by Ann's Florist and Coffee
4. Caffe Europa
5. Piazza Italia
6. Street corner: SE 9th Ave and Las Olas Blvd
7. Across Las Olas Bldv., in front of El Camino
8. Cuba Libre
9. Street corner: SE 8th Ave and Las Olas Blvd
10. Gran Forno Pronto (live performance playing)
11. Wild Sea Las Olas
12. Cheescake Factory
13. Sushi Garage
14. IT! Italy Ristorante
15. Across Las Olas Bldv., in front of YOLO
16. Street corner: SE 3rd Ave and Las Olas Blvd

Standing at location 1:
Amplified music for multiple establishments audible

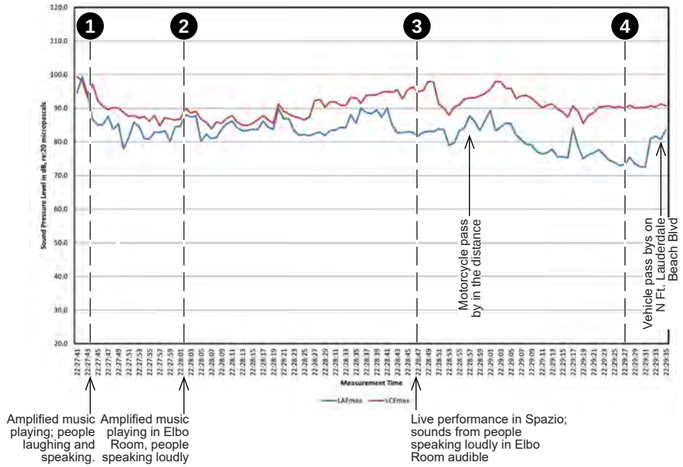
Standing near location 4:
Pulse of vehicle pass bys near location 4



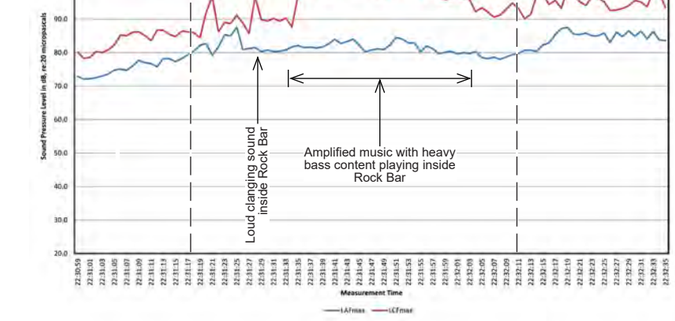
Standing near location 5:
Amplified music playing inside Rock Bar; sounds from people speaking/laughing audible



Fort Lauderdale Soundscape Study
Beach Soundwalk
LD2.02
Saturday - April 22, 2023



Fort Lauderdale Soundscape Study
Beach Soundwalk
LD2.03
Saturday - April 22, 2023



LEGEND

- START OF SOUNDWALK PATH
- END OF SOUNDWALK PATH
- **SOUNDWALK PATH:** 4/22/2023 10:15PM TO 10:40PM

SPOT SHORT TERM MEASUREMENT LOCATIONS

1. Beach Party Pizza & Karaoke; 3009 E Las Olas Blvd
2. Elbo Room
3. Spazio Italian Restaurant
4. Solluna
5. Rock Bar
6. Cafe Ibiza
7. The Drunken Taco

Soundscape Intervention:

academic studies and schematic proposals for locations in Fort Lauderdale, FL

Students from the University of Florida School of architecture participated in developing architectural and planning strategies that respond to the soundscape at locations of interest that were identified as part of the larger soundscape study with Siebein Acoustic and the UF School of Architecture.

The work below represents student visits to the selected locations, participation in sound walks, personal observations, photo documentation, precedent studies, and then, coalescing that information and generating schematic design proposals seek to provide strategies to improve urban density, mixed-use, and an improved soundscape.

The work includes 11 student projects spanning two academic semesters including Fall 2022 and Spring 2023 in two different courses: Advanced Graduate Design Studio 3 (Fall 2022), and the graduate seminar Energy, Ecology, and Architecture (Spring 2022). Included below is an overview of each of the courses and selected work from each student illustrating how future architectural design, while considering sustainability and urbanity, can improve sonic livability in urban contexts with very specific implementation proposals for specific sites in Ft. Lauderdale.

Summary of findings

1. Vertical distance can be an effective sound abatement strategy general street noise including traffic, sidewalk cafes, and unamplified events in the streets. This strategy could be implemented through requiring residential high-rise construction to limit residences in the lower floors – vertical zoning.
2. In addition to Item 1, sound level limits at the windows or balconies of these units could be established as a more nuanced implementation of property line standards.
3. Building envelope systems (walls, doors, windows) could be required that, as a system, would limit the amount of sound that is transmitted through them. This could be achieved by material layers, heavier construction or buffer spaces between the outside and inside spaces.
4. Buildings themselves could absorb and diffuse the sounds striking them rather than reflecting and subsequently amplifying the sounds or focusing the sounds in particular areas. Absorption and diffusion can be achieved through material selections and articulation on the building skin or a combination of both.
5. Strategic zoning could incentivize designs, along arterial corridors that fill the sites and provide acoustic barriers to the residential neighborhoods behind them. This strategy would also benefit from Item 4 above. Care should be taken to keep noisy program elements on the arterial corridor side of the building.
6. Sound locks or buffer spaces between noisy interior programs such as loud clubs or manufacturing could be implemented to control intermittent loud sounds from emanating from a building.
7. Rooftop and elevated terraces, that allow residents to find peaceful spaces within their larger buildings could offer times respite and relief from urban bustle while enjoying the outdoors.

Soundscape Studio: Advanced Graduate Design 3 | Fall 2022

ARC 6356 | School of Architecture | College of Design Construction and Planning |
University of Florida

> *We may speak of a musical composition as a soundscape, or a radio program as a soundscape or an acoustic environment as a soundscape… … the auditory equivalent of a landscape.*
>
> R. Murray Schafer | Simon Fraser University

Project Challenge:

Conceptual Visioning – the big ideas

Before endeavoring to resolve the 1000's of detail questions that a piece of architecture will demand that we answer, we must develop a clarity of intention, that is: spatial, contextual, supports human activities, and that is inspiring for designers and for those who might dwell within our architecture. Clarity of intention comes from research into the context, precedents, visiting the context and sites, and considering linkages between conceptual ideas and the physicality of the place.

Schematic Design

Here we translate visioning concepts into architecturally specific proposals that integrate linkages to context; develop structural, spatial, and circulation systems; and resolve these systems through plan, section, and 3D models. How does the focus on 'soundscape' influence and prioritize these systems? How does soundscape design suggest possibilities for materials, enclosure systems, and refinement of program elements that advance the conceptual visioning phase?

The site

Students will work on one of two sites: Ft. Lauderdale Beach, Ft. Lauderdale Downtown. Each of the sites is approximately 1.2 to 1.5 acres. Requirements for setbacks and height limits should be governed by the local building code. In the case of expanding outside those limitations, please propose a rational for the benefit to the community and why the code might be modified.

The Program

Program elements are the minimum required and other program elements, especially those that explore ideas of the soundscape should be added, but not substituted. Program areas should not vary by more than 10%.

- Night Club 10,000 sf with 5,000 sf of that area at least 24' tall (main dance area)
- Retail area 30,000 sf
- Municipal offices 35,000 sf
- Lease offices 35,000 sf • Parking for 300 automobiles.
- Residences (2,000 sf average size): 300
- Required vertical circulation – elevators and fire stairs

Each student will submit the following elements for the final presentation (mid-term can be in progress):

- Concept statement that expresses the prioritization of ideas, and how they relate to the soundscape strategies among other architectural considerations (100 – 250 words)

- Site plan with context 1/32”=1 foot scale (the site info can be an image from google earth)
- First level plan 3/32” (should show adjacent context)
- Parking level plan 3/32”=1 foot scale
- Residential level plan 3/32”=1 foot scale
- Two building sections 3/32”= 1 foot scale
- Two site elevations with context 1/32”=1 foot scale
- One exploded isometric showing program elements & soundscape strategies (labeled) – not to scale
- Five+ sketch perspectives illustrating the form, occupational moments, and how they relate to the conceptual ideas and soundscape strategies.

Student Responses:

In the following section selected student work illustrates how concepts generated from the soundscape studies could influence building design and perhaps guide codes and requirements toward a continued improvement in Fort Lauderdale’s soundscape over the next few decades.

The project summaries are those of the students seeking to explain their proposals as simplified abstracts of the larger body of research and design over the course of the semester.

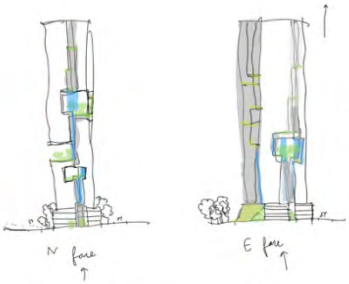
Cascade Park by Stephanie Roberts (Downtown Fort Lauderdale)

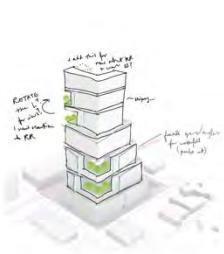
Cascade Park is a mixed-use project that is a vertical extension of the river, as well as a vertical extension of the Riverwalk's greenspaces in downtown Fort Lauderdale. Nearby the railroad tracks, the parcel opens its first floor to the east edge along Moffat Avenue with a viewing platform for the railroad; this is where the train proves itself as a temporal spectacle for guests to experience only a few times throughout their day, rather than a noisy nuisance.

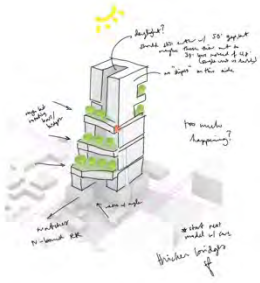
The first floor also embodies a main plaza that holds an outdoor market space where guests can shop at kiosks and food trucks. While considerably noisy with the railroad on the east edge, and the traffic on the north edge from Southwest 2nd Street, the north segment of the site provides corridors beside enclosed retail space for pedestrians to enter into a courtyard threshold space. The courtyard acts as a visual and physical acoustic buffer with the building masses to moderate the undesirable city sounds.

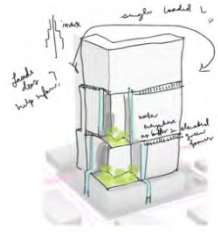
As for the southeastern edge, a corner plaza incorporates water features of water walls and fountains to additionally mask the unwanted noise, and introduce desirable natural sounds. This includes the rustling of the foliage with birdsong along with the dropping water sounds from the installations. These features at the ground level ascend their way upward to elevated vegetated spaces in the residential tower adding to the green aspect of Cascade Park. The water features function practically to collect rainwater providing irrigation for the sky garden terraces.


OUTDOOR MARKET/RETAIL
GROUND PLAZA


N face
E face

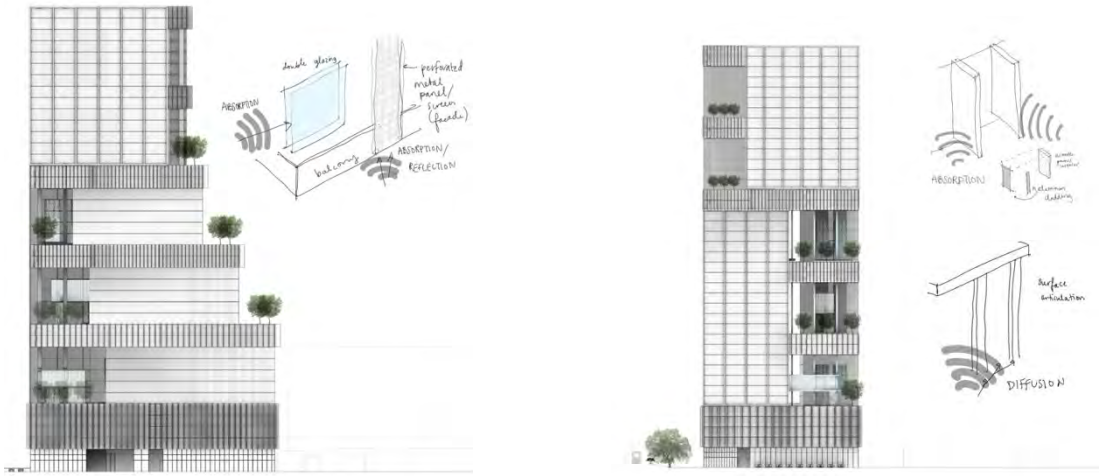


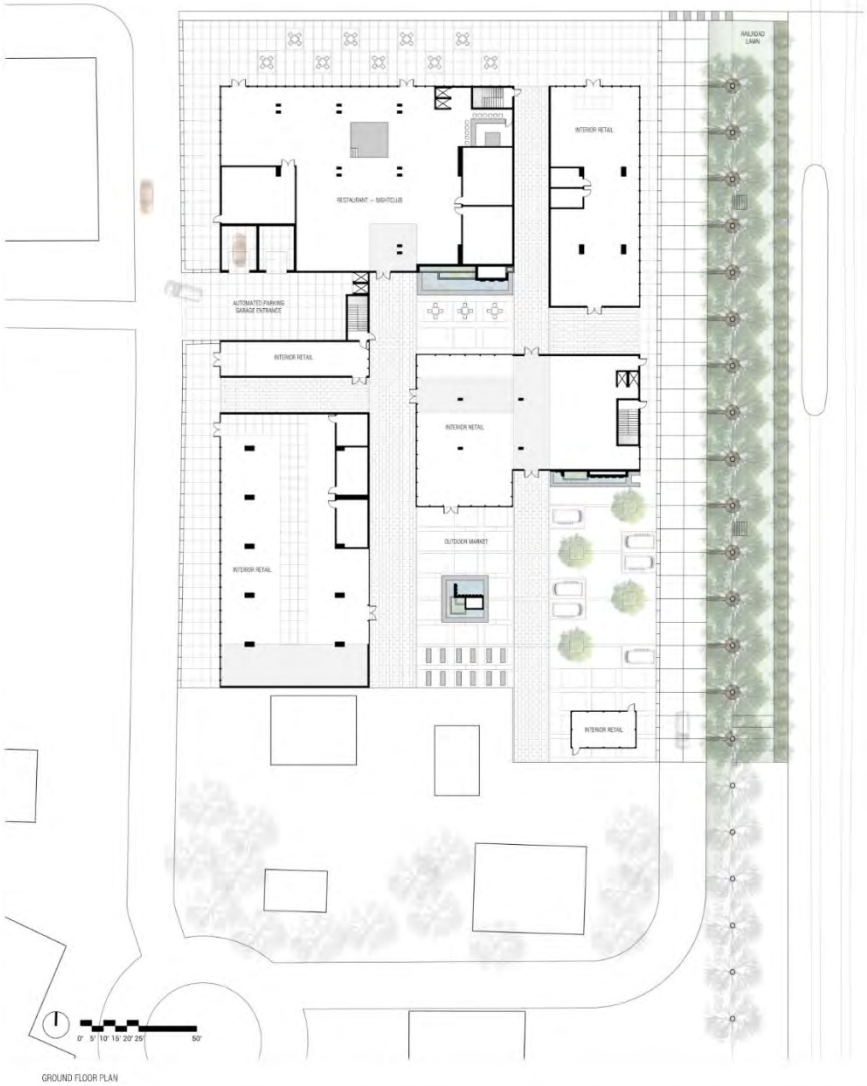




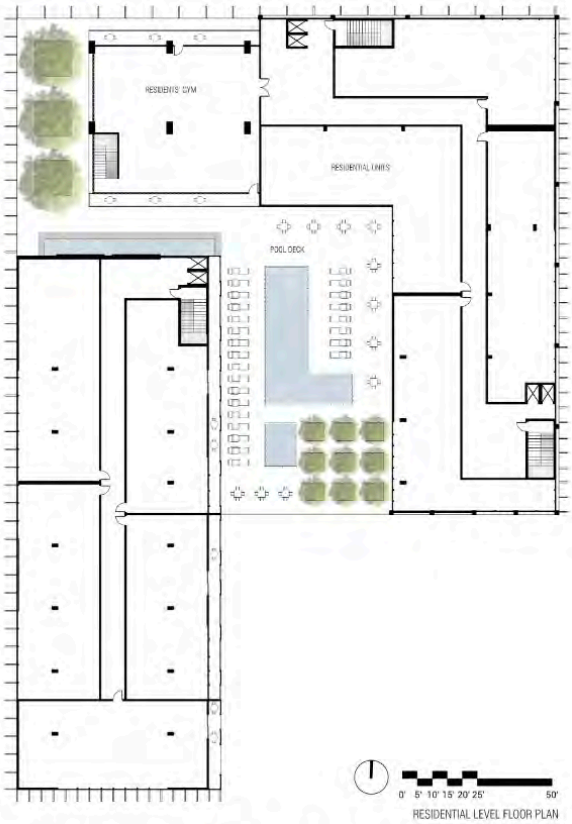

REVISION


GROUND PLAN



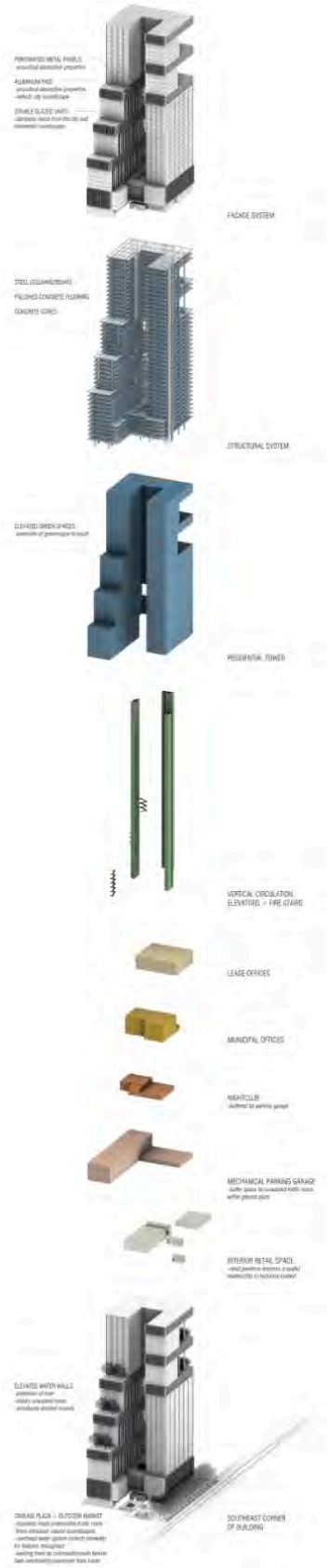


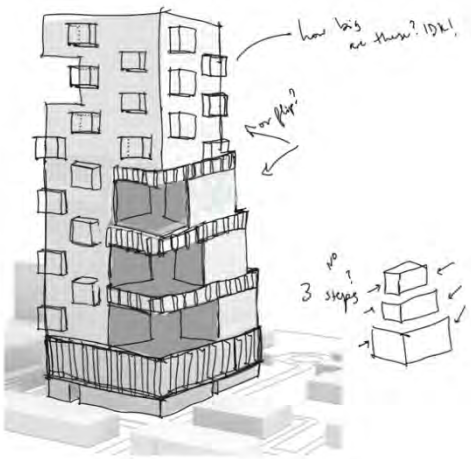
GROUND FLOOR PLAN

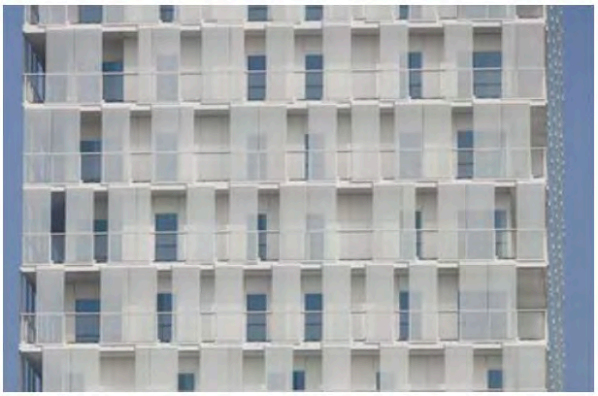


RESIDENTIAL LEVEL FLOOR PLAN

PARKING LEVEL FLOOR PLAN





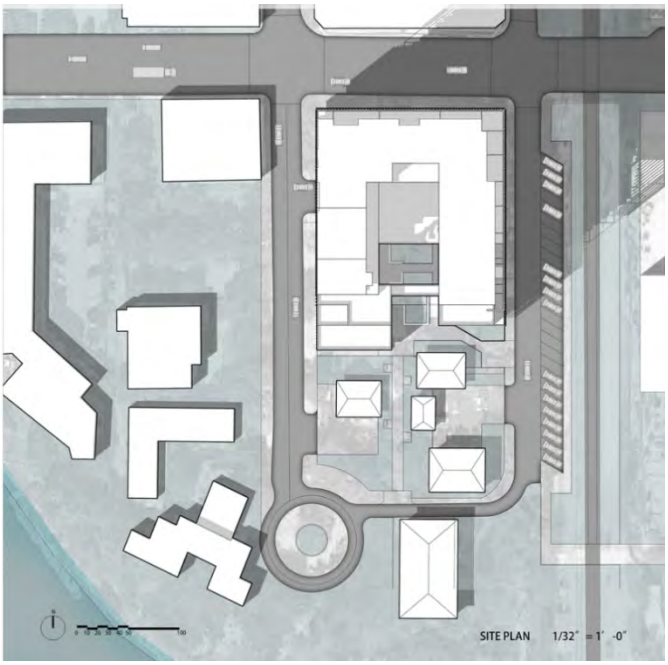


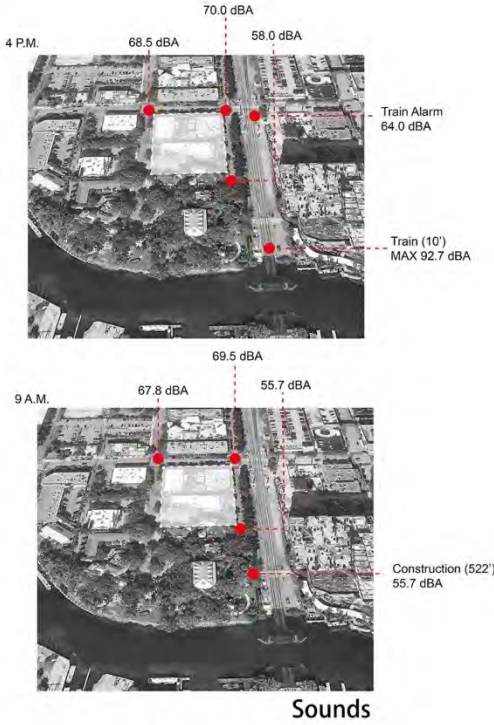
Park Tower
Studio Farris

DeNoiser by Baichuan Liu (Downtown Fort Lauderdale)

Our daily life is surrounded by many different sounds from the environment, either noisy and annoying or pleasant and soothing. This design is designed as ***a denoiser*** to prevent urban noise from entering the interior space as much as possible, and to help people hear the sounds of nature to some extent. The design aims to make noise reduction more possible on the noisy side through the use of mask, buffer, and sound-absorbing material. In the quieter part of the building, part of the building is dissolved to make it possible to accept desired sounds. While considering the sounds of the environment, this design also responds positively to the surrounding urban context.

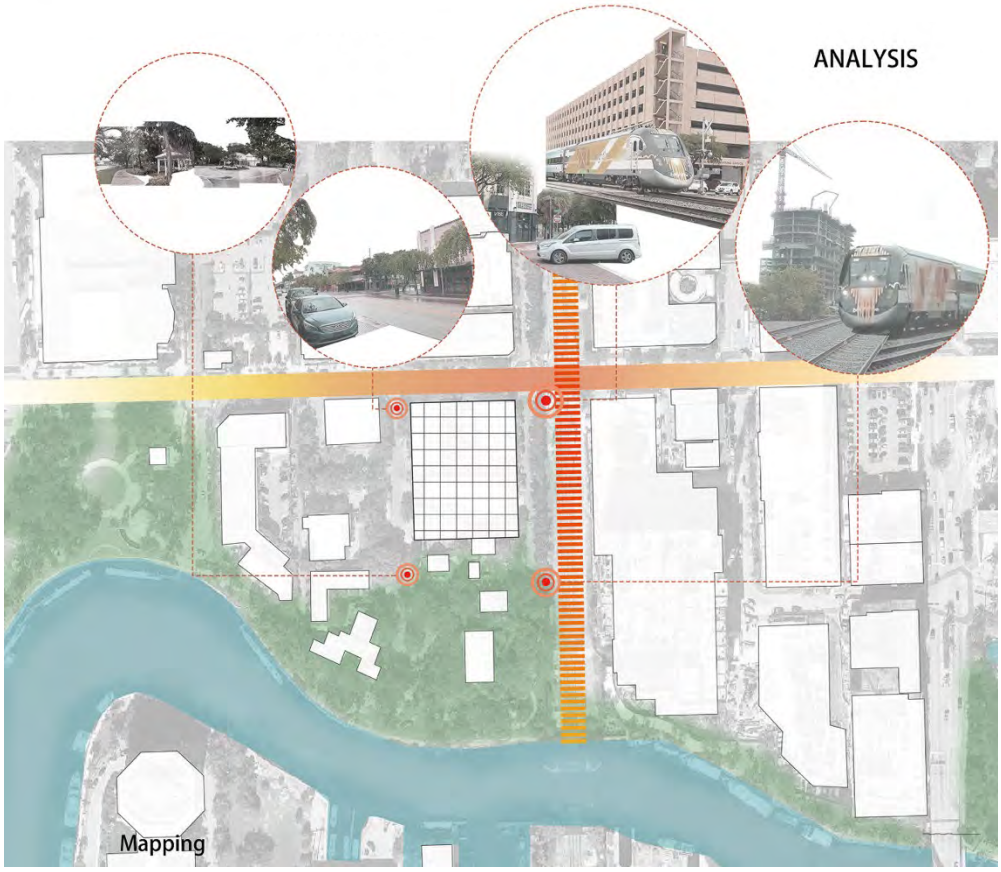
The shape of the part of the building facing the river, to the south is open, creating a visual connection of green space along the north-south axis of the site, both horizontally and vertically. The western part of the building has a strong sense of mass being dissipated, in response to the park to the west. The public space in the northeast corner of the building provides an opportunity to observe the bustling city. The green space in the building is not only to respond to the urban green environment, but also to increase the dynamics of the interior and provide a place for people to interact and enjoy in life.


SITE PLAN 1/32" = 1' -0"

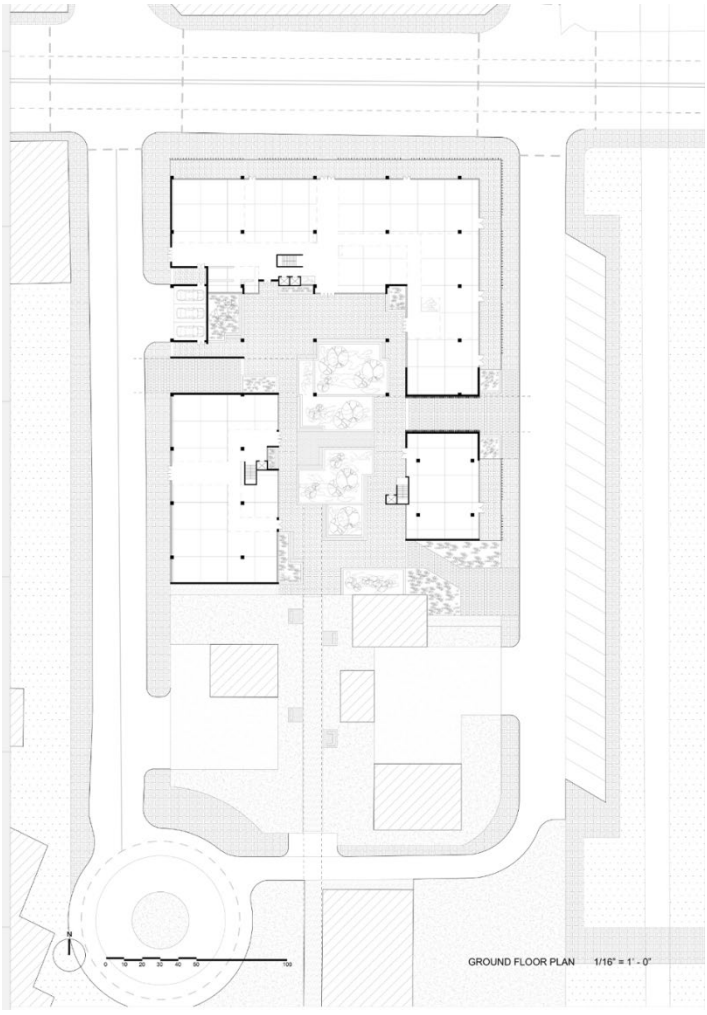

70.0 dBA
4 P.M.
68.5 dBA
58.0 dBA
Train Alarm
64.0 dBA
Train (10')
MAX 92.7 dBA
69.5 dBA
9 A.M.
67.8 dBA
55.7 dBA
Construction (522')
55.7 dBA
Sounds

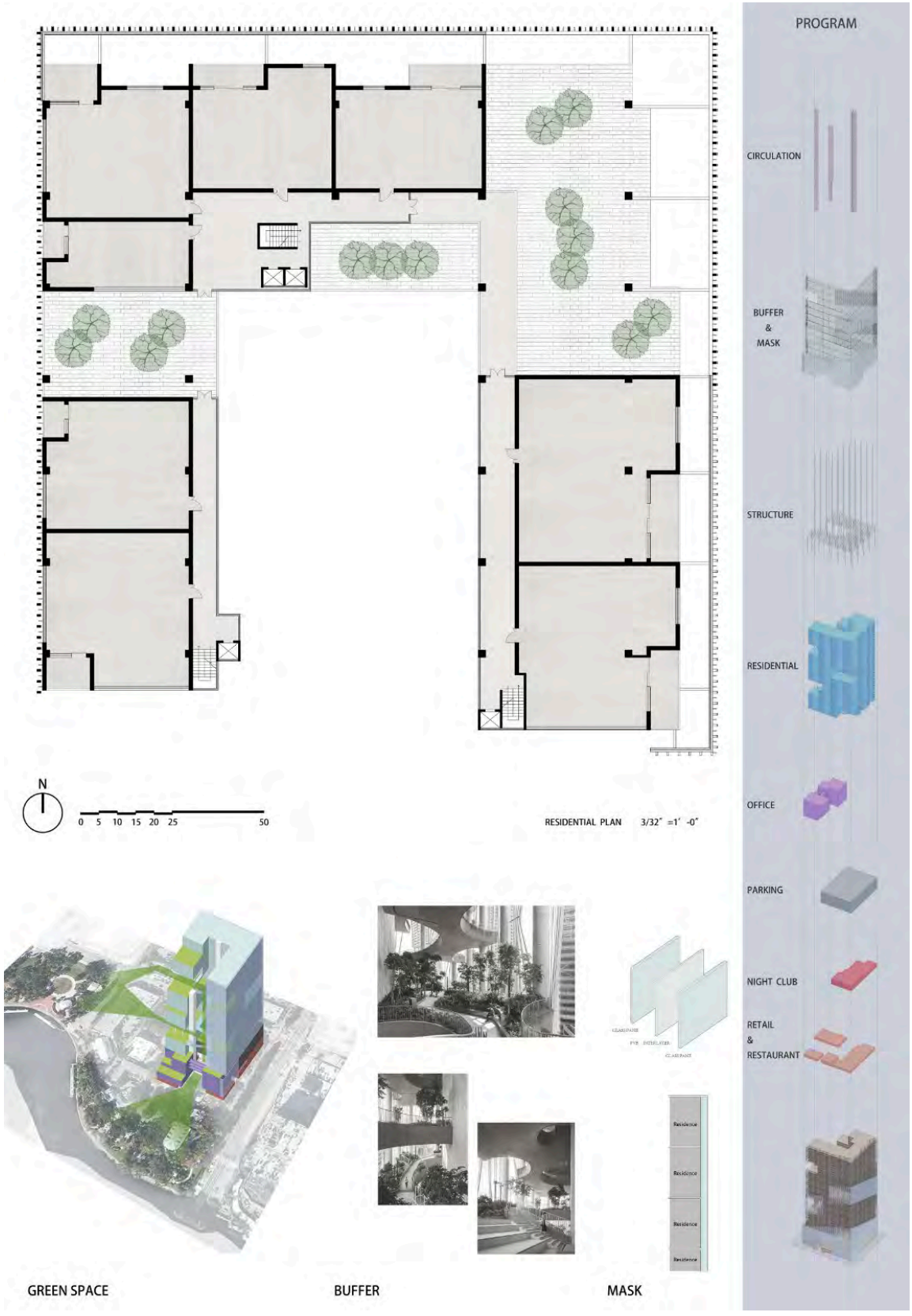

Building


Traffic


ANALYSIS
Mapping


ACOUSTIC STRATEGY EXPLOSION
Interior space
Glass
Balcony
Structure
Glass pane
PVB Interlayer
Glass pane
Acoustic Glass
Grille


GROUND FLOOR PLAN 1/16" = 1' - 0"


PROGRAM
CIRCULATION
BUFFER & MASK
STRUCTURE
RESIDENTIAL
OFFICE
PARKING
NIGHT CLUB
RETAIL & RESTAURANT
N
0 5 10 15 20 25 50
RESIDENTIAL PLAN 3/32" =1' -0"
Residence
Residence
Residence
Residence
GREEN SPACE
BUFFER
MASK

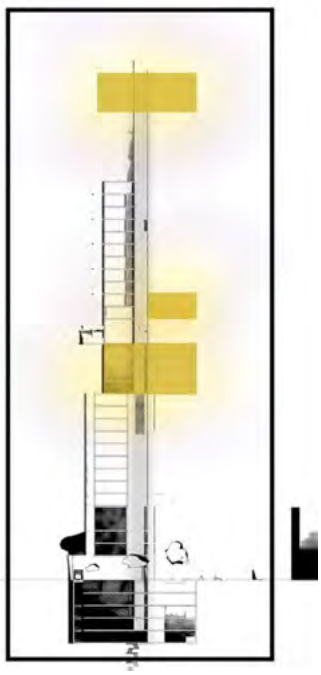

N
0 10 20 30 40 50 100
ELEVATION 1/16" = 1' -0"

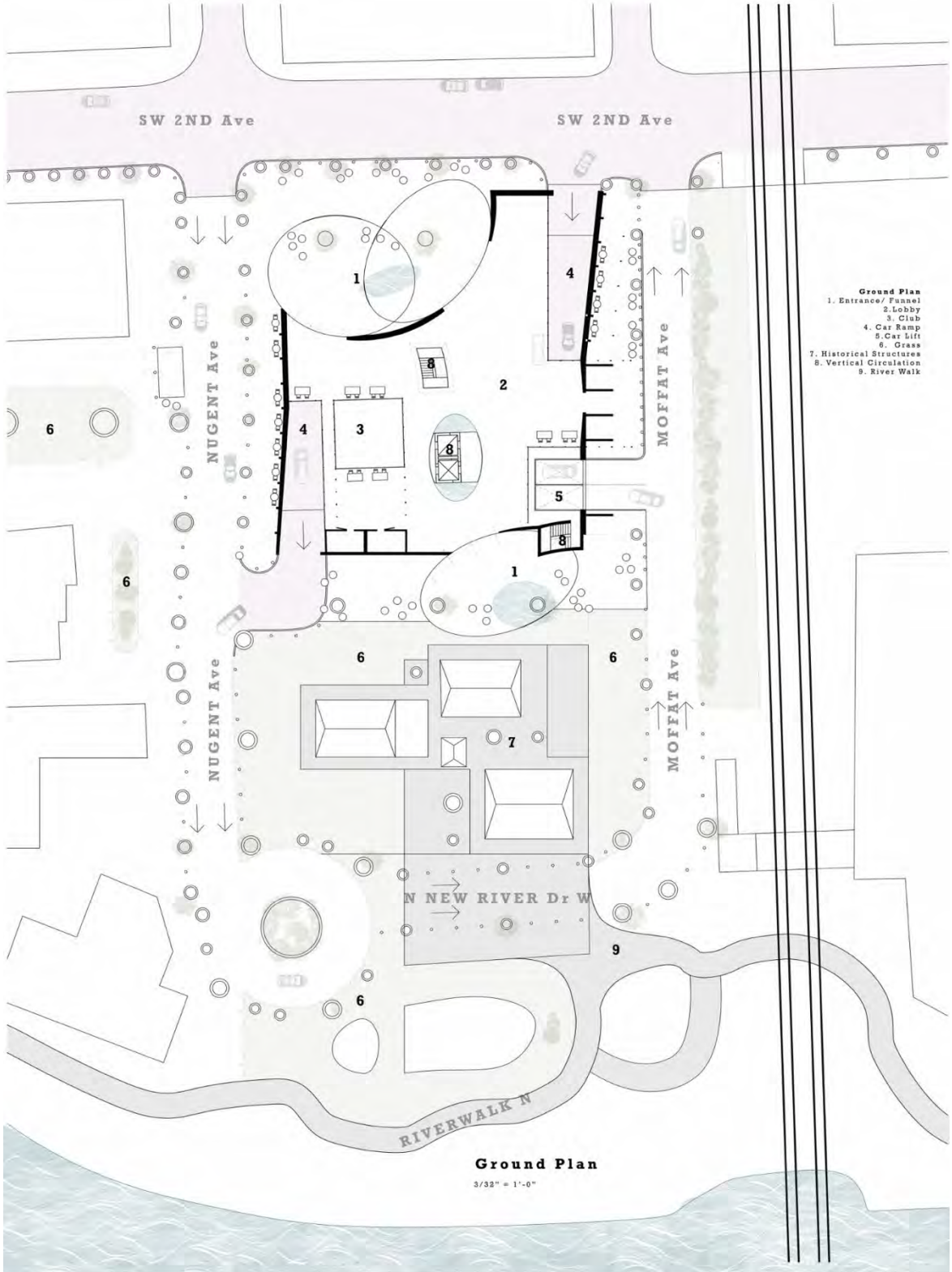

N
0 10 20 30 40 50 100
ELEVATION 1/16" = 1' -0"

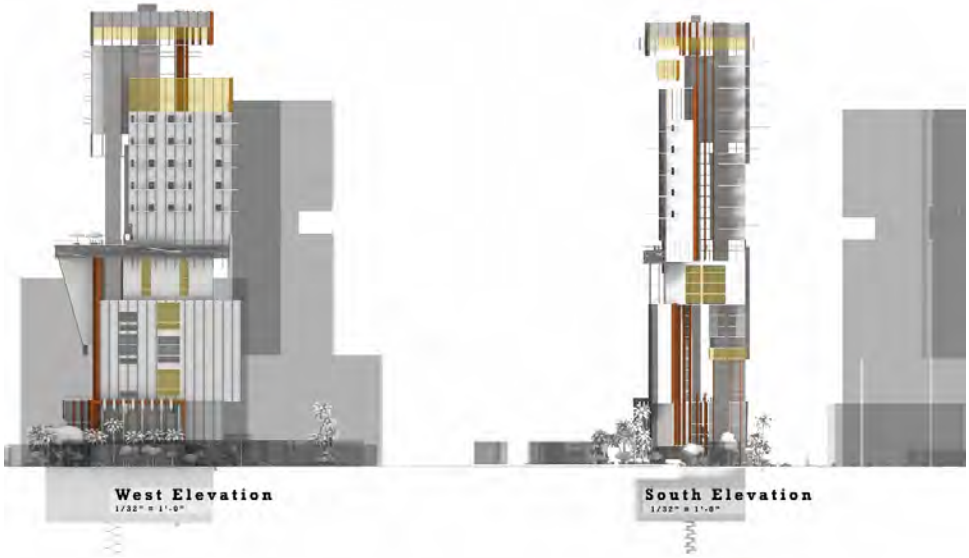
Seam and Beacon by Kuljon J. Pierre (Downtown Fort Lauderdale)

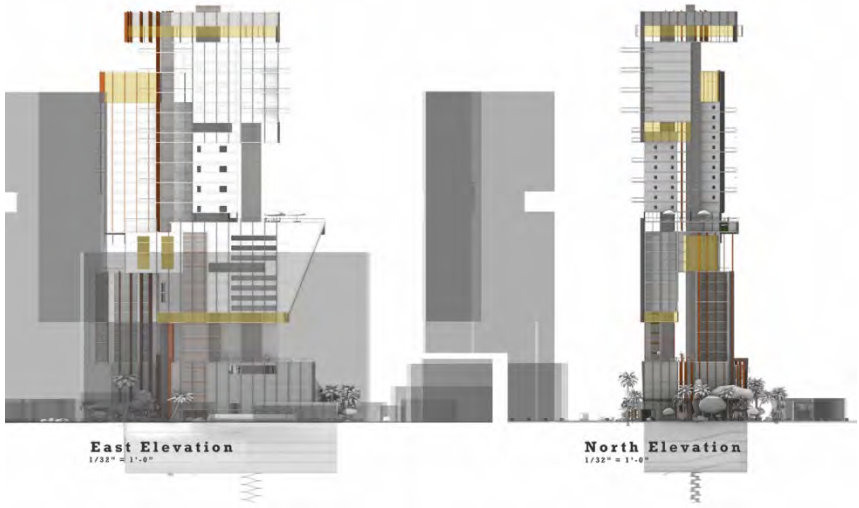
A vertical experience that is anchored by a 'seam' that stitches various elements of the project and an urban lantern emitting light that reaches acting as a 'beacon' for downtown Fort Lauderdale. The seam travels through the project tethering vertical guardians, and light volumes providing a balance between voids and masses.

The project seeks to provide suburban amenities, yards and green spaces, mechanical parking, and noise abatement via spatial separation from the street below. Building articulation provides sound diffusion with green spaces as acoustic buffers within the structure.



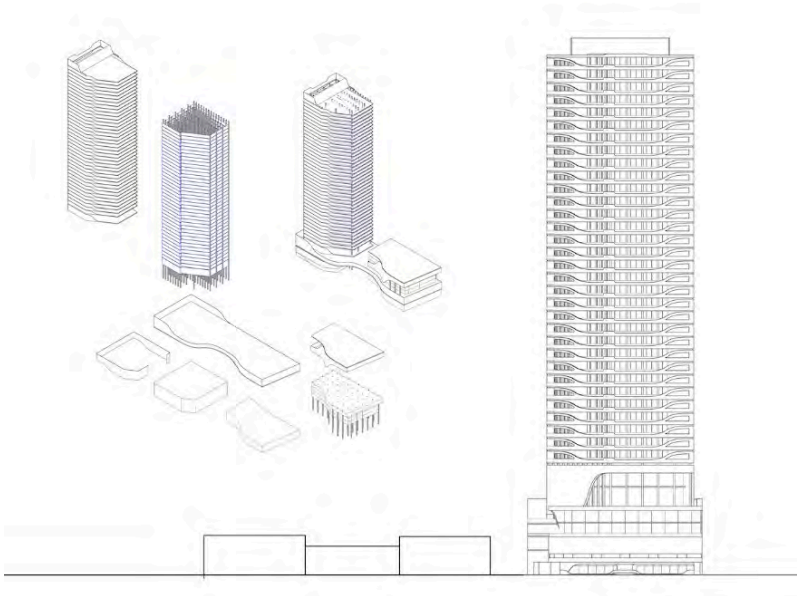

SW 2ND Ave
SW 2ND Ave
NUGENT Ave
NUGENT Ave
MOFFAT Ave
MOFFAT Ave
N NEW RIVER Dr W
RIVERWALK N
Ground Plan
1. Entrance/ Funnel
2.Lobby
3. Club
4. Car Ramp
5.Car Lift
6. Grass
7. Historical Structures
8. Vertical Circulation
9. River Walk
Ground Plan
3/32" = 1'-0"

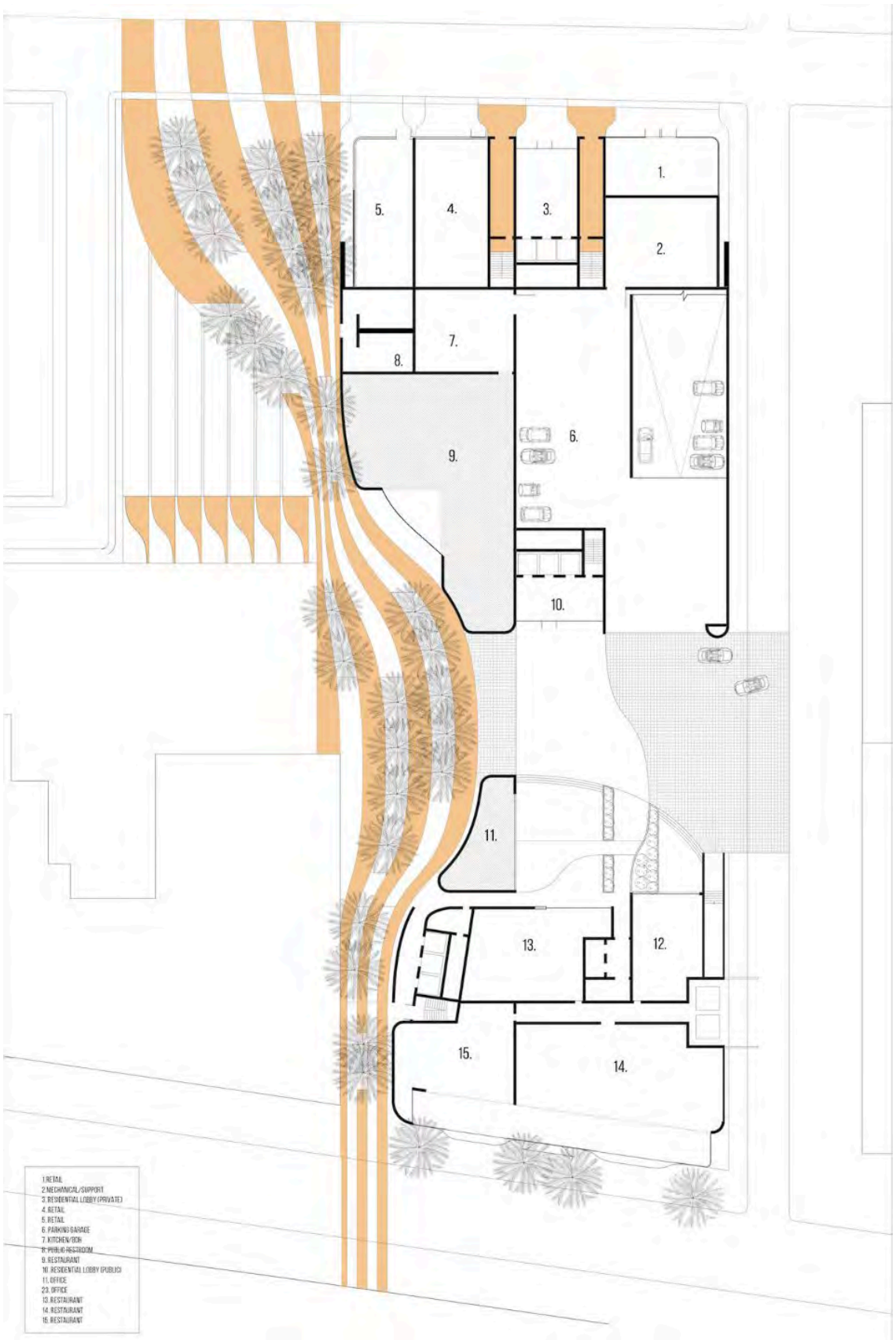

West Elevation
South Elevation

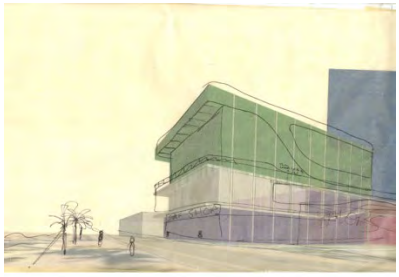

East Elevation
North Elevation

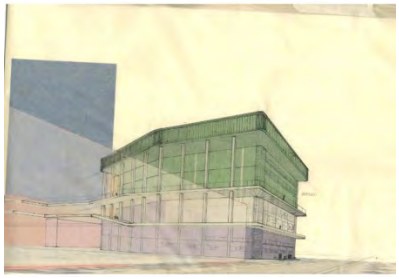
The Wave Condominiums by Alex Boucher (Fort Lauderdale Beach)

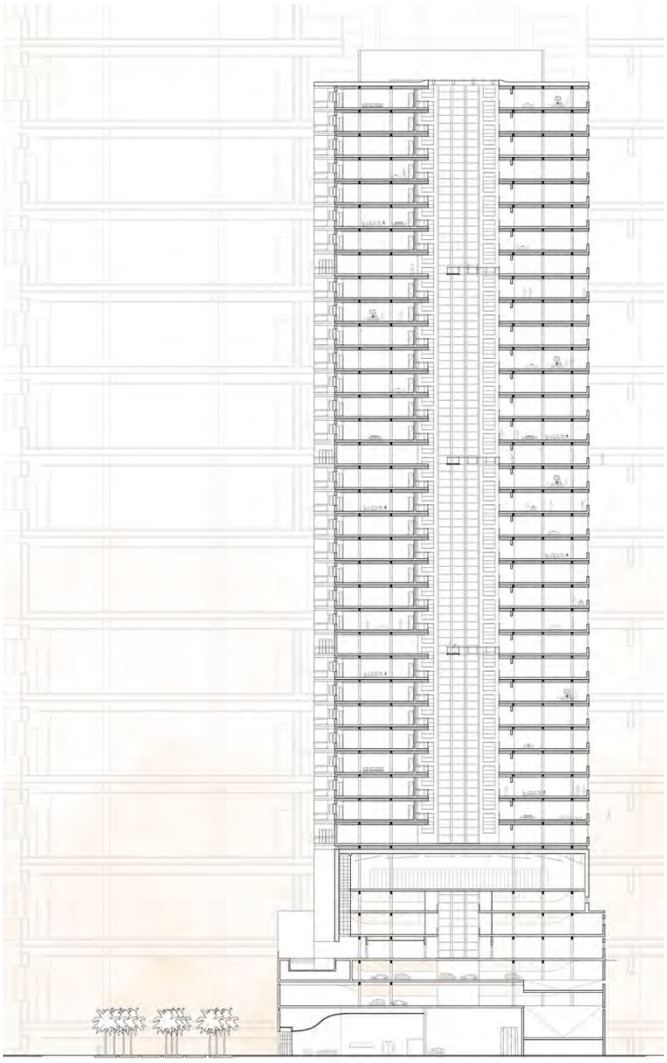
Designed with the sound of the ocean. The Wave Condominiums synergistically blends the acoustic and formal delight akin to the lapping, rolling or crashing of waves with their smooth, directional, and consistent form. The fibrous exterior facade, on the west is robust and absorbs the unwanted noise from cars and trucks before peeling back on the ocean façade to allow the sounds of the ocean roll in. The onsite night club and nearby bar scene could cause disturbances during the day and into the night. In this proposal, the nightclub and entertainment venues are surrounded by unoccupied evening/night program acting as a buffer between residential and noisy spaces. The complex features a public park surrounded by shopping and dining options. Office workers, customers and residents alike can enjoy panoramic views along the East facade, just above the nightclub. Varied scales of curvature are deployed for visual continuity in addition to providing an effective sound diffusing strategy.

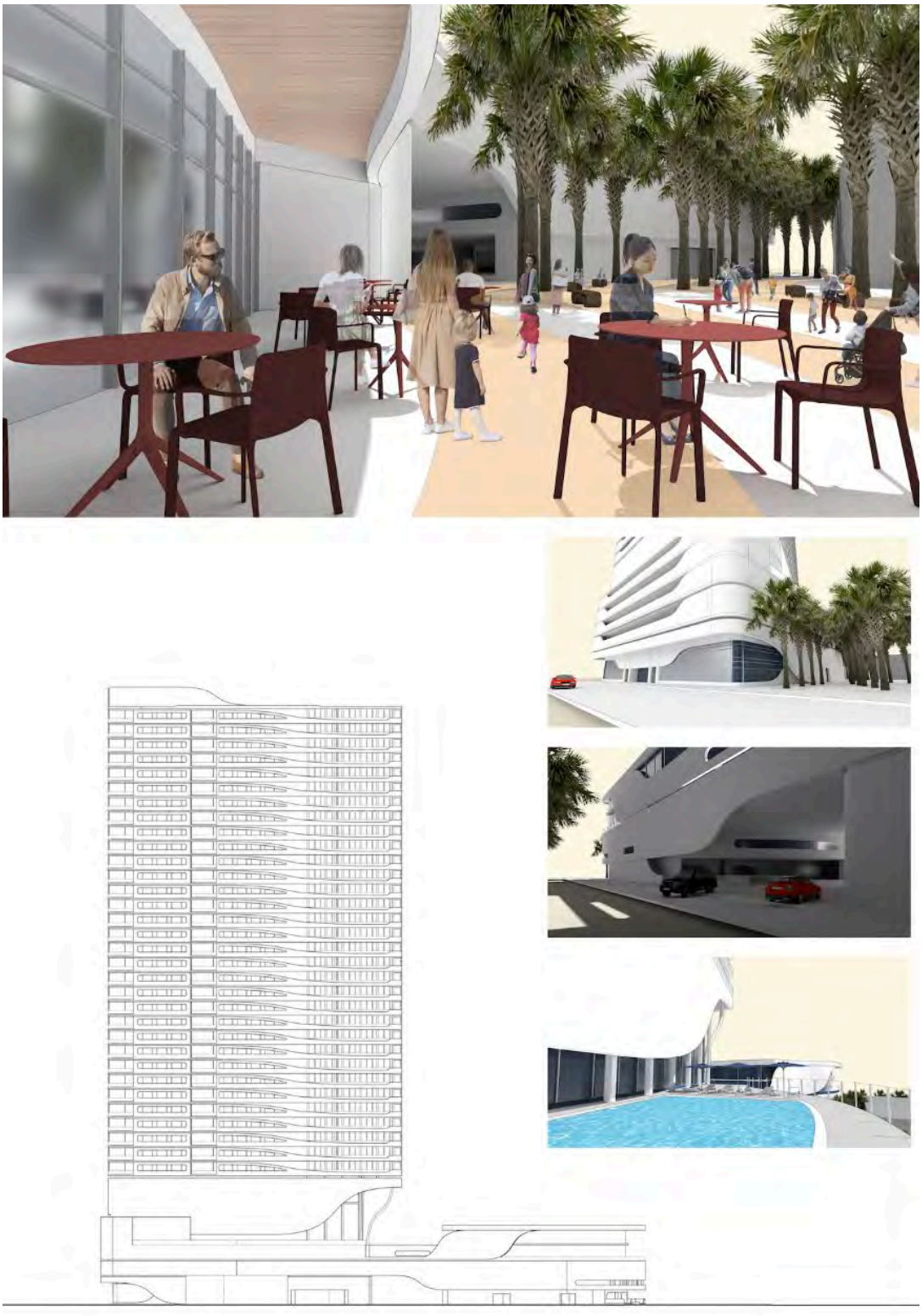



1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.
1. RETAIL
2. MECHANICAL/SUPPORT
3. RESIDENTIAL LOBBY (PRIVATE)
4. RETAIL
5. RETAIL
6. PARKING GARAGE
7. KITCHEN/BOH
8. PUBLIC RESTROOM
9. RESTAURANT
10. RESIDENTIAL LOBBY (PUBLIC)
11. OFFICE
23. OFFICE
13. RESTAURANT
14. RESTAURANT
15. RESTAURANT



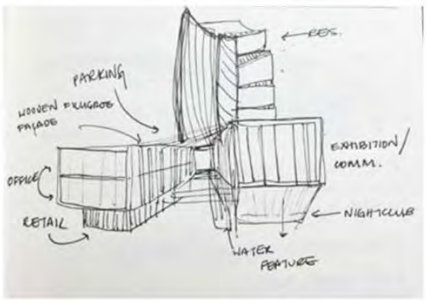


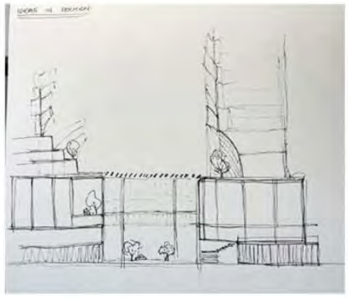


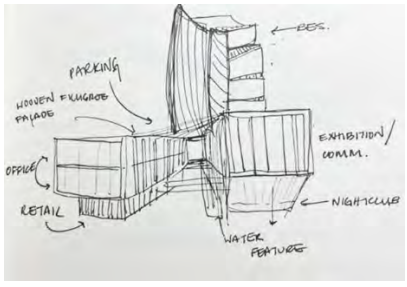


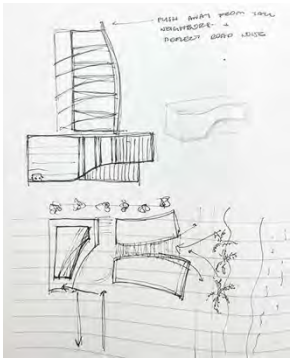
Reflection Tower by Maya Kwasniewski (Fort Lauderdale Beach)

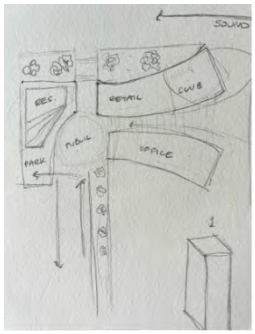
Reflection Tower seeks to bring the sound of the ocean into the building through reflection and diffusion. The main residential block is pulled away from AIA allowing the commerce and entertainment venues to buffer residential space. Other acoustically non-sensitive spaces such as the parking garage are located to buffer traffic and loud vehicle noise. The project studied building form as a diffusing/reflecting system tuned to the desired (waves from the beach and seagulls) and undesirable noises such as traffic and amplified music. These ideas are integrated at the building scale, commercial terrace scale, and at the scale of the residential balconies.



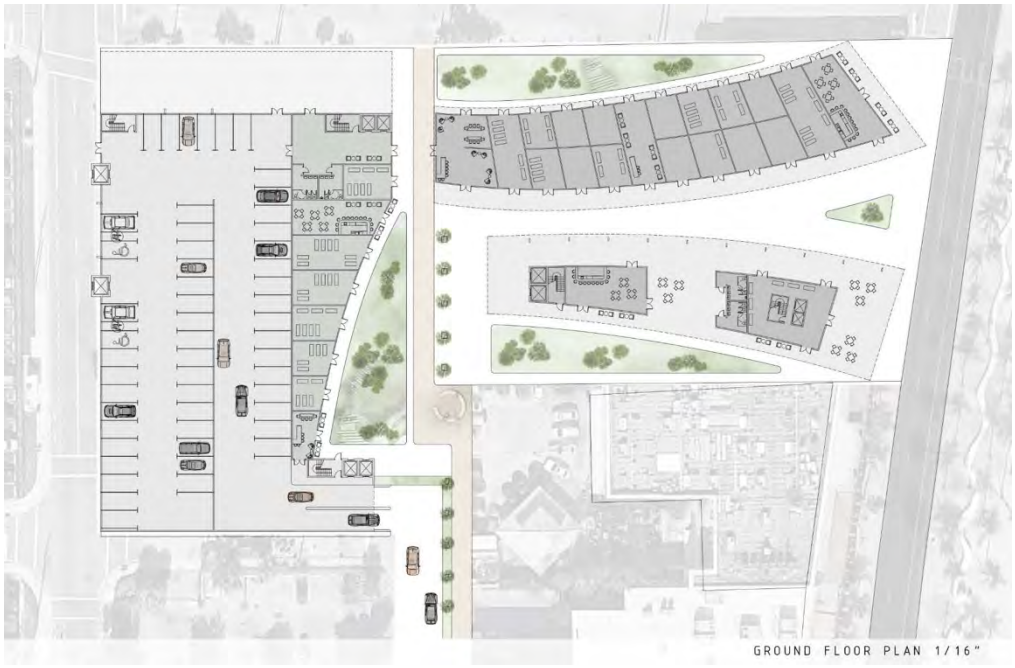






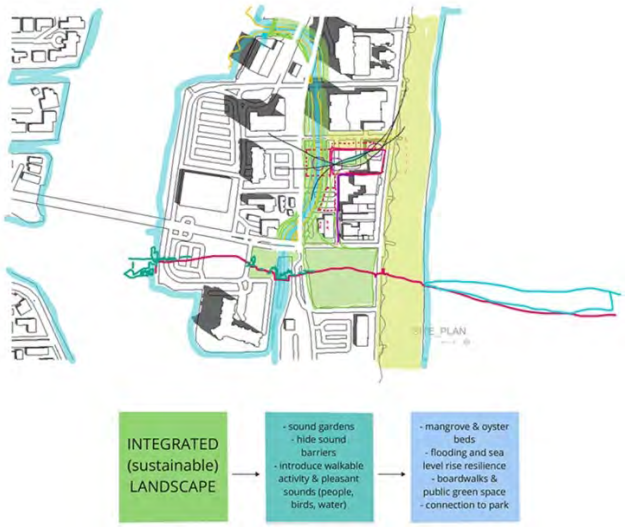


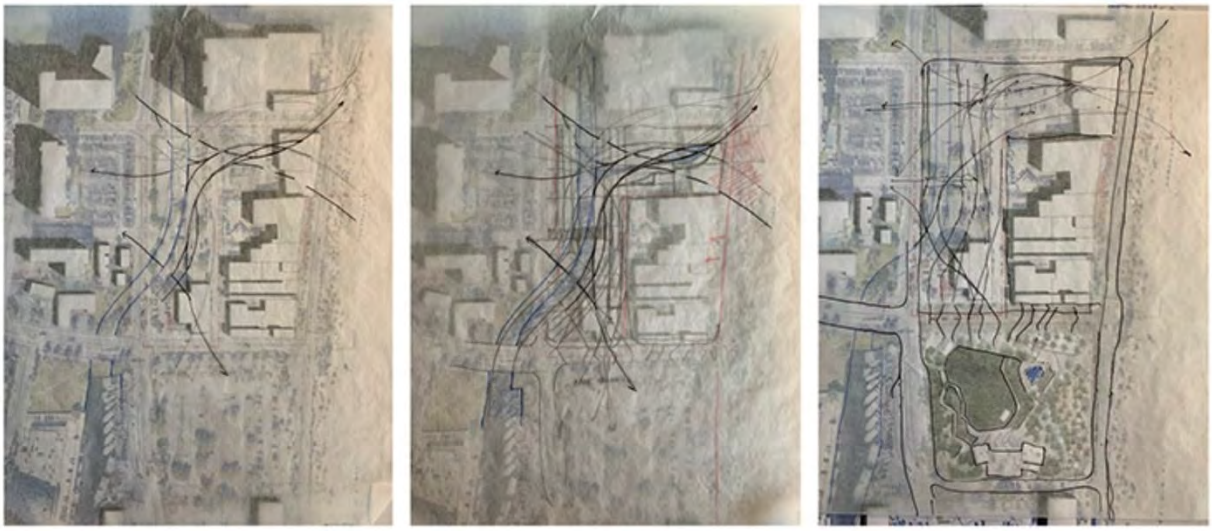

SITE PLAN

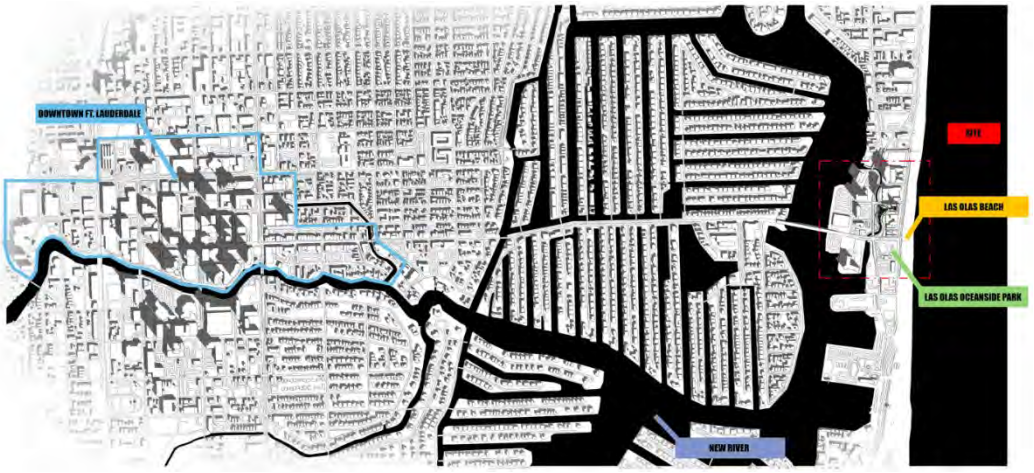

GROUND FLOOR PLAN 1/16"

Filtered Connectivity: Adapting Coastal Soundscapes by Dana Shores (Fort Lauderdale Beach)

Building an ecology that allows sounds we want to attract to fold into walkable experience. Diffusing and reflecting traffic noise, providing natural buffer sounds, and focusing through are the main acoustic strategies implemented. The movement of users throughout the project allows program to be activated at multiple levels layering itself to protect residences above from unwanted noise. The site located between the Intracoastal Waterway and Ocean is at a unique junction to encourage pedestrian experiences yet the noise and disruption from vehicular traffic can ruin the beach essence. Re-Integrating the water's soundscape back into the site becomes a primary goal with nature's connection acting as a datum of responses and reactions.

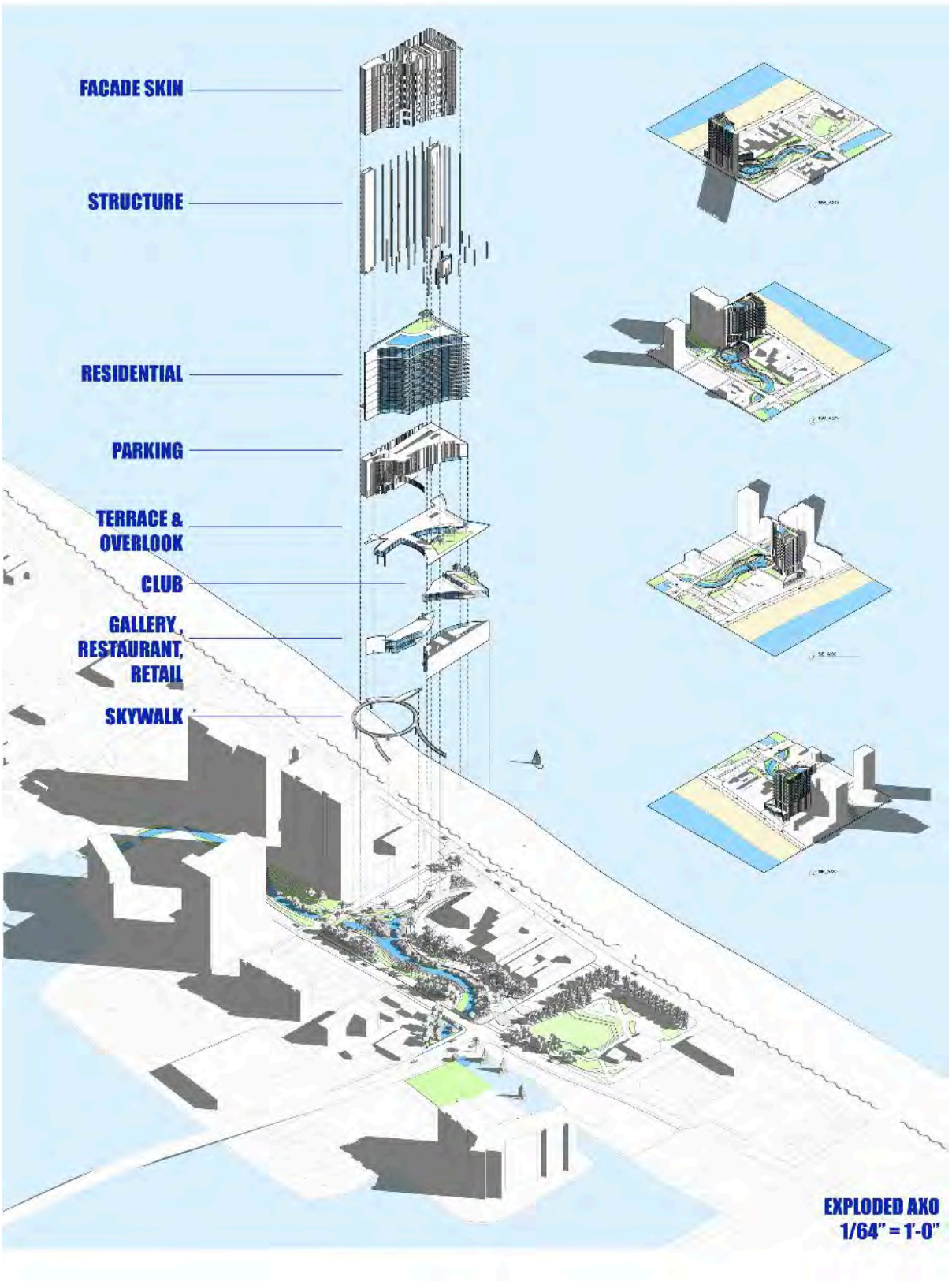

SITE PLAN
INTEGRATED (sustainable) LANDSCAPE
- sound gardens
- hide sound barriers
- introduce walkable activity & pleasant sounds (people, birds, water)
- mangrove & oyster beds
- flooding and sea level rise resilience
- boardwalks & public green space
- connection to park

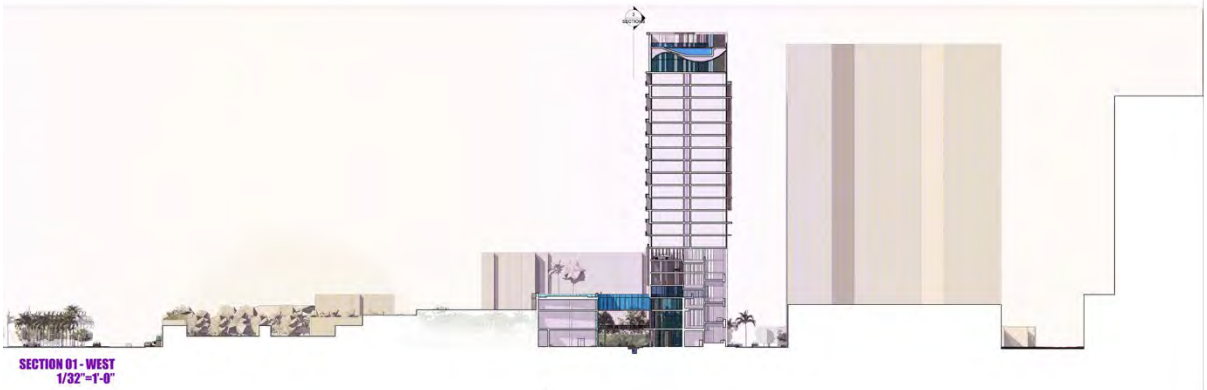


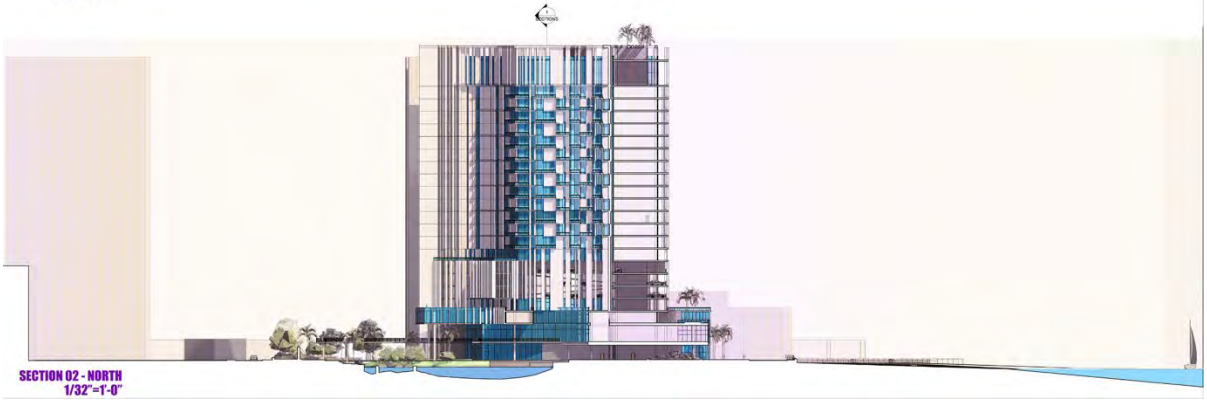

DOWNTOWN FT. LAUDERDALE
SITE
LAS OLAS BEACH
LAS OLAS OCEANSIDE PARK
NEW RIVER


LIVING EDGES - FILTERING MANGROVES & OYSTER BEDS
SHADED SEATING AREAS
GATHERING COMMUNITY - FARMERS MARKET & FOOD TRUCKS
WALKABILITY
SENSATIONS
ATLANTIC OCEAN
S BIRCH RD.
CORTEZ ST.
SEABREEZE BLVD.
S. FORT LAUDERDALE BEACH BLVD.
LAS OLAS BEACH
E. LAS OLAS BLVD.
LAS OLAS OCEANSIDE PARK
SITE DIAGRAM
1" = 80'-0"

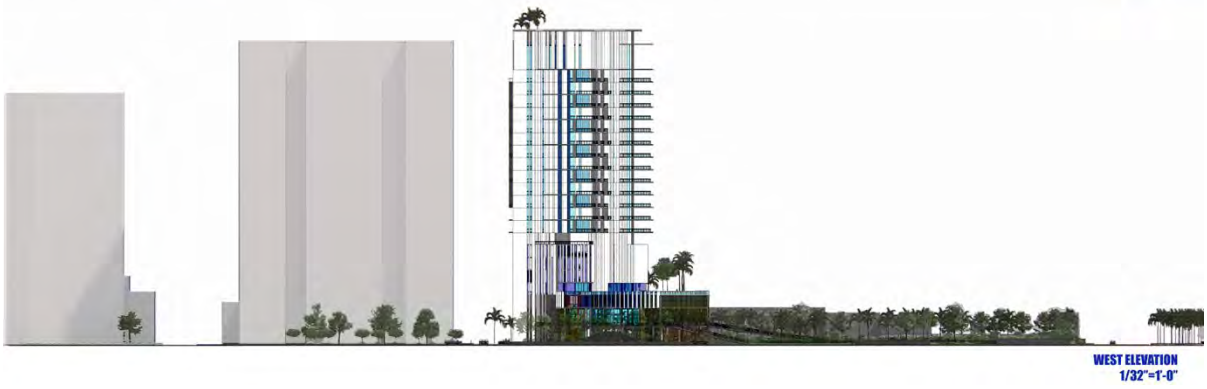

LEGEND
1. RETAIL
2. RESIDENTIAL LOBBY
3. ART GALLERY
4. STORAGE
5. PARKING
6. DROP OFF
7. PERFORMANCE PLAZA
8. YOGA / GYM
9. CLUB / OFFICE LOBBY
10. RESTAURANT & BAR
11. SKYWALK LOOP
12. SCULPTURE FOUNTAINS
13. FOOD TRUCKS
14. MANGROVE ISLAND & OYSTER BED ECO-ZONES
15. STEPPED SEATING
POINSETTIA ST.
SEABREEZE BLVD.
S. FORT LAUDERDALE BEACH BLVD.
EXISTING BUILDINGS TO REMAIN
LAS OLAS BEACH
ATLANTIC OCEAN
E. LAS OLAS BLVD.
EXIST. LAS OLAS OCEANSIDE PARK
SITE PLAN - GROUND LEVEL
1/32" = 1'-0"


FACADE SKIN
STRUCTURE
RESIDENTIAL
PARKING
TERRACE & OVERLOOK
CLUB
GALLERY, RESTAURANT, RETAIL
SKYWALK
EXPLODED AXO
1/64" = 1'-0"


SECTION 01 - WEST
1/32"=1'-0"


SECTION 02 - NORTH
1/32"=1'-0"


EAST ELEVATION
1/32"=1'-0"


WEST ELEVATION
1/32"=1'-0"

Soundscape Seminar

Environmental Technology Elective Spring 2023
ARC 6680 • 03 Credits

Soundscape Tower

Project Challenge:

How do we, as architects translate our understanding context into architecture that is responsive and sensitive to the contextual ecology: urban, suburban, natural, social, commercial, sonic? Students are asked to explore this question through speculative design and analysis with regard to the incorporation of local resources, environmental impact, resource efficiency, integrated technology, soundscape ecology, and to propose architecture that promotes culturally rich lifestyles.

> *"In the case of all things which have several parts and in which the totality is not, as it were, a mere heap, but the whole is something besides the parts…"*
>
> *Aristotle 980a Metaphysics, Translated by W. D. Ross*

Schematic Design

Translate visioning concepts, as noted above, into architectural proposals that integrate linkages to the context contextual ecology; develop spatial, and circulation systems; develop enclosure systems, and resolve these systems these elements through plan, section, and 3D models. How does the focus on 'soundscape' influence and prioritize these systems? How does soundscape design suggest possibilities for materials, enclosure systems, and refinement of program elements that advance the conceptual visioning phase?

The site

Students will work on their site of selection in Ft. Lauderdale, Florida. Requirements for setbacks and height limits should be governed by the local land use code. In the case of expanding outside those limitations, please propose a rational for the benefit to the community and why the code might be modified.

The Program

Program elements are the minimum required and other program elements, especially those that explore ideas of the soundscape should be added, but not substituted. Program areas may vary to meet the opportunities and constraints of the site. The program seeks to develop a floor area ratio (FAR) of at least 10.

- Night Club 10,000 sf with 5,000 sf of that area at least 24' tall (main dance area)
- Retail area 10,000 to 30,000 sf
- Municipal offices 10,000 - 30,000 sf
- Lease offices 10,000 sf • Parking for 100 automobiles.
- Residences (1,600 sf average size): 80
- Required vertical circulation – elevators and fire stairs

Deliverables

24x36 PDF sheets in portrait format. Number of sheets as needed.

Each student will submit the following elements for the final submission:

- Concept statement that expresses the prioritization of ideas, and how they relate to the ecological strategies including soundscape considerations among other architectural considerations (100 – 250 words)
- Site plan with context
- First level plan

- Parking level plan
- Residential level plan
- Two building sections with context
- One exploded isometric showing program elements & soundscape strategies (labeled) – not to scale
- Five+ sketch perspectives illustrating the form, occupational moments, and how they relate to the conceptual ideas and soundscape strategies.

Note: drawings should be resolved at 1/16" scale level of resolution. Detail is not critical but rather the organization, relationship to context, material selections, and strategies for sustainability and the soundscape ecology expressed as architectural strategies.

Process

Students will follow the general outline below to develop their proposals. Much of this was done in the project 1 research phase of work and that information should be condensed and applied withing the Project 2 submission

Steps:

1. Students should become familiar with their site by visiting physically if possible and via Google Earth. Students Student should provide a context site plan and images with their proposals. [5 pts]

2. Review climate data: psychrometric chart, breezes, rainfall, and solar availability for contextual responses. Sources would include Climate Consultant or other. Include a climate summary [5 pts]

3. Based on the site selected, students are asked to develop a conceptual site analysis identifying: access to roads, opportunities for views, solar orientation, natural ecology, (vegetation, wetlands, topography), potential open civic space, agricultural opportunities and any inspiration for organizing the site. [15 pts]

4. Initial unit concepts. Develop a simple unit diagram for the program spaces making decisions regarding vertical zoning and circulation systems. Consider daylight, shading, and potential for photovoltaic with regard to unit for and orientation (N.S.E.W.). Consider view, privacy (visual and acoustic), and the relationship to the street as a community contributor. This should be expressed as a modular system for the residential portion of the project. [5 pts]

5. Once the base unit(s) are developed schematically, test configurations within the tower and how circulation works between and through the lower commercial elements in the tower. Opportunities for view, daylight, breezes, and quiet should be considered. It is suggested to make minor modifications to the unit prototypes to accommodate combining of the units. [15 pts]

6. Commercial and institutional programming. These are typically open area spaces to be developed by occupants in the future. Consider what is at the street and how that enhances the context at the pedestrian level in terms of organizing entry (auto/Ped), providing shade, contributing to an occupied street, and of course mitigating noise while perhaps enhancing the soundscape. [20 pts]

7. Integrate the elements studied above as cohesive soundscape tower proposal for your site in Ft. Lauderdale. [15 pts]

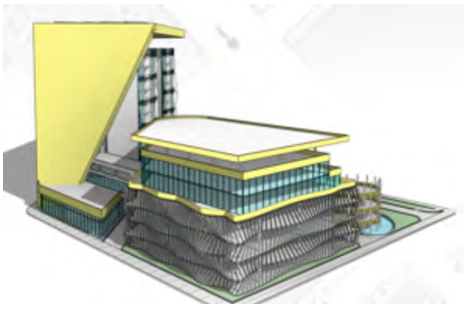
"In the case of all things which have several parts and in which the totality is not, as it were, a mere heap, but the whole is something besides the parts…"

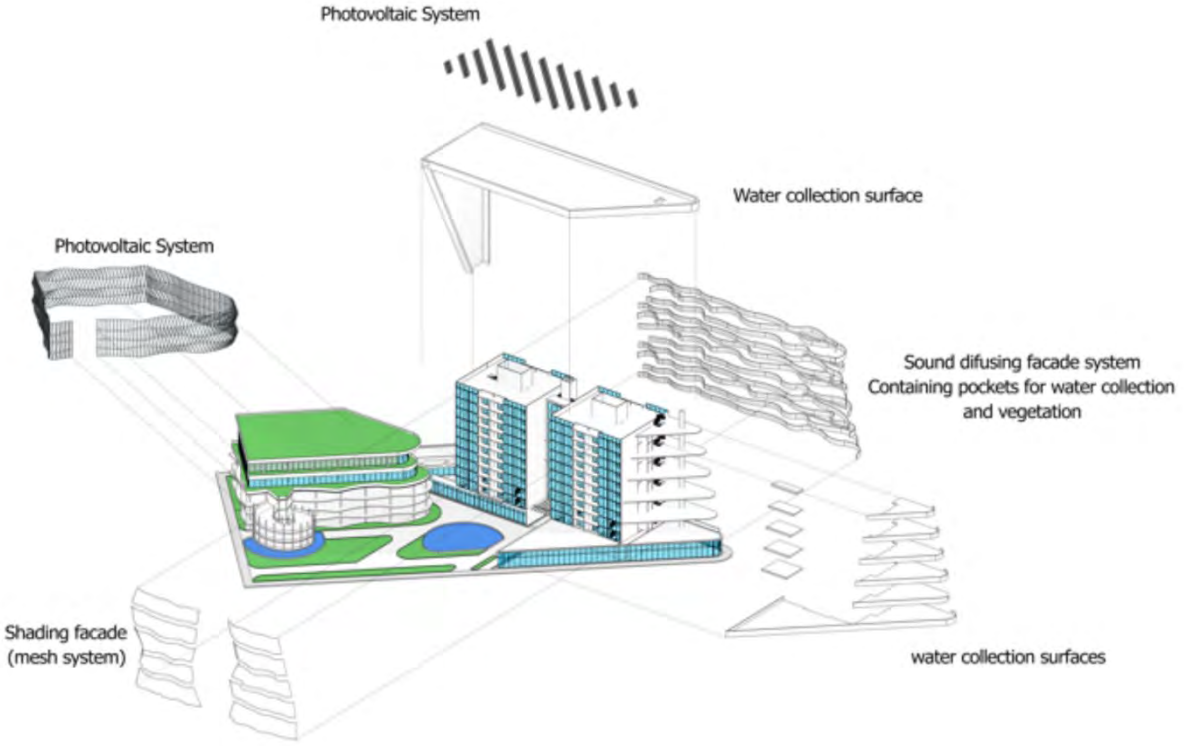
Aristotle 980a Metaphysics, Translated by W. D. Ross

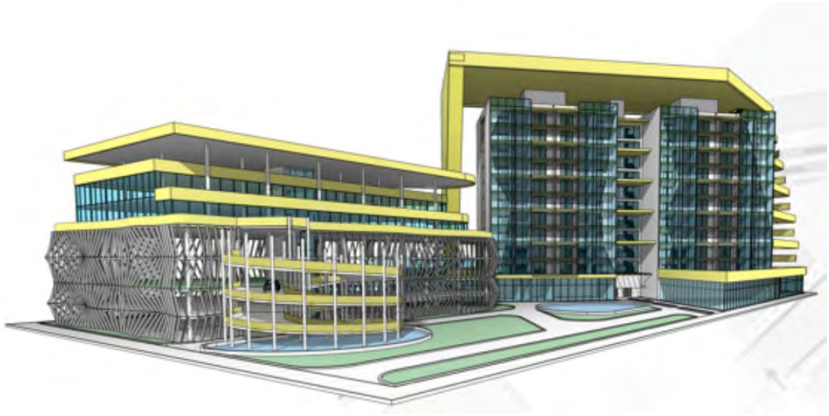
Ribbon Tower by Maysain Tannos
(SE corner of NE 3rd Avenue and North Flagler Drive.)

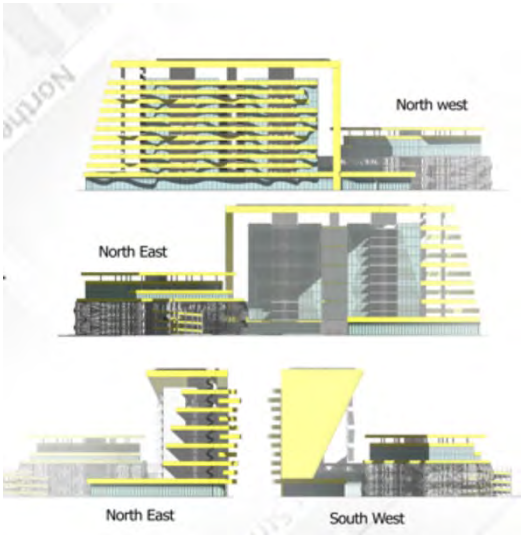
Energy ecology efficiency in buildings has become an increasingly important topic in recent years. With the growing awareness of environmental issues and the need for sustainable living, more and more people are looking for ways to reduce their carbon footprint and live in an eco-friendly manner. One key aspect of energy ecology efficiency in buildings is the use of renewable energy sources such as solar power. Photovoltaic panels are a popular choice for many homeowners and businesses as they allow for the generation of electricity from the sun. Another important aspect of energy ecology efficiency in buildings is water collection. With water becoming an increasingly scarce resource in many parts of the world, it is important to find ways to conserve it. Collecting rainwater can be a simple yet effective way to do this, and many buildings are now incorporating rainwater collection systems into their design.

As a response to the soundscape, the building itself acts as an urban buffer from a noisy intersection and rail line in addition to loud music venues. As an acoustic barrier, the building deploys a 'ribbon' system of shading and acoustic diffusing material. This strategy dissipates sound rather than reflecting it to other buildings. The building mass forms a barrier between the generally commercial-transportation corridor and emergent residential neighborhoods.




Photovoltaic System
Water collection surface
Photovoltaic System
Sound difusing facade system
Containing pockets for water collection
and vegetation
Shading facade
(mesh system)
water collection surfaces




North west
North East
North East
South West

The Ecological Revive by Maite Bruno (SW 4th Avenue at the New River)

Downtown Ft. Lauderdale is a place that has nurtured life before the existence of the city, with the New River area becoming the heart where the natural ecology of the town emerged. The site acts as the origin of Ft. Lauderdale, serving as the crown that holds together the districts of art, history, entertainment, culture, education, and business, while linking them to its natural local resources, thus playing an important role in the city life for the emerging community. Historically, the Riverwalk reflects the past and present of the city, telling the story of the town. Commercially, it is a tourist destination that connects with the 3rd largest cruise port, while extending the livability of the place with the waterways as another layer of circulation, which makes it part of the main wealth source of economy of Ft. Lauderdale. Culturally, it links to the New River, being one the main 165 waterways that represent the identity of the town. However, it is currently in need of repair, with the New River affected by debris, pollutants, inappropriate land uses, the site being in danger of flooding in the next 5 years, and most importantly, losing the ecological link that defines the place. Therefore, the site offers an opportunity to form strong links between its districts, activate the area for the community, and create an environment that showcases the character of the place, restoring its local resources.

The project proposal receives the Riverwalk but al so continues its path vertically, by creating a new ground plane and al l owing for green pockets as the tower increases in height. The New Ground not only helps to enhance the char act er of the pl ace, but it also acts as a noise barrier for the residents that are going to inhabit the building. Al so, by creating a new elevated ground, the building captures the prevailing breezes for natural cooling effects, allows for community gather spaces to emerge, and reacts to the rising flooding levels, being able to function at least until the year 2130.

The project aims to not only enhance the existent natural resources but to give back to the environment. Therefore, the skin is designed to harvest energy with the use of algae and vegetation variations to capture the energy from the sun based on the sun angle and heating hours, while absorbing the noise coming from night clubs in the area with angled matrix variations that reacts to the sound waves. Thus, the proposal fosters an overall ecology of the place, creating an urban retrofit to provide benefits from natural ecology, to community ecology, economical ecology, and heritage+ art ecology.

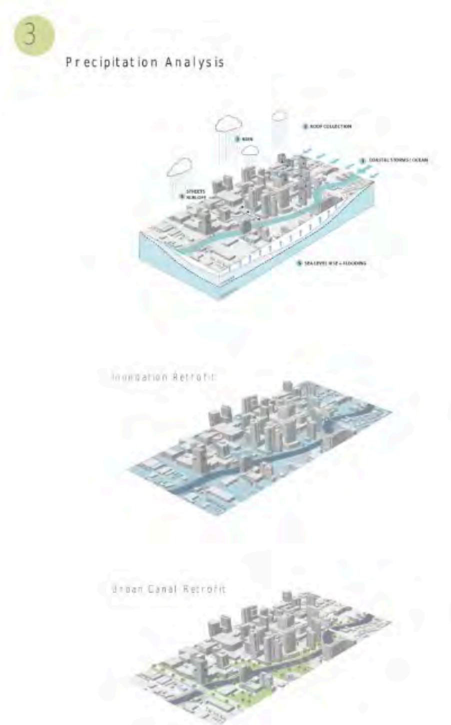

The project proposal receives the Riverwalk but also continues its path vertically, by creating a new ground plane and allowing for green pockets as the tower increases in height. The New Ground not only helps to enhance the character of the place, but it also acts as a noise barrier for the residents that are going to inhabit the building. Also, by creating a new elevated ground, the building captures the prevailing breezes for natural cooling effects, allows for community gather spaces to emerge, and reacts to the rising flooding levels, being able to function at least until the year 2130.
The project aims to not only enhance the existent natural resources but to give back to the environment. Therefore, the skin is designed to harvest energy with the use of algae and vegetation variations to capture the energy from the sun based on the sun angle and heating hours, while absorbing the noise comming from night clubs in the area with angled matrix variations that reacts to the sound waves. Thus, the proposal fosters an overall ecology of the place, creating an urban retrofit to provide benefits from natural ecology, to community ecology, economical ecology, and heritage + art ecology.
Southwest View

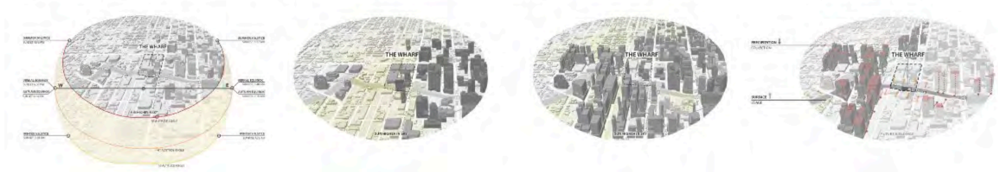

Riverwalk Promenade


LIVE
OFFICES/WORK
PARK
PUBLIC
PARK
PUBLIC
PARK
OPEN
Retail/Mobile/Art
NOISE


Pedestrian and Environmental Edge
Pockets OR Green Facade
Canopies/ Shade throughout
Offices
Retail + Public
OPEN
Capture Breezes / Cooling Effect + Flooding
+ Pedestrian Scale
Raised Park / Ground
MODULES
(1st Floor)

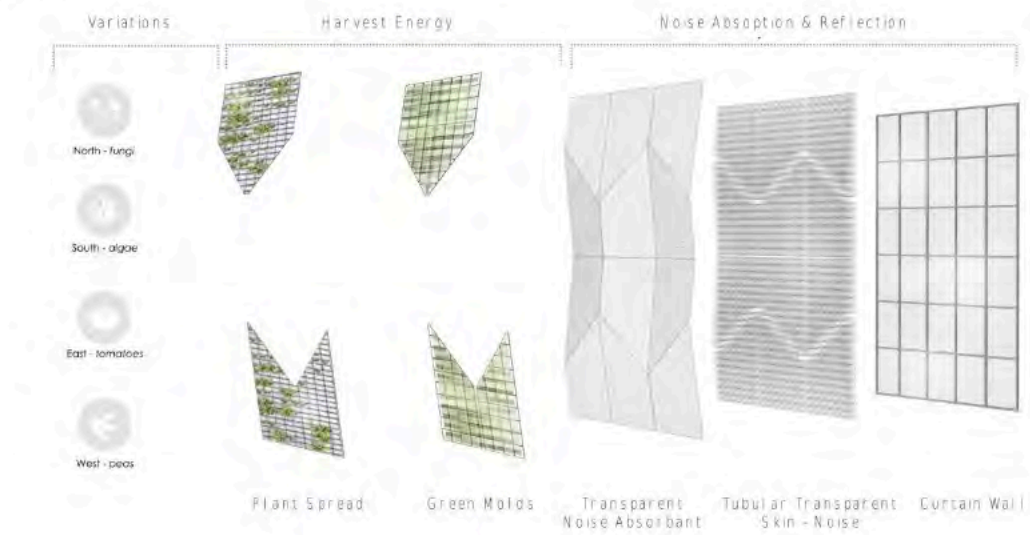

Context Analysis
Water Bodies + Land
1
Community, Historic, Commerce
Circulation - Transit
2
Urban Fabric Systems
Wind Analysis


3
Precipitation Analysis
Inundation Retrofit
Urban Canal Retrofit

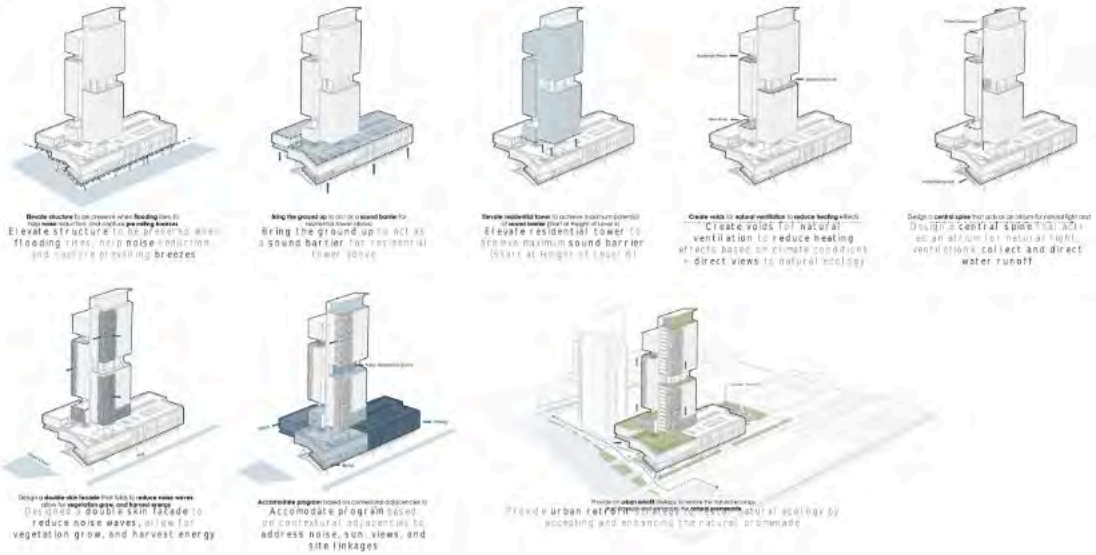

Sun Analysis
Current Shade
Future Shade - 60 Years
Precipitation Analysis
THE WHARF


Districts Analysis - Site
ENTERTAINMENT & ARTS
HISTORIC
SITE
COURTS
SW 2nd St
SW 4th Ave
SW 3rd Ave
SW 2nd Ave
SE 1st Ave
SE 2nd Ave
SE 3rd Ave
SE 2nd St
Wayne Huizenga Park
New River
SW 5th St
SW 6th St
SW Flagler Ave
SW 1st Ave
Middle St
W Las Olas Blvd
E Las Olas Blvd

Skin Diagram

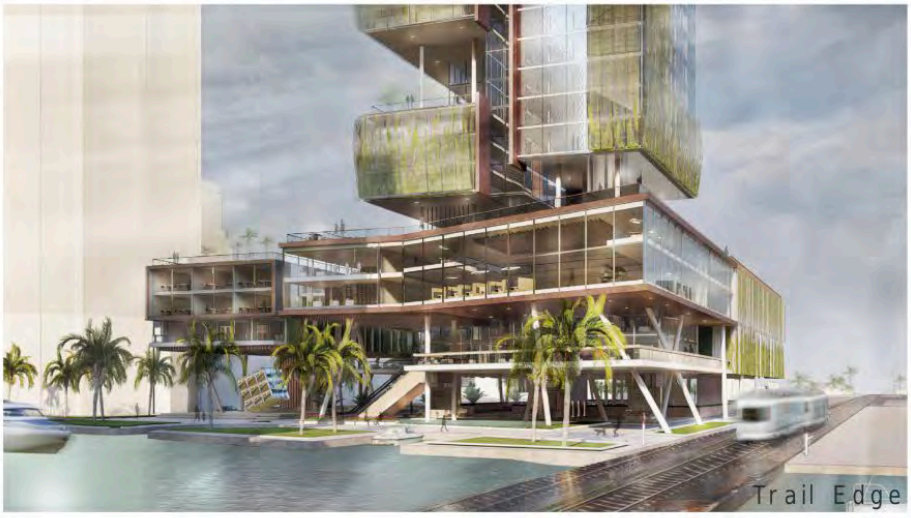


Massing Diagrams

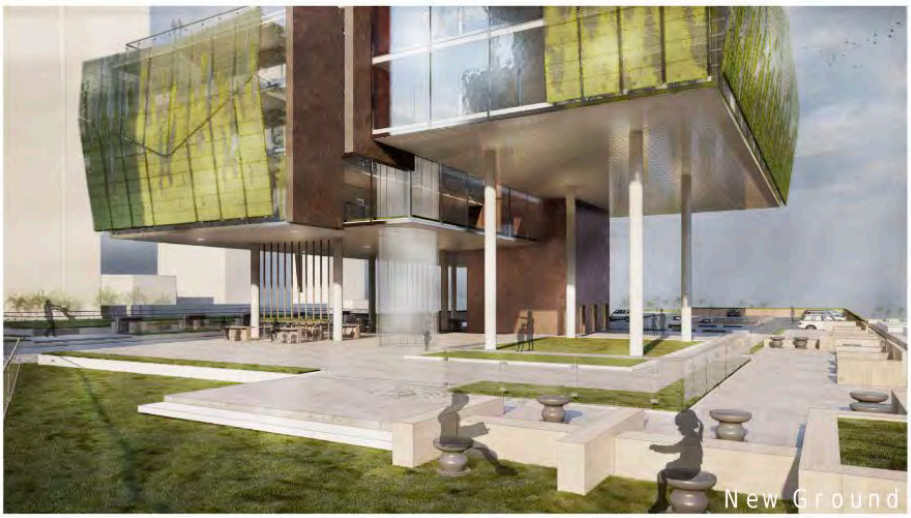



Water Flow Diagram
As part of the urban Retrofit strategy, the building is designed to capture rainwater, collect it in a central tank visible from all levels, and provide water treatment once it gets to the pond in the ground, and distributed to the bioswale and ponds park at the South. In the process, the rainwater can be used for gray water, and garden and skin irrigation. The water tank is enhanced rather than concealed, as a way to showcase the main natural resource of Ft. Lauderdale (also known as the Venice of America for its waterways), and react to the nature of the district: Art, where the tank itself becomes an art piece.
The Building becomes an art piece from architecture, to skin, to its structural columns, while providing sculptures as occupants walk through, enhancing the character of the community of the place and providing a pleasant environment for the residents, tourists, and employees that walk in the "New Ecological Promenade" everyday.
Green Roofs
Pocket Gardens + Water Bodies
Noise Absorption
Water Tank Collection + Treatment
Noise Diffusion
Riverwalk Promenade
Transverse Section


Riverwalk Promenade Entry


Trail Edge


Pond Park

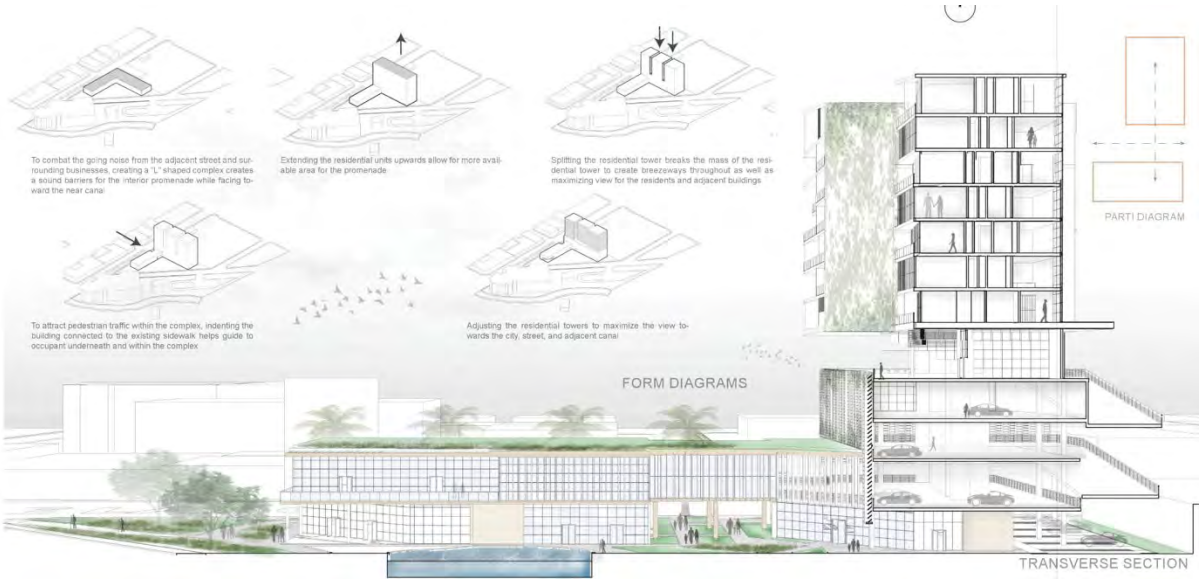

New Ground

Timber Heights by TQuion Smith
(SE corner of East Los Olas Boulevard and Tarpon Drive.)

Sustainability has been a critical issue in architect in recent years due to the increasing concerns about climate change, resource depletions, and environmental degradation. As architects, we have the responsibility to consider the environmental impact our work has on the environment and need to push toward design that is energy-efficient, resource efficient and environmentally responsible. This project is a culmination of integration, adaptation and innovation within the city of Fort Lauderdale, located on one of the major corridors of East Las Olas Boulevard. Surrounded with robust pedestrian activity during the day and the evening, this boulevard has been a staple in Fort Lauderdale. Unfortunately, as these events continue to occur, the harsh reality of noise pollution is a growing concern for the residents of the city.

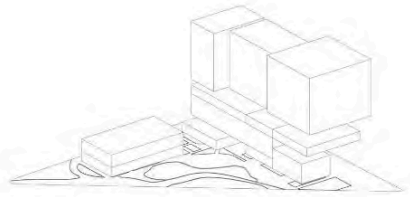
Located on a current parking lot adjacent to East Las Olas Boulevard, this site is the perfect location for this new mixed-use complex that gives back to the community with its program and architectural presence. The city of Fort Lauderdale has a future vision for the progression of its city life and from the image above, their plan is to create a linkage from downtown to Las Olas to create a corridor full of activity. Stemming from arts and entertainment to walking as well as clubbing, this lineage of activity is in alignment with the current path of the site chosen.

The program of the Timber Heights extends both residential and nightlife activities with architectural design strategies that buffer noisy activities, use the building mass as a barrier, and uses sustainable facades that also can effectively diffuse and reduce sound energy to improve quiet along East Los Olas Boulevard.

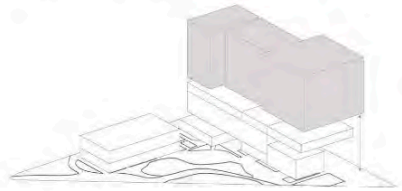

To combat the going noise from the adjacent street and surrounding businesses, creating a "L" shaped complex creates a sound barriers for the interior promenade while facing toward the near canal
Extending the residential units upwards allow for more available area for the promenade
Splitting the residential tower breaks the mass of the residential tower to create breezeways throughout as well as maximizing view for the residents and adjacent buildings
To attract pedestrian traffic within the complex, indenting the building connected to the existing sidewalk helps guide to occupant underneath and within the complex
Adjusting the residential towers to maximize the view towards the city, street, and adjacent canal
FORM DIAGRAMS
PARTI DIAGRAM
TRANSVERSE SECTION


PARK PERSPECTIVE

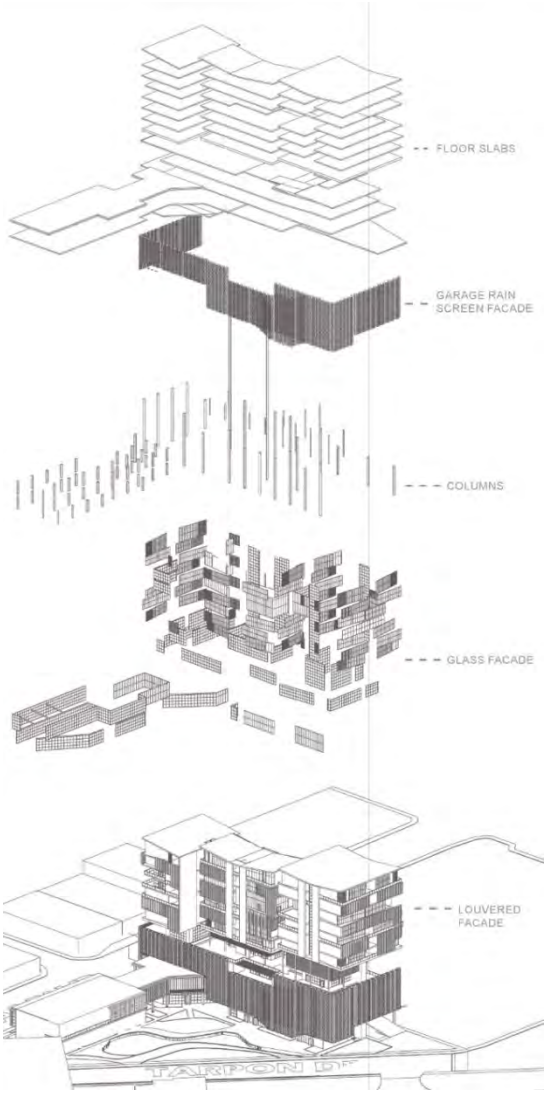
FIRST FLOOR PLAN

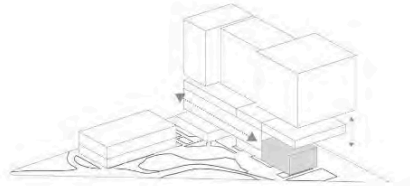


Transforming the current site which is an existing parking lot allowed for the transformation of the plaza which included a detention pond to mitigate rainwater. This can act as a water feature but as a sustainable option to water collection

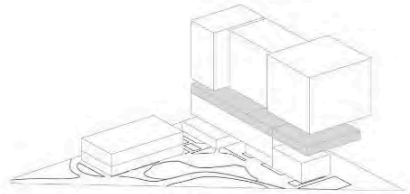


Positioning the residential units above the other program helps decrease the noise level.

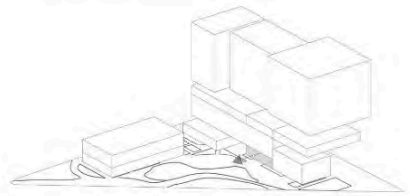




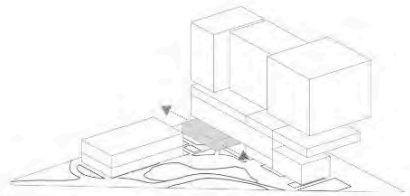
The placement of the nightclub sits on the ground floor of the complex for easy access and positioned as far away from the residents and main street.



The office spaces between the parking garage and residential units allows for a semi-private location for the municipal programs



The addition of a market serves as another program the relates to the existing building near the site, bringing the attraction into the site.



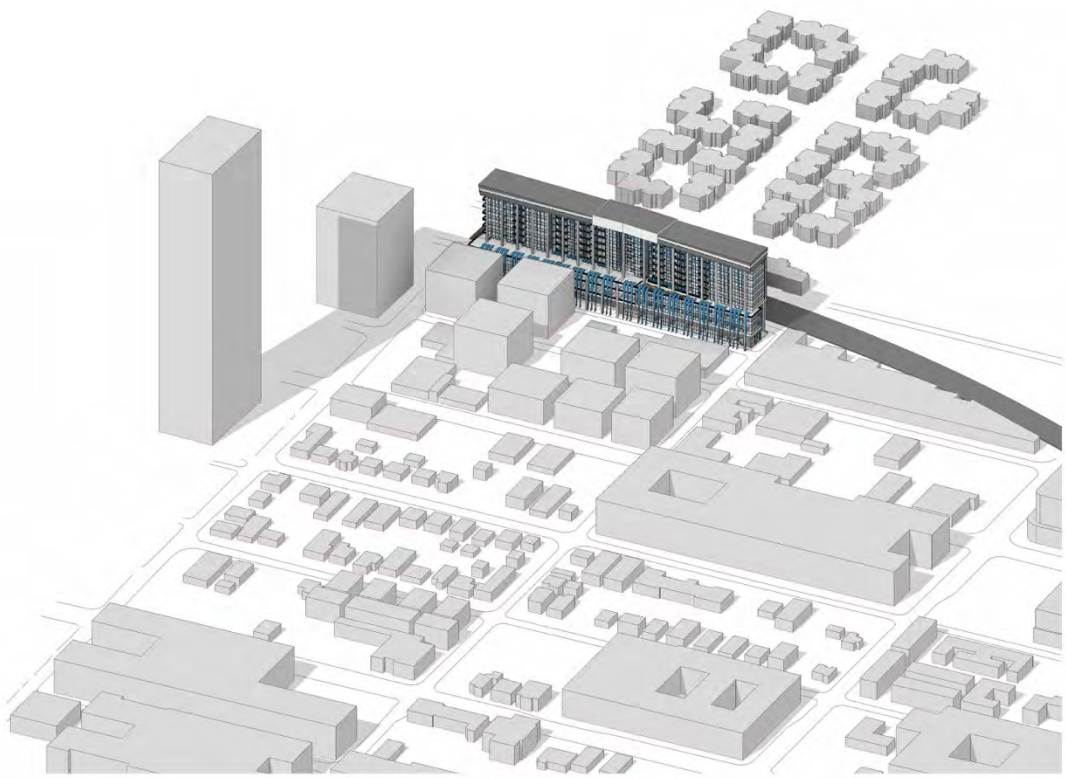
Adding the gallery serves as a link to the future vision of the city to bring forward local artist of the community. This location has the access to the main corridor as well as the interior plaza

RESIDENTIAL SKY LOUNGE

Soundscape Cocoon by Blake Albritton
(NE corner of Northwest Flagler Avenue and Northwest 4th Street)

This project aims to create a multiuse residential tower containing retail space, leasing offices, municipal offices, a nightclub, and appropriate parking, while reacting to the elements of the site, taking advantage of and mitigating aspects of the location's environment and soundscape. This building utilizes a unique louvered facade which wraps it in sound baffling material to both absorb sound and heat, angling outward vertically to provide shade while maintaining views, and stretching horizontally when delineating sound separation between differing programmatic typologies of differing sound intensity. This is most noticeable in the transition between the lower programmatic elements and the residential tower, which is isolated and wrapped by the façade, like a protective cocoon, protecting against solar heat gain and unwanted sound

The southwestern site location in Flagler village is a north to south oriented site on the perimeter of the neighborhood along the railroad tracks which run through Fort Lauderdale. The buildings size, orientation, and sound dispersing facade help create a barrier between the noisy railroad tracks and the eastward neighborhood largely made up of residential and mixed-use buildings. Against the central business district to the south, the size and program of this building is appropriate for the site and within context of current and ongoing development in the area. Minimizing some of the negative effects of reconstruction in this dense urban area, the site is currently occupied by a self-storage facility, an empty lot, and a small abandon shop complex. Outside of the site itself, additional possible site interventions include demolishing a small single story abandoned building to the east to create a greenspace in front of the club, to allow the noise from the club to dissipate outward and creating a landscaped bridge over the railroad tracks. This would further contain the noise from the train while connecting pedestrians from the adjacent neighborhood to the city and retail within the building while creating more greenspace in otherwise undevelopable areas.




VEHICULAR ENTRY AND RESIDENTIAL LOBBY AND OFFICES ON SMALLER STREET
SMALLER SHOPS IN ALLEYWAY
NIGHTCLUB ENTRY
LARGE RETAIL OPENS TO MAJOR ROADWAY SOUTH OF SITE


2 3D NORTHWEST

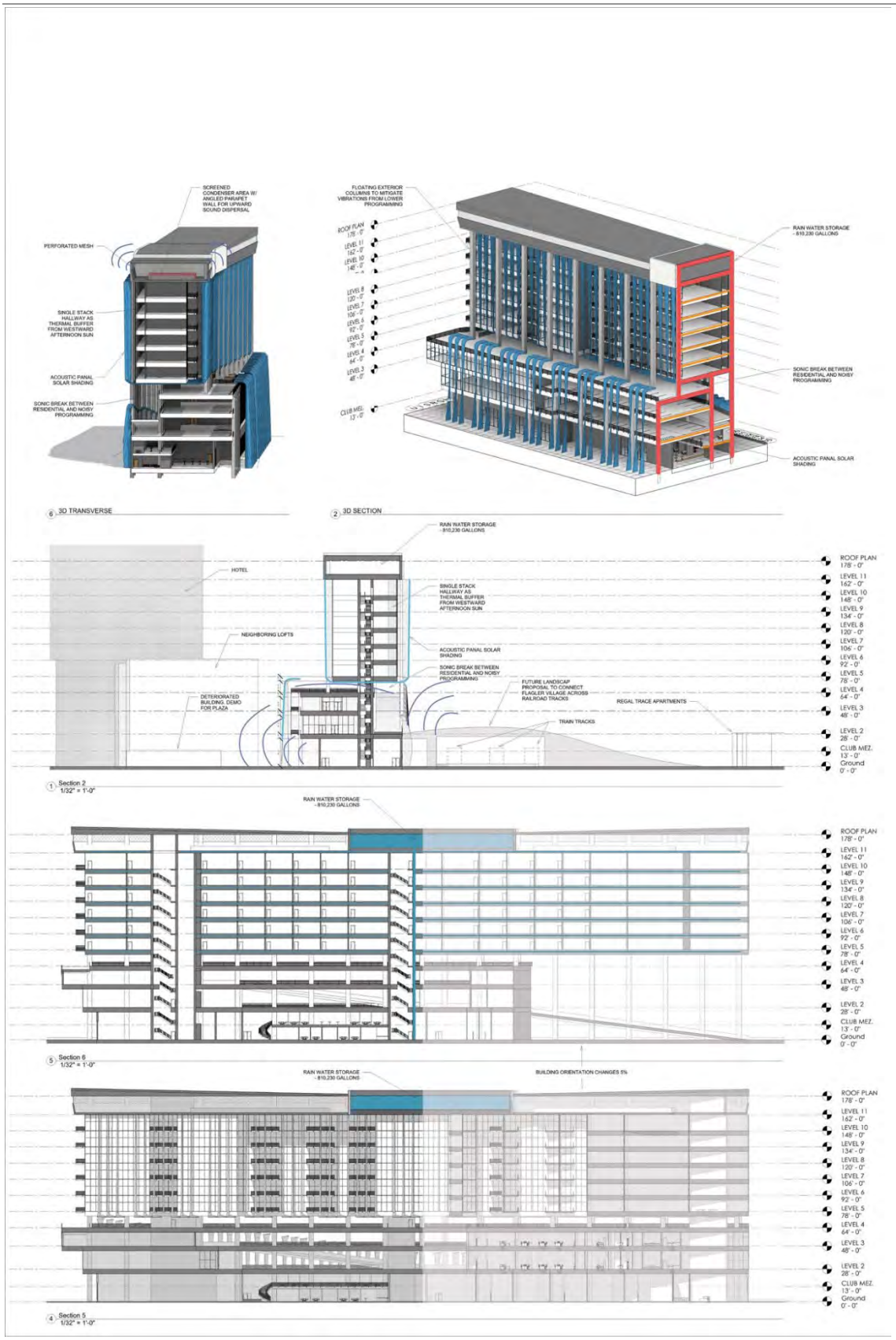

3 3D NORTHEAST

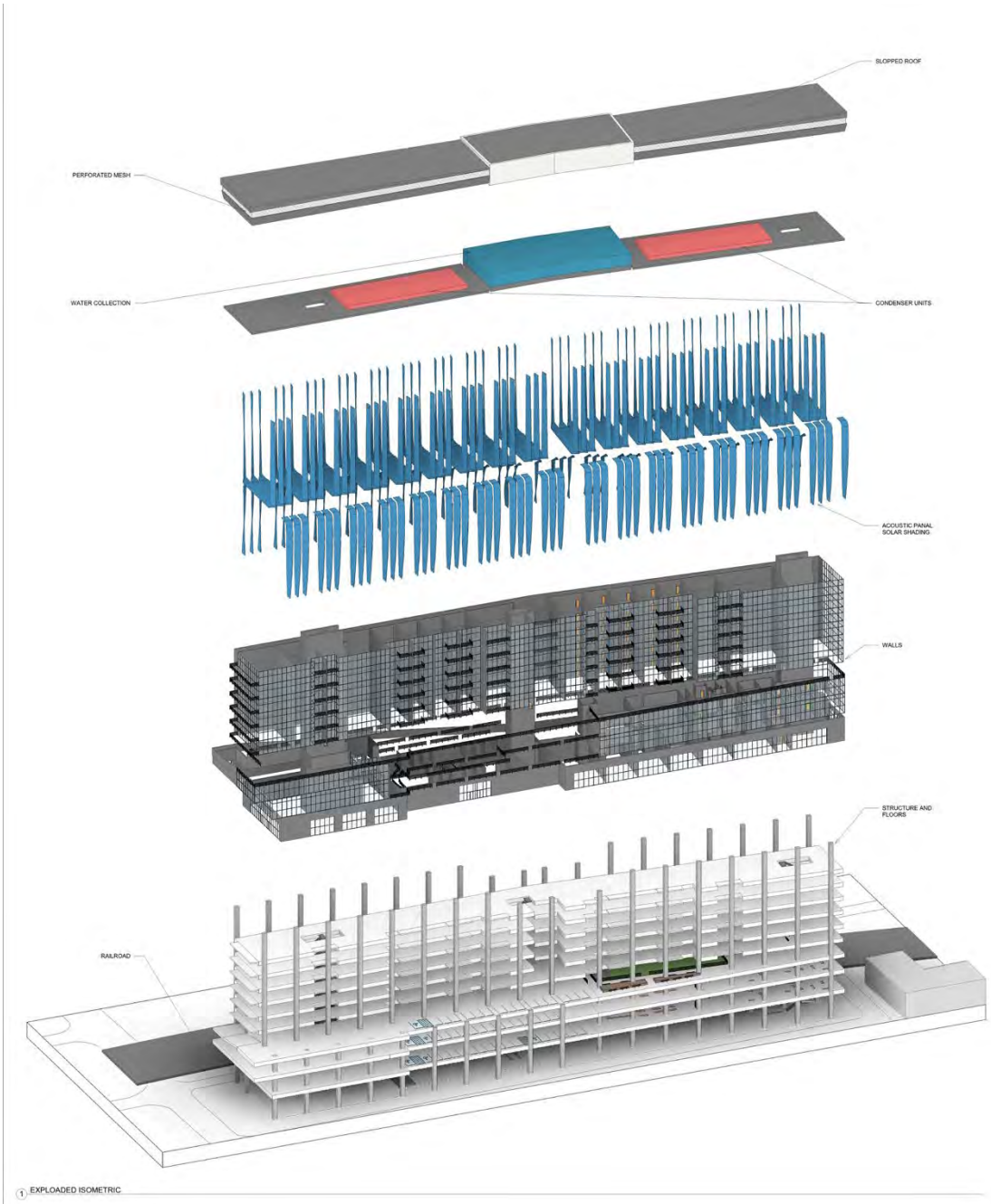

4 3D SOUTHWEST

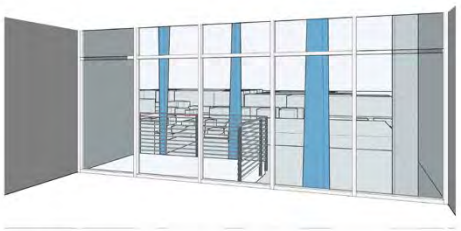

5 3D SOUTHEAST


1 East
1/32" = 1'-0"
2 South
1/32" = 1'-0"
3 North
1/32" = 1'-0"
4 West
1/32" = 1'-0"

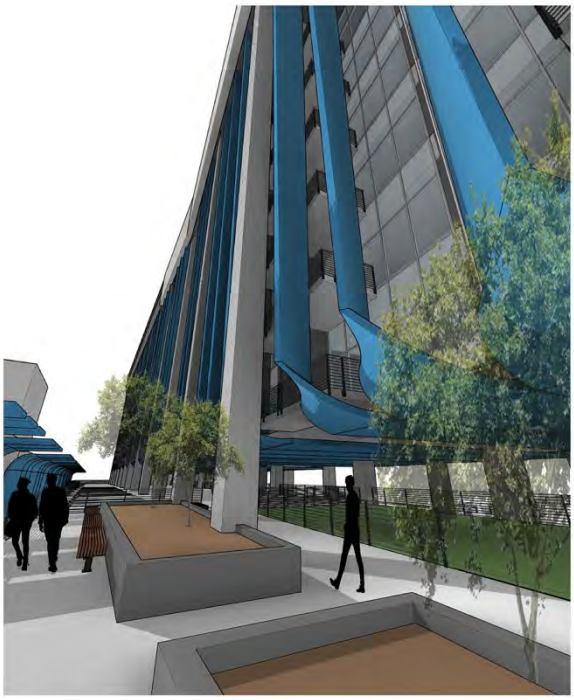

WATER STORAGE
6 ROOF PLAN
1/32" = 1'-0"
CONDENSER UNITS
WATER STORAGE
ROOF ACCESS STAIRS
7 LEVEL 11
1/32" = 1'-0"
OPEN ON ABOVE LEVELS
5 LEVEL 5-10
1/32" = 1'-0"
4 LEVEL 4
1/32" = 1'-0"
3 LEVEL 3
1/32" = 1'-0"
2 LEVEL 2
1/32" = 1'-0"
Plan utilizes programmatic elements and parking to provide an insular surrounding to contain the soundscape produced from the club.
N
8 CLUB MEZ
1/32" = 1'-0"
1 LEVEL 1
1/32" = 1'-0"


SCREENED CONDENSER AREA W/ ANGLED PARAPET WALL FOR UPWARD SOUND DISPERSAL
PERFORATED MESH
SINGLE STACK HALLWAY AS THERMAL BUFFER FROM WESTWARD AFTERNOON SUN
ACOUSTIC PANAL SOLAR SHADING
SONIC BREAK BETWEEN RESIDENTIAL AND NOISY PROGRAMMING
FLOATING EXTERIOR COLUMNS TO MITIGATE VIBRATIONS FROM LOWER PROGRAMMING
RAIN WATER STORAGE - 810,230 GALLONS
SONIC BREAK BETWEEN RESIDENTIAL AND NOISY PROGRAMMING
ACOUSTIC PANAL SOLAR SHADING
6 3D TRANSVERSE
2 3D SECTION
HOTEL
NEIGHBORING LOFTS
DETERIORATED BUILDING. DEMO FOR PLAZA
FUTURE LANDSCAP PROPOSAL TO CONNECT FLAGLER VILLAGE ACROSS RAILROAD TRACKS
REGAL TRACE APARTMENTS
TRAIN TRACKS
ROOF PLAN 178' - 0"
LEVEL 11 162' - 0"
LEVEL 10 148' - 0"
LEVEL 9 134' - 0"
LEVEL 8 120' - 0"
LEVEL 7 106' - 0"
LEVEL 6 92' - 0"
LEVEL 5 78' - 0"
LEVEL 4 64' - 0"
LEVEL 3 48' - 0"
LEVEL 2 28' - 0"
CLUB MEZ. 13' - 0"
Ground 0' - 0"
1 Section 2 1/32" = 1'-0"
5 Section 6 1/32" = 1'-0"
BUILDING ORIENTATION CHANGES 5%
4 Section 5 1/32" = 1'-0"


SLOPPED ROOF
PERFORATED MESH
WATER COLLECTION
CONDENSER UNITS
ACOUSTIC PANAL
SOLAR SHADING
WALLS
STRUCTURE AND
FLOORS
RAILROAD
1 EXPLOADED ISOMETRIC



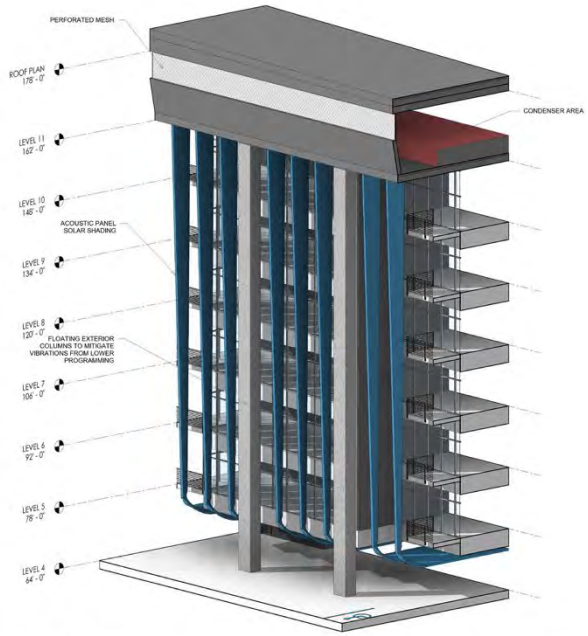
3 VIEW FROM RESIDENCE



2 4TH FLOOR OUTDOOR SPACE

5 NE PERSPECTIVE

4 SE PERSPECTIVE



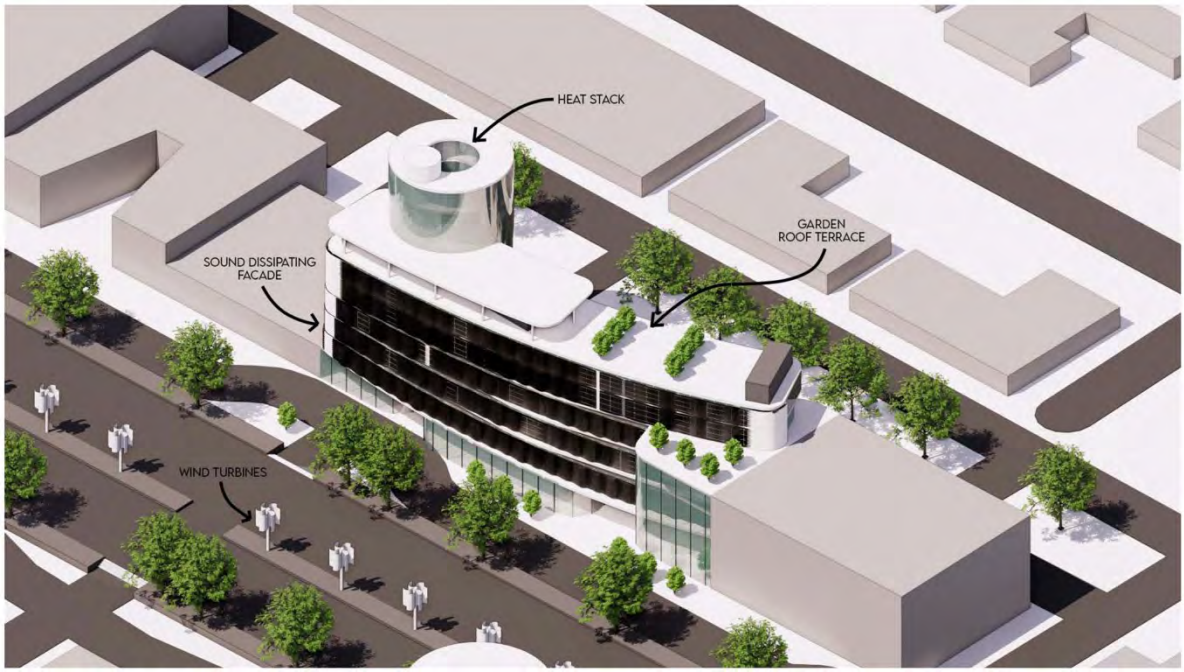
1 RESIDENTIAL FACADE SHADING

Mixed-Use Strip Intervention by Kyle O'Quinn
(East Oakland Park Boulevard between NW 26th and NW 27th Avenues)

The site is located at a major urban arterial corridor (East Oakland Park Boulevard) that connects downtown Fort Lauderdale to the Atlantic Ocean. The road is, flanked on either side by urban strip commercial with residential neighborhoods behind them. Traffic along this corridor is somewhat high speed and the buildings are pulled back, placed along parallel secondary streets that allow vehicles to be siphoned from the highway.

This project proposes that these secondary streets be reoriented from a primary vehicle focus to a pedestrian focus. The reconstruction has the potential of transforming what is essentially a linear parking lot into an urban oasis and drawing commercial activity from the residences by offering shade and walkability. Improved integration between East Oakland Park Boulevard and the adjacent neighborhoods could enhance the sustainability of this retail corridor, rather than relying on seasonal traffic. However, because of this corridor's central highway, it is important to maintain a strong urban barrier that will block, diffuse and absorb as much of the road noise as possible. Sound reduction is achieved using low and wide buildings that span their sites, stepping back as it rises vertically, with a facade that is designed in a shape derived from an acoustical form.

Finally, due to conflict in programmatic requirements, the proposal includes two separate buildings, rather than a single building. These buildings are placed diagonally along the highway at the termination of perpendicular side streets, acting as a gateway or threshold for the cars passing by, denoting an increase in pedestrian activity and marking a major crossing area that links the neighborhoods symbolically and physically to stitch the residential neighborhoods on either side of this urban divide back together.

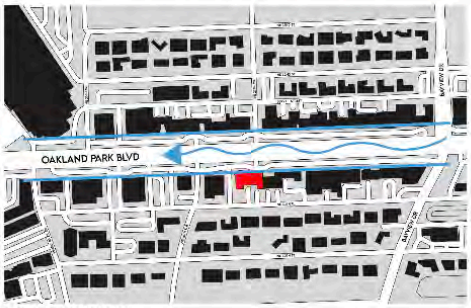


ZONING

SOUND PENETRATION

TREE COVERAGE

RETAIL BLOCKS



WIND CORRIDOR

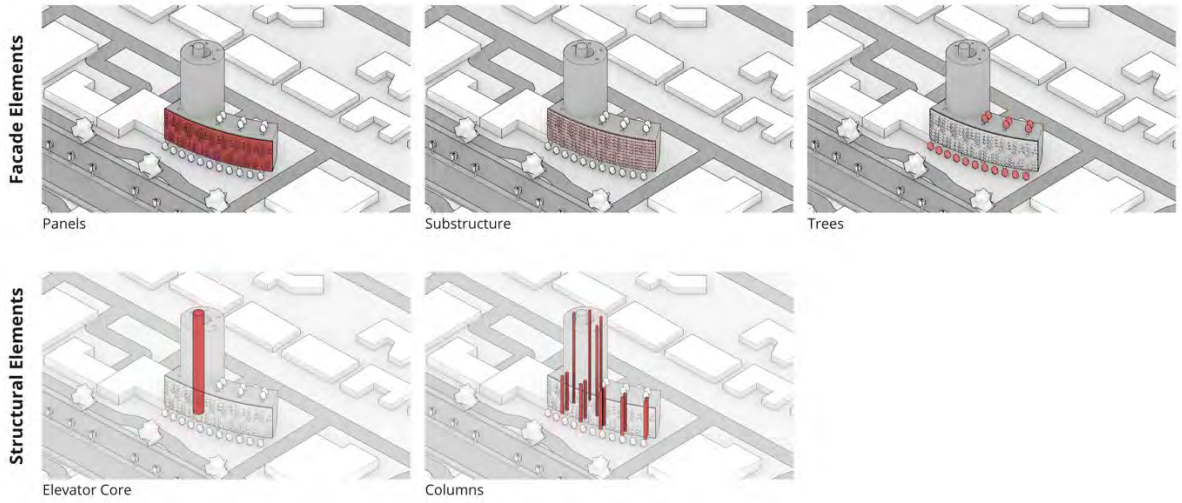
MICROSHADING

POTENTIAL SISTER SITES

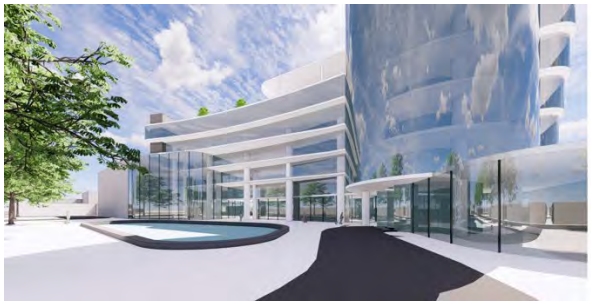

URBAN ALIGNMENTS

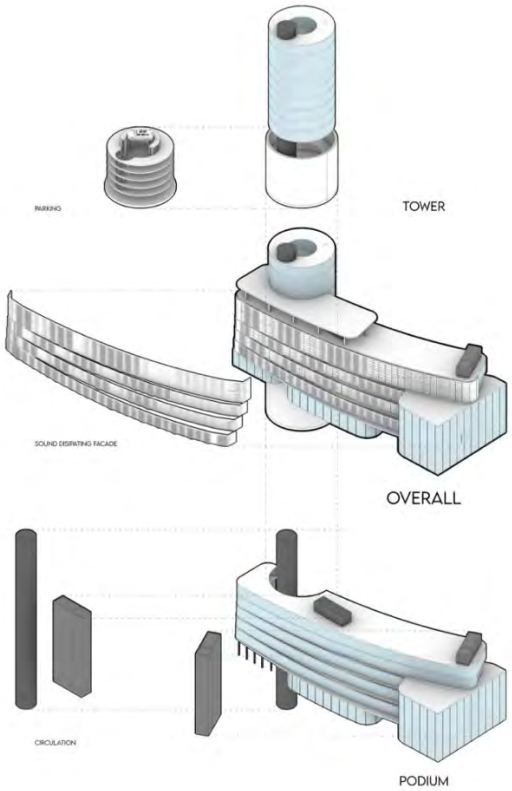

RETAIL/RESIDENTIAL DIVIDE

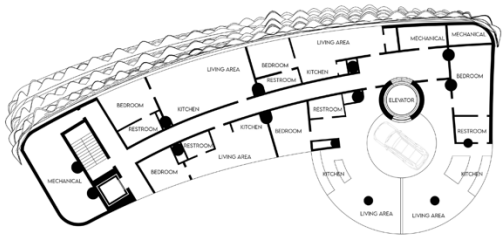

POTENTIAL CROSSWALKS

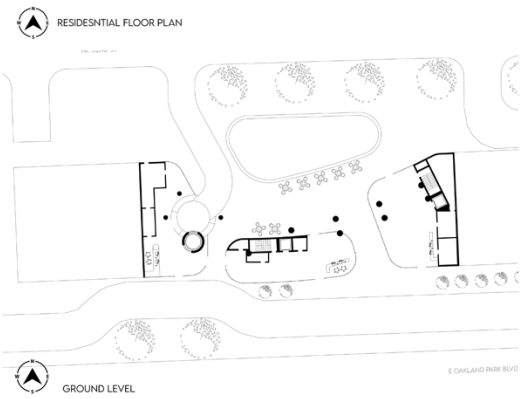

Facade Elements
Panels
Substructure
Trees
Structural Elements
Elevator Core
Columns

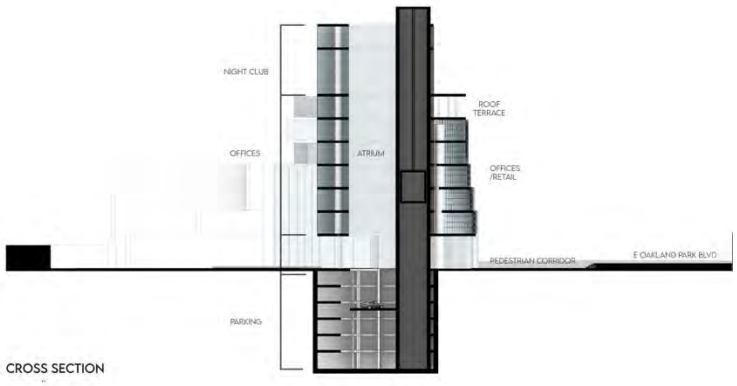

RESIDENTIAL
NE 32ND ST
NE 27TH AVE
EAST OAKLAND PARK BLVD
NE 26TH TER
NE 30TH ST
N
W
E
S
CARS
PEDESTRIANS
RESIDENTIAL



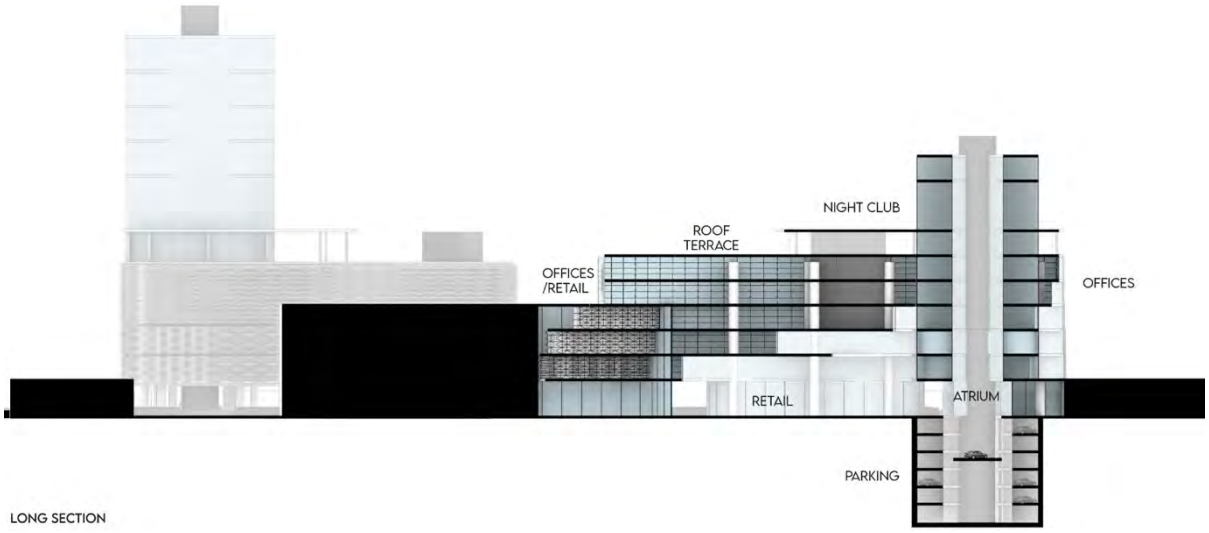

PARKING
TOWER
SOUND DISPATING FACADE
OVERALL
CIRCULATION
PODIUM


MECHANICAL
LIVING AREA
BEDROOM
RESTROOM
KITCHEN
ELEVATOR


RESIDESNTIAL FLOOR PLAN
GROUND LEVEL



CROSS SECTION



LONG SECTION

SUMMARY OF RELATED LITERATURE AND STANDARDS ON SOUND MEASUREMENTS

Handbook of Acoustical Measurements and Noise Control by Cyril M. Harris

Chapter 9. Noise Measurement Techniques

1. Page 9.7 – Recommended microphone position – 70^{o} to 80^{o} angle above the horizontal to the sound source.
2. Page 9.10 – Correction for background noise.
3. Page 9.12 – Correction for reflections from nearby surfaces.
   - A. ANSI S12.18 – Locate the microphone a distance that is more than 5 times the wavelength of the lowest frequency of interest or 5 times the distance to the source
   - B. ASTM Standards – 1-1/2 times the largest surface dimension
4. Page 9.12 through 9.14 – Effects of humidity, temperature, and observer.
5. Page 9.20 – Data to be recorded.

Handbook of Environmental Acoustics by James P. Cowan

Chapter 3. Noise Measurement

1. References to Standards are somewhat outdated.
2. Pg. 75 through 81 - Follow industry accepted practices for conducting acoustical measurements including:
   - A. Windscreen usage
   - B. Calibration of equipment
   - C. Placement of microphone
   - D. Consideration of meteorological conditions
   - E. Corrections for background noise interference

Review of Environmental Acoustic Measurement Standards

1. ASTM E 1014-12 (Reapproved 2021) - *Standard Guide for Measurement of Outdoor A-Weighted Sound Levels*

- A. Item 4.3 - For sound level measurements meant to "quantify relatively steady or slowly varying outdoor sound levels."
- B. Item 4.4 - Depends on "simplified manual data acquisition" and is "more appropriate for the simpler types of environmental noise situations."
- C. Item 4.6 – "No procedures are provided for estimating or separating the influence of two or more simultaneously measured sounds." Useful in establishing compliance "when the measured data are below a specified limit".
- D. Section 5 - Apparatus - Type 2 meter, windscreen, tripod, weather measurements, etc.
- E. Section 6 - Calibration. 1 dB off = invalid, 1.5 dB off = fix meter.
- F. Section 7 - Interference - Wind, rain, power lines, meteorological effects.
- G. Item 7.1. No measurements shall be made when steady wind speed exceeds 20km/h.
- H. Item 8.2.2.2 - "Measure sound levels at each location with and without the source

operating."

Guidelines of Interest

A. Item 7.1.1 : "No measurement shall be made when steady wind speeds exceed 20 km/h" (12 mph). *Probably best to not take measurements if above 8 mph.*

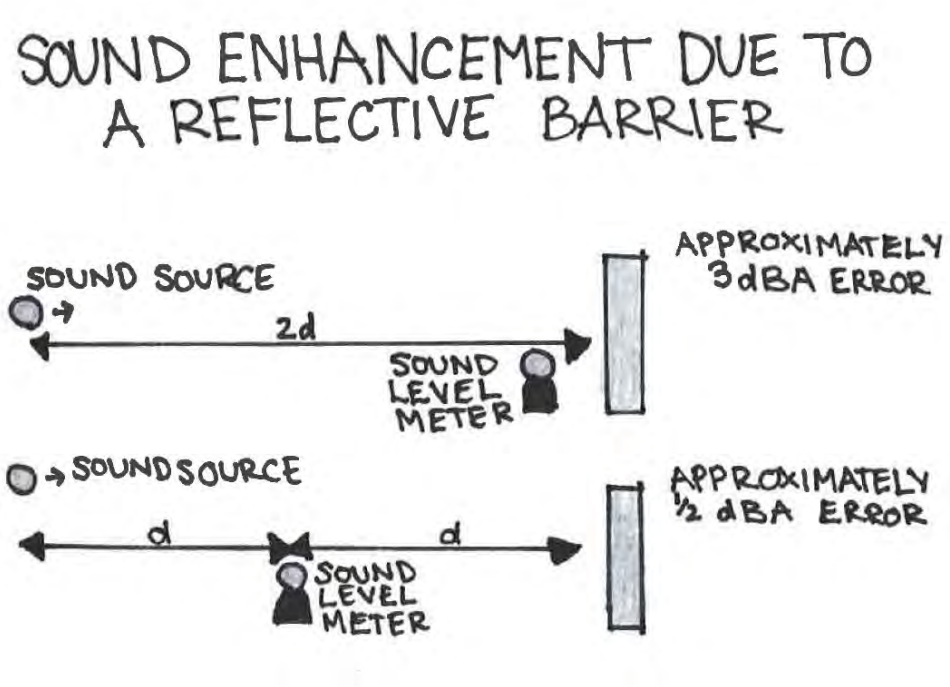
B. Item 8.3.2 – Record meteorological data for each measurement set or on an hourly basis, whichever is less. *Only really important for long distance (greater than 500 ft) of a specific sound source.*

2. *ASTM E 1503 – 14* – Standard Test Method for Conducting Outdoor Sound Measurements Using a Digital Statistical Sound Analysis System

A. Measurement of outdoor sound levels at specific locations using a digital statistical analyzer and a formal measurement plan (ASTM E 1779).

B. Recommendations/guidelines to consider:

Item 5.2: Effects of Wind
Item 5.3: Effects of Moisture and High Humidity
Item 5.5: Place microphone away from acoustically reflective surfaces by at least 2-1/2 times the major dimension of the surface



Item 5.8: For measurements at large horizontal distances (1,000 ft or more), consult someone experienced in meteorological influence on sound propagation

C. Item 6: Apparatus, Item 7: Calibration, Item 8: Procedure and Item 9: Report. Should be followed to the extent practical or necessary given the situation.

Item 8.3.9: Support the microphone on a sturdy tripod or mast at a height between 1.2m and 1.5 m above the ground

3. *ASTM E 1686 - 16* - Standard Guide for Applying Environmental Noise Measurement Methods and Criteria

A. Very informative standard with definitions of acoustical measurement terms, discussion of acoustical criteria, etc.
B. Primarily geared towards individuals or groups evaluating environmental noise conditions possibly for a future project, or those trying to develop environmental noise criteria for enforcement or regulation purposes.

4. *ASTM E 1780 – 12* (Reapproved 2021)- Standard Guide for Measuring Outdoor Sound Received from a Nearby Fixed Source

A. Intro – "Techniques and precautions are not fixed or mandatory and cannot replace the judgment of acoustical professionals."
B. Item 4.2 – "This guide provides a standard procedure for a trained acoustical professional."
C. Item 4.3 – "Measurements should be performed by or under the direction of a person experienced in the measurement and analysis of outdoor sound, and who is familiar with the use of the required equipment and techniques."
D. Item 5: Apparatus, Item 6: Calibration and Self-Noise, Item 7: Interference from Airborne Sound and Electromagnetic Fields, and Item 8: Measurement Plan and Procedure. Should be followed to the extent practical or necessary given the situation.
E. Specific items of interest include:
Item 8.2.4: Locate microphone mounted to a tripod or pole 1.5-2m (5 to 6.5 ft) above the ground surface. Higher locations should be chosen where human occupancy is likely, for example, the future top story of a high-rise building.
Item 8.3.1: Recordings of tonal sound for subsequent analysis.
Item 8.6.3: Background/ambient noise correction.
Item 9.3.1: Discussion of potential atmospheric effects
F. Annexes give very good guidelines for preparing equipment, keeping a field log, reporting the data, and calibrating the equipment.

5.* ANSI S1.13-2020 – *Measurement of Sound Pressure Levels in Air

A. Can be purchased individually at www.ansi.org.
B. Outdoor measurements can be made following this standard provided environmental conditions remain within stated limits.
C. Classifies the types of sounds that can occur – continuous, impulsive, intermittent, and steady or fluctuating versions of each.
D. Contains requirements for sound level meters to be used and their capabilities, conducting acoustical measurements, and reporting the data.

6.* ANSI S12.18-1994 (Reaffirmed 2009) – *Procedures for Outdoor Measurement of Sound Pressure Level

A. Can be purchased individually at www.ansi.org.
B. Outdoor measurements can be made following this standard provided environmental conditions remain within stated limits.
C. Considers the effects of the ground, the effects of refraction due to wind and temperature gradients and the effects due to turbulence.

D. Two methods are used. Method No. 1 outlines conditions for routine measurements. Method No. 2 is the precision method and has more strict conditions for its use, resulting in more accurate measurements.

7. ANSI S12.9-1993 (R2008) *Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-term Measurements with an Observer Present*

A. Item 6.1. "Reflecting objects with small dimensions (trees, posts, bushes, etc.) should not be within 1.5 m of the microphone position. If sound pressure levels are measured within 1.5 m of such objects, the effect, if any, on the measured data should be determined from measurements made at another location where the objects are at a greater distance, or by an equivalent procedure".

8. ANSI Standards for Equipment

A. ANSI/ASA S1.4-2014/Part 1 / IEC 61672:1-2013– American National Standard Specification For Sound Level Meters
B. S1.11-2004 (R2009) - Specifications for Octave-Band and Fractional Octave-Band Analog and Digital Filters
C. S1.40-2006 (R2020)– Specifications and Verification Procedures for Sound Calibrators
D. S1.42-2020–Design Response of Weighting Networks for Acoustical Measurements

Footnotes:
*--- (**1**) ---*
Editor's note— *Ord. No. C-08-37, § 1, adopted July 15, 2008 , repealed Ch. 17, in its entirety, which pertained to noise control. Section 2 of said ordinance enacted provisions designated as a new Ch. 17 to read as herein set out. See also the Code Comparative Table.*
Cross reference— *Permit to operate loudspeaking device on aircraft, § 7-9; noise abatement for aircraft, § 7-160; sounding of railroad whistles and horns, § 16-17; sound devices on vehicles and aircraft, § 16-78; nuisances, Ch. 18.*
State Law reference— *Municipal Home Rule Powers Act, F.S. ch. 166; motor vehicle noise, F.S. § 316.293.*

Sec. 17-1. - Definitions.

The following words, terms and phrases, when used in this chapter, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

A-weighted sound level means the sound level as measured with the A-weighting network on a sound level meter meeting the standards set forth in the American National Standards Institute (ANSI) S1.4-1983 or its successors. The unit of reporting is dBA. Sounds measured with the "A" weighting network approximate the response of human hearing when measuring sounds of low to moderate intensity without an amplified low frequency component.

Ambient sound level means that measured value which represents the summation of the sound from all of the discrete sources affecting a given site at a given time, exclusive of extraneous sounds and those from the source under investigation. Ambient sound level is synonymous with background sound level. Ambient sounds are differentiated from extraneous sounds by the fact that the former are of a more steady state, although they may not be continuous.

Amplified sound means the reproduction of sound from any radio, stereo, CD player, DVD player, microphone, drum, turn table, audio or visual equipment, musical instrument, sound equipment, sound amplification device, television set, exterior loudspeakers, bullhorn or any similar device.

Backup alarm means an audible safety device designed to alert people that a vehicle is operating in reverse, meeting Occupational Safety and Health Administration (OSHA) rules at 29 CFR Part 1926.601(b)(4) and 29 CFR Part 1026.602(a)(9), which require, in part, that: the vehicle has a reverse signal alarm audible above the surrounding noise level.

C-weighted sound level is the sound level as measured using the "C" weighting network with a sound level meter meeting the standards as set forth in ANSI S1.4-1983 or its successors. The unit of reporting is dBC. The "C" weighting network is more sensitive to low frequencies than the "A" weighting network.

Continuous sound means any sound with a duration of more than one (1) second, as measured with a sound level meter set to the "slow" meter response.

Decibel means a logarithmic (dimensionless) unit of measure often used in describing the amplitude of sound. Decibel is denoted as dB.

Emergency energy release device means a device used specifically to release excess energy on a non-scheduled basis as necessary for purposes of safety.

Extraneous sound means a sound of high intensity and relatively short duration which is neither part of the ambient sound, nor comes from the sound source under investigation.

Impulsive sound means a sound that has a duration of less than one (1) second and under investigation.

LMAX means the maximum sound level measured during the sound measurement p

Mechanical device means any device that transmits or modifies energy.

Moped means any vehicle with pedals to permit propulsion by human power, having the rider and designed to travel on not more than three (3) wheels; with a motor rated r horsepower and not capable of propelling the vehicle at a speed greater than thirty (30) as defined in F.S. § 316.03, as may be amended from time to time.

Motor vehicle means any self-propelled vehicle not operated upon rails or guideway, but not including any bicycle, motorized scooter, electric personal assistive mobility device, or moped; as defined in F.S. § 316.03, as may be amended from time to time.

Motorboat means any vessel equipped with machinery for propulsion, irrespective of whether the propulsion machinery is on actual operation; as defined in F.S. § 327.02, as may be amended from time to time.

Motorcycle means any motor vehicle having a seat or saddle for the use of the rider and designed to travel on not more than three (3) wheels in contact with the ground, but excluding a tractor or moped; as defined in F.S. § 316.03, as may be amended from time to time.

Motorized scooter means any vehicle not having a seat or saddle for the use of the rider, designed to travel on not more than three (3) wheels, and not capable of propelling the vehicle at a speed greater than thirty (30) miles per hour on level ground; as defined in F.S. § 316.03, as may be amended from time to time.

Mixed-use property means more than one (1) type of use in a building or set of buildings; some combination of residential and non-residential use.

Multifamily dwelling means any building occupied or intended to be occupied by more than two (2) families, living separately and with separate kitchens or facilities for cooking on the premises. This includes apartments, condominiums and coach homes, but does not include hotels, motels, bed and breakfast, townhouse, or cluster dwellings.

Noise means, for the purposes of this chapter, any sound that is in violation of any provision of this chapter.

Noise control officer means environmental inspectors, building and zoning inspectors, code enforcement officers and police enforcement personnel authorized to enforce provisions of this code.

Noise disturbance means any sound which is unreasonably loud, raucous, or jarring to reasonable persons of ordinary sensibilities, or any sound which affects the health, safety, or welfare of other persons, or exceeds the noise levels as defined in section 17-6.

Plainly audible means any sound that can be detected by a person using his or her unaided hearing faculties.

Public right-of-way and *public space* means land conveyed or dedicated by plat, deed, easement or other conveyance which is devoted to, required for or intended for the use by the public as a means of public traverse and other public purposes.

Replace LMax with:
LAFmax - the maximum A-weighted sound level taken during the measurement period with a Fast response (125ms)

LCFmax - the maximum C-weighted sound level taken during the measurement period with a Fast response (125ms)

Premises means structures that make up a parcel of property

Real property line means either (a) the boundary line of a parcel; (b) the vertical and horizontal boundaries of a dwelling unit that is part of a multifamily dwelling; or (c) on a mixed-use property, the interface between the two (2) portions of the property on which different categories of activity are being performed.

Single-family dwelling is a dwelling unit designed for or occupied by one (1) family and includes standard, detached, and attached dwellings.

Single-family dwelling (attached) is a one-family dwelling attached to another one-family dwelling by a common vertical wall and where each unit is located on a separate plot. Single-family dwellings that are attached include duplex, cluster, and townhouse dwellings.

Sound means oscillations in pressure in a medium with elasticity and viscosity, such as air, that evoke auditory sensation in the human ear.

Sound level meter means an instrument that measures sound and conforms to ANSI S1.4-1983 or its successor publications.

Total sound level means that measured level which represents the summation of the sounds from the sound source under investigation and the ambient sounds which affect a given place at a given time, exclusive of extraneous sound sources.

Vessel means every watercraft, barge, and airboat, used or capable of being used as a means of transportation on water, as defined in F.S. § 327.02, as may be amended from time to time.

(Ord. No. C-08-37, § 2, 7-15-08)

Voluntary self monitoring system means the use of an audio monitoring system that monitor and log the sound levels produced by the system to demonstrate compliance with the noise ordinance.

Sec. 17-2. - Penalties.

Any person who violates any provision of this chapter and who shall be found violating or found in violation of any provision of this chapter shall be subject to the penalties as prescribed in section 1-6 and/or Chapter 11 of this Code.

(Ord. No. C-08-37, § 2, 7-15-08)

Repeat violators will be subject to installation of noise monitoring system to verify conformance with noise ordinance limits.

Sec. 17-3. - Noise control officers.

Noise control officers should undergo noise measurement training sessions annually or bi-annually.

...stablished by this chapter shall be administered and enforced by noise control

...all have the power to investigate and pursu... without the need for a complaint from a private citizen. ...inance

and initiate enforcement under this chapter.

(Ord. No. C-08-37, § 2, 7-15-08)

Type 1 or Type 2

and

Sec. 17-4. - Sound level measurement.

Sound level measurement shall be made with a sound level meter using the "A" weighting scale or "C" weighting scale, as specified in this chapter for the specific sound s...

(Ord. No. C-08-37, § 2, 7-15-08)

A windscreen must be used for all sound level measurements. Sound level meter shall be calibrated before and after every measurement, located at least 3 ft, 6 ft preferred from walls and other sound reflecting surfaces. Measurements shall be made with the meter secured to a tripod. Corrections for background noise should be applied.

Sec. 17-5. - General prohibitions.

It shall be unlawful for any person to make or continue or cause to be made or continued any noise disturbance within the limits of the city.

(Ord. No. C-08-37, § 2, 7-15-08)

Sec. 17-6. - Maximum permissible dBA sound levels.

50 dBA/55dBC in areas of lower density in other areas of the City

55 dBA/60 dBC in areas surrounding the Wharf, Riverwalk, A1A, Seabreeze and built up areas in the city

70dBC

other provision in this chapter, it shall be unlawful, except as expressly permitted herein, to

e making of any sound which exceeds the limits set forth in this section.

TABLE I

MAXIMUM PERMISSIBLE SOUND LEVEL LIMITS dBA

USE	TIMES	OUTDOOR	INDOOR
Residential	7:00 a.m. to 10:00 p.m.	60 dBA*	45 dBA
	10:00 p.m. to 7:00 a.m.	50 dBA	35 dBA
Commercial	24 hours	65 dBA	55 dBA
Industrial	24 hours	75 dBA	65 dBA

75 dBC

60 dBC from 12:00pm to 10pm

85 dBC

55dBC from 10pm to 12pm

If a complainant is located in elevated dwelling units, measurements shall be taken in the area where the disturbance is heard.

and 75 dBC

*If the residential use is within a commercial, industrial, or mixed use, or within two hundred (200) feet of such use, the outdoor sound level limit is sixty-five (65) dBA between 7:00 a.m. to 10:00 p.m.

Sound level measurements shall be taken as follows:

a. The sound level limit for the complainant's use shall apply.

b. Outdoor sound level measurements shall be taken on or within the real property line of the complainant.

Or immediately adjacent to

c. Indoor sound level measurements shall apply when the sound source is on or within the same parcel of land as the complainant or when the real property line between the sound source and the com all, floor, or ceiling. Indoor sound level measurements shall be taken with omplainant.

Take a minimum of one (1) measurement

d. ~~Three (3) measurements~~ of the normal, usual operation of the sound source under investigation shall be taken. The metric that shall be applied is LMAX. Each ~~of the three (3)~~ measurements shall be no less than thirty (30) seconds in duration, ~~and all three (3) measurements shall be taken within any one-hour period. If the sound source under investigation is of a total duration of less than ninety (90) seconds, one thirty-second measurement shall be sufficient~~.

LAFmax and LCFmax

1. *Impulsive sound:*

a.

Between the hours of 7:00 a.m. and 10:00 p.m. daily, impulsive sounds which occur ten (10) or more times in any one (1) hour shall not exceed the permissible sound level limits as set forth in Table I, and impulsive sounds which occur less than four (4) times in any one-hour period shall not equal or exceed twenty (20) decibels above the permissible sound level limits as set forth in Table I.

Voluntary sound level monitoring to demonstrate compliance is encouraged.

b. Between the hours of 10:00 p.m. and 7:00 a.m. daily, impulsive sounds which occur four (4) or more times in any one (1) hour shall not exceed the permissible sound level limits as set forth in Table I, and impulsive sounds which occur less than four (4) times in any one-hour period shall not equal or exceed twenty (20) decibels above the permissible sound level limits as set forth in Table I.

2. *Steady pure tones:* If the sound source under investigation is a mechanical device, excluding HVAC equipment on residential property, and is emitting a sound with a steady tonal quality which does not fluctuate more than plus or minus three (3) dBA, the permissible sound level limits in Table I shall be reduced by five (5) dBA.

(Ord. No. C-08-37, § 2, 7-15-08)

Sec. 17-7. - Specific restrictions.

1. *Amplified sound.* No person shall cause, allow, or permit the operation of any amplified sound device from the following use districts or locations in the following manner:

a. *Residential use:*

i. Sound shall not be plainly audible for a period of one (1) minute or longer at a distance of twenty-five (25) feet or more when measured from the source property line between the hours of 10:00 p.m. and 7:00 a.m. daily.

ii. Sound shall not be plainly audible for a period of one (1) minute or longer at a distance of fifty (50) feet or more when measured from the source property line between the hours of 7:00 a.m. and 10:00 p.m. daily.

b. *Rights-of-way.* Sound shall not be plainly audible at a d motor vehicle or any other sound source.

c. *Special entertainment overlay district.* When measure structure or establishment from which the sound is er

Sound levels from Special entertainment overlay district must meet the source sound level limits contained in section 17-7.1.c.i and Residential sound level limits contained in Table 1, as well as plainly audible criteria for residential properties located more than 500 ft from the Entertainment District.

Meeting the more stringent of the residential sound level limit or the SEOD requirements dictates compliance, and sound levels in establishments in SEOD must be lowered even if they comply with the stated source sound levels.

i. *Sound shall not exceed:*

1. Eighty-five (85) dBA or ninety-five (95) dBC Mon a.m. the following day:
2. Seventy (70) dBA or eighty (80) dBC Monday th
3. Sixty-five (65) dBA or seventy-five (75) dBC Mon

ii. *Sound shall not exceed:*

1. Eighty-five (85) dBA or ninety-five (95) dBC Friday through Sunday and legal holidays (as provided by state law), from 12:00 p.m. to 1:00 a.m. the following day:
2. Seventy (70) dBA or eighty (80) dBC Friday through Sunday and legal holidays (as defined by state law), from 1:00 a.m. to 3:00 a.m.
3.

Voluntary sound level monitoring to demonstrate compliance is encouraged.

Sixty-five (65) dBA or seventy-five (75) dBC Friday through Sunday and legal holidays (as defined by State law), from 3:00 a.m. to 12:00 p.m.

Sound level limit of XX dBA/XX dBC at the source for amplified music venues not located in Special entertainment district overlay.

d. *Commercial, mixed-use, or industrial* ... operation of any amplified sound device in such a ma... :

   i. From 12:00 p.m. to 10:00 p.m. daily: sound levels shall not exceed sixty (60) d... within the premises of a complainant.

   ii. From 10:00 p.m. daily to 12:00 p.m. the following day: sound levels shall not ... when measured within the premises of a complainant.

Voluntary sound level monitoring to demonstrate compliance is encouraged.

   iii. Sound level limits in Table 1 shall apply when sound level measurements are taken outdoors at or within the property line of the complainant.

2. *Animals.* Unless unreasonably provoked, it shall be unlawful for any person to own, keep, possess or maintain any domesticated animal which vocalizes (howls, yelps, barks, squawks, or other noise) and the vocalizing is plainly audible at or within the property line of the complainant; and:

   a. The vocalizing is for more than five (5) minutes without interruptions, defined as an average of four (4) vocalizations per minute; or

   b. The vocalizing is two (2) times or more per minute for twenty (20) consecutive minutes.

3. *Commercial sanitation operations.* No person shall cause, allow, or permit the loading, unloading, opening or otherwise handling boxes, crates, containers, garbage cans, or recyclable containers, between the hours of 10:00 p.m. and 7:00 a.m. daily when such operations are conducted on a property located within two hundred fifty (250) feet of a residential use.

4. *Construction:*

   a. No person shall operate or cause to be operated any equipment used in construction, repair, alteration or demolition work on buildings, structures, streets, alleys, or appurtenances thereto with sound-control devices less effective than those provided on the original equipment.

   b. It shall be unlawful for any person to operate or cause to be operated equipment for the aforementioned uses Monday through Saturday before 8:00 a.m. or after 7:00 p.m. and Sunday before 10:00 a.m. or after 7:00 p.m., except for public works transportation projects that are approved pursuant to section 17-9.

5. *Emergency generators:*

   a. Testing of generators shall be conducted for the minimum duration and at the minimum frequency recommended by the manufacturer, but in no case shall said testing exceed one (1) hour in any one (1) day.

   b. Testing shall only be conducted between the hours of 10:00 a.m. and 7:00 p.m. daily.

   c. The sound emissions from generators shall not exceed sixty-eight (68) dBA when measured at a distance of twenty-three (23) feet from the generator. in all directions

   d. When the generator is located on the same parcel as the complainant, the indoor sound level limits in Table 1 shall apply.

6. *Heating, ventilation, and air conditioning (HVAC) equipment on residential property.* No person shall operate or cause to be operated any HVAC equipment on residential property which exceeds forty (40) dBA between the hours of 10:00 p.m. and 7:00 a.m. daily when measured within the premises of a complainant.

7. *Landscaping and yard maintenance power tools or motorized equipment.* No person shall operate or cause to be operated any landscaping or yard maintenance power tools or motorized equipment Monday through Friday before 7:00 a.m. or after 7:00 p.m. in nonresidential areas, Monday through Friday before 8:00 a.m. or after 7:00 p.m. in residential areas, and Saturday and Sunday before 8:00 a.m. or after 6:00 p.m. in any portion of the city. No person shall operate or cause to be operated any landscaping or yard maintenance power tools or motorized equipment or appurtenances thereto with sound-control devices less effective than those provided on the original equipment.
8. *Motorboat.* No person shall operate or cause to be operated any motorboat in any lake, river, stream, or other waterway which is not muffled pursuant to F.S. § 327.65.
9. *Motor vehicles, motorcycles, mopeds and motorized scooters.* No person shall cause a rapid throttle advance (revving) of an internal combustion engine resulting in a noise disturbance.

(Ord. No. C-08-37, § 2, 7-15-08 ; Ord. No. C-22-11 , § 2, 4-5-22)

The use of automatic loud vehicle detection systems may be tested and employed throughout the City.

Sec. 17-8. - Exemptions.

The following are exemptions to this chapter:

1. Construction operations between 8:00 a.m. and 7:00 p.m., Monday through Saturday and between 10:00 a.m. and 7:00 p.m. on Sunday for which building permits have been issued, or construction operations not requiring permits due to the scope of work or ownership of the project by an agency of government; providing all equipment is operated in accordance with its manufacturers' specifications, uses as standard equipment its manufacturers' mufflers and noise-reducing equipment, and is in proper operating condition.
2. Emergency energy release devices.
3. Facility-wide warning devices.
4. Back-up alarms so long as they are self-adjusting to ambient sound levels and meet the requirements of OSHA standards.
5. Noises arising from any authorized emergency vehicle when responding to an emergency call or acting in time of emergency.
6. Noise caused in the performance of emergency work, at the site of the emergency, for the immediate safety, health or welfare of the community or individuals of the community or to restore property to a safe condition.
7. All noises coming from the normal operations of an aircraft.
8. Motor vehicles, mopeds, or motorized scooters as defined herein and muffled in accordance with state law.
9. Vessels operated on the waterways within the city limits which are muffled pursuant to F.S. § 327.65, as may be amended from time to time.
10. Impulsive sound resulting from the controlled detonation of explosives at quarries and construction sites.
11. Sanitation operations which include the unloading, emptying or collection of any waste or recyclable container between the hours of 7:00 a.m. and 10:00 p.m. daily.
12. The sound emissions of emergency generators shall be exempt when there is loss of power for any cause other than non-payment of utility services. The testing of emergency generators shall be conducted pursuant to section 17-7(e).
13.

Landscaping and yard maintenance power tools or motorized equipment between 7:00 a.m. and 7:00 p.m. Monday through Friday in nonresidential areas, Monday through Friday between 8:00 a.m. and 7:00 p.m. in residential areas, and between 8:00 a.m. and 6:00 p.m. Saturday and Sunday in any portion of the city. Notwithstanding the preceding sentences, no person shall operate or cause to be operated any landscaping or yard maintenance power tools or motorized equipment or appurtenances thereto with sound control devices less effective than those provided on the original equipment.

(Ord. No. C-08-37, § 2, 7-15-08 ; Ord. No. C-22-11 , § 3, 4-5-22)

Expand this requirement to include new or renovated amplified music entertainment venues, restaurants, bars, nightclubs and other similar occupancies within 1,000 ft of residential, commercial and mixed -use properties and new or renovated residential, commercial and mixed -use developments within 1,000 ft of an entertainment venue or Entertainment District.

Sec. 17-9. - Construction of large public works transportation projects.

(a) When a public transportation project that cannot reasonably be co forth in Chapter 17, is to be constructed and the project is one that traffic for a period of time that exceeds one hundred eighty (180) c that special circumstances exist and approve a noise management regulations, which will apply instead of the other regulations conta

(b) Consideration of an application for relief from the requirements of the City of Fort Lauderdale shall be initiated by filing an application construct the transportation improvement, with the city engineering division. An application shall include a noise management plan that shall include the following elements:

(1) A conceptual site plan showing the size and location of all structures and infrastructure improvements to be constructed under the proposed project;

(2) A legal description of the property where the project is occurring;

(3) A description of the need for the public improvement;

(4) A description of the economic and environmental impact on the area as a result of improvement;

(5) A description of the noise regulation(s) from which relief is necessary in order to construct the improvement and a description of the proposed regulations that the project shall meet during construction;

(6) A description of the anticipated noise impact of the construction on adjacent properties;

(7) A description of how the noise management plan mitigates negative impacts that might occur;

(8) A description of the continuous noise-monitoring program proposed for the construction period, which measure noise levels as well as makes an audio recording of the noise;

(9) The results of a baseline ambient, A-weighted sound levels noise study, in the project area of continuous duration, at monitoring sites, said study to be previously approved by the city engineer;

(10) A description outlining the resources of the applicant to monitor noise and implement the noise management plan, which shall include the identification of noise control officers; and

(11) An estimate of the cost and time savings that will result from the adoption of the noise management plan.

(c) The application shall be reviewed by the city department responsible for review of development permits for a determination that the application is complete and then forwarded when complete to the development review committee (DRC). After review and comments by the DRC, the application shall be forwarded to the city commission.

(d) The city commission shall hold one (1) public hearing to consider a resolution approving the noise management plan and shall provide notice of hearing to owners of property within three hundred (300) feet of the boundaries of the public works transportation project. For purposes of notification, the owners shall be considered to be the names shown on the property appraiser's tax rolls as such are known by the city. Except as otherwise required by law, condominium, cooperative and time-share associations shall be notified as one entity and that entity shall be responsible for notifying individual owners or members of their association. The notice shall be mailed to the address shown at least ten (10) days before the date of the hearing.

(e) The city commission may approve, or approve with conditions, the noise management plan based on the following findings:

(1) There is a need for the public works transportation project and the project is of such large size and that its duration is for more than one hundred eighty (180) days such that special circumstances exist.

(2) On-site improvements have been incorporated into the noise management plan that minimize the impact of construction noise.

(3) The noise management plan represents a viable and cost-effective plan that balances the need for the public improvement to be constructed in a reasonable period of time versus the noise to be produced and hours of construction, which impact adjacent properties.

(4) Off-site or on-site conditions exist that reduce the noise impact if any, and to the extent possible, the noise management plan utilizes those conditions.

(5) That the noise management plan provides for the continuous monitoring of noise during the project construction period, the data from which shall be provided to the city by a direct, real-time, hook-up between city and applicant's computer system in a computer readable format, compatible with the city's noise monitoring system.

(f) Any person involved with a public entity transportation construction project who has been convicted of violating any of the terms or conditions of an approved noise management plan, by a court of competent jurisdiction, may be cause for the city commission to revoke such public entity's noise management plan. Upon such a conviction, the city manager may place on the city commission agenda the matter of revoking the plan. After consideration of the matter and allowing representatives of the public entity to be heard, the city commission by resolution may revoke or place conditions upon the noise management plan. The factors to be considered by the city manager and the city commission shall include the number and seriousness of the specific noise management plan violations of which a person involved with the public entity's project has been convicted of violating, whether the penalty imposed pursuant to the conviction has been satisfied, whether the public entity has made modification to its operations to conform to the requirements of the noise management plan and based on the foregoing criteria, the danger to the health, safety, and welfare of the public due to continued operation by the public entity pursuant to its noise management plan.

(Ord. No. C-08-37, § 2, 7-15-08)

Sec. 17-10. - Construction of large or complex projects (transportation and non-transportation); exemption for time to comply.

(a) Upon good cause shown by the owner of any noise source, the city manager shall have the power to grant a special permit, which provides an exemption from the provisions of section 17-7(4) of the Noise Control Ordinance in order to allow sufficient time for the installation of necessary materials, equipment, facilities, or

modifications necessary for construction as certified by the Building Official.

(b) Approval of the special permit shall be based upon cases of necessity or in the interest of public health, safety and convenience. In the issuance of such permit(s), the city manager shall weigh all facts and circumstances and shall determine whether the reasons given for the necessity are valid and reasonable, whether the public health, safety and convenience will be protected or better served by granting the permit requested, and whether the manner and amount of loss or inconvenience to the party in interest imposes a significant hardship upon such party.

(1) A thirty (30) day special permit may be granted but shall not authorize construction sound between the hours of 11:00 p.m. and 6:00 a.m., unless specifically granted by the city manager, with one (1) fifteen (15) day extension for a total not to exceed forty-five (45) days.

(2) When located within a Regional Activity Center Land Use Designation, the City Manager may extend the special permit beyond forty-five (45) days, as specified above, if it is found that granting such extension is will ensure reduced overall impacts of construction on neighboring properties but shall not authorize construction sound between the hours of 10:00 p.m. and 7:00 a.m. Monday through Saturday and between the hours of 7:00 p.m. and 10:00 a.m. on Sunday. When an extension is requested by an applicant a specific narrative outlining such reduced impacts to neighboring properties and surrounding areas shall be included with the application. This narrative shall include, but shall not be limited to the following:

a. Reduction to traffic impacts.

b. Overall reduction in construction timelines with specific dates by comparison to timelines for construction under the construction times provided in Section 17-7-4.

c. Specified activities that will occur during this special permit shall be listed with specific time of activities included.

(3) Special permit(s) shall be for a specific period and shall include a start date and a finish date. Each specific period shall require a special permit.

(4) A notice measuring at least 16" x 20" with two (2) inch letters must be posted in at least two (2) places on the perimeter of the construction site during the life of the permit describing the activity, purpose, hours and dates for the special permit.

(5) Nothing in the special permit shall imply multiple periods or multiple construction sites or projects.

(6) Appropriate Maintenance of Traffic (MOT) agreements must also be submitted or included with any special permit request.

(7) The City Manager may revoke such special permit if it is found that a violation of the special permit has occurred or if he/she finds the permit no longer serves the interests of public health, safety or convenience as stated herein.

(8) The city manager may refer approval of a special permit to the city commission.

(c) The City Commission may authorize additional special permit extensions of time beyond the authority of the City Manager through adoption of a resolution upon a showing of good cause when it is demonstrated the special permit is in the best interests of public health, safety, and convenience. The City Commission may revoke such special permit if it is found that a violation of the special permit has occurred or if it is found that

the special permit no longer serves the interest of the public health, safety, and convenience.

(Ord. No. C-18-18 , § 1, 8-21-18; Ord. No. C-20-37 , § 1, 11-5-20; Ord. No. C-21-08 , § 2, 3-2-21)

Editor's note— (Ord. No. C-18-18 , § 1, adopted August 21, 2018, amended § 17-10 in its entirety to read as herein set out. Former § 17-10, pertained to construction of large projects; noise management plan; exemption for time to comply, and derived from Ord. No. C-08-37, § 2, 7-15-08 .

1. Any modifications to the Noise Ordinance should be enacted for a trial period of 6 months without penalty and an additional 6 months where warnings are given to help establishments move into compliance where needed.