



URBAN
SOLUTION
GROUP

Ambient Monitoring Report

Dorado 36 Pad
Weld County, CO

Prepared for:

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1. Introduction

Urban Solution Group, LLC (Urban) was commissioned by **Bison IV Operating, LLC** (Bison) to document the ambient A-weighted and C-weighted sound pressure levels at four locations adjacent to the proposed Dorado 36 Pad (Dorado 36 Location) in Weld County, Colorado. Key location information is presented below.

Pad Location: SE 1/4 NW 1/4 SEC. 36, T7N, R63W, 6TH P.M.

Duration: 72-Hours:

Starting at 12:00 a.m. Friday, August 30, 2024

Ending at 12:00 a.m. Monday, September 2, 2024

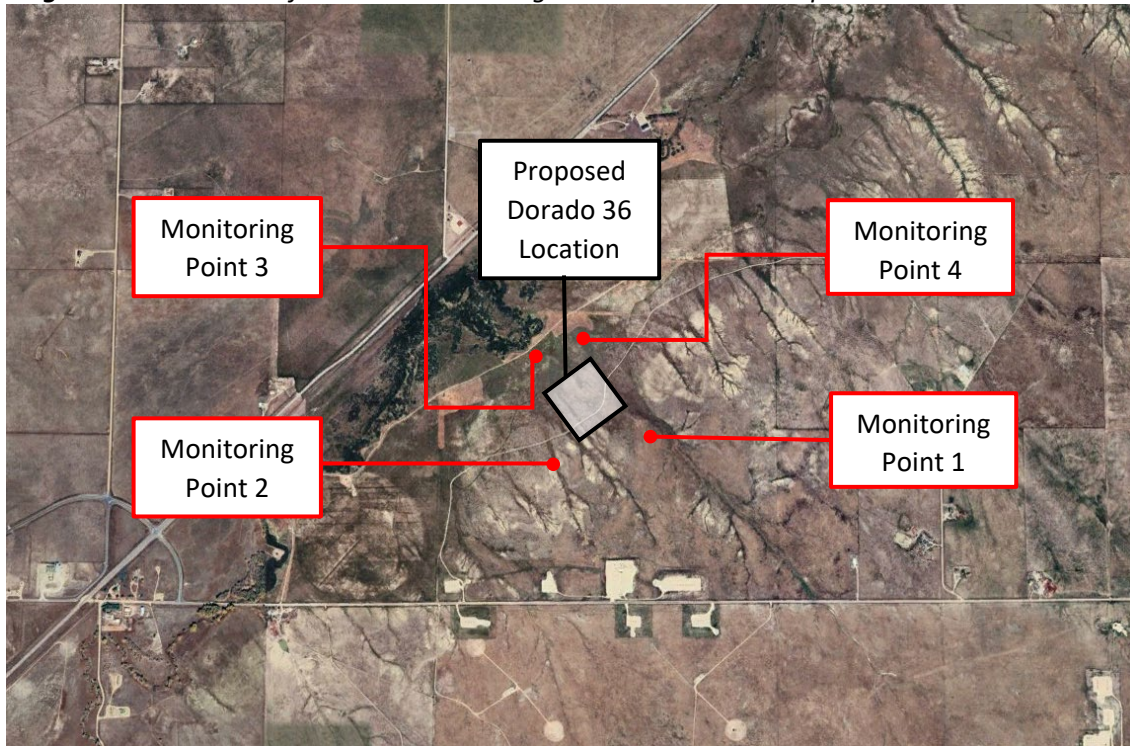
Monitoring Point (MP) Coordinates: MP1: 40°31'48.29"N, 104°22'57.69"W

MP2: 40°31'46.75"N, 104°23'16.76"W

MP3: 40°31'58.92"N, 104°23'20.74"W

MP4: 40°32'4.57"N, 104°23'9.74"W

Figure 1. Aerial View of Ambient Monitoring Locations and the Proposed Dorado 36 Location



2. Summary

Urban collected sound pressure level (SPL) measurements at four locations near the proposed Dorado 36 Pad to document A- and C-weighted sound levels. This reporting period analyzed sound measurements collected from August 30, 2024, at 12:00 a.m., to September 2, 2024, at 12:00 a.m. inclusive. Figure 1 on the previous page shows the monitoring points in relation to the proposed Dorado 36 Pad. Table 1 below shows the overall A- and C-weighted SPL averages (Leq) for the 72-hour monitoring period. The SPL averages presented in this table show the overall sound levels when wind was below five (5) miles per hour. The raw data was filtered to remove data points where wind speeds exceeded five miles per hour, per WOGLA guidelines.

Table 1. Overall Study, Sound Level Averages

Location	Daytime Averages (Leq)		Nighttime Averages (Leq)		Overall Averages (Leq)	
	dBA	dBC	dBA	dBC	dBA	dBC
Monitoring Point 1	40.2	57.8	41.4	58.1	41.0	58.0
Monitoring Point 2	41.4	56.5	43.9	58.5	43.0	57.8
Monitoring Point 3	41.4	55.2	45.0	57.3	43.9	56.5
Monitoring Point 4	42.3	56.7	45.2	57.9	44.2	57.4

3. Ambient Monitoring Results

Urban conducted a 72-hour ambient sound monitoring study from 12:00 a.m. Friday, August 30, 2024, to 12:00 a.m. Monday, September 2, 2024, to monitor and document local ambient sound levels at four nearby locations using Type 1 SvanTek noise monitoring stations. The sound level meters collect measurements of both A- and C-weighted sound pressure levels (SPL) and were each calibrated before and after the measurement period. Wind data was recorded with a weather station attached to the sound level meter at Monitoring Point 2 situated approximately 500 feet southwest of the proposed Dorado 36 Pad. The wind is assumed to be the same at all monitor locations.

The proposed Dorado 36 Pad is located east of Colorado State Highway 392 and north of County Road 74, in Weld County, CO. The closest road, Colorado State Highway 392, is a major highway that sees a high amount of traffic and is located approximately 2,900 feet northwest of the proposed Dorado 36 Pad.

The sound level meters are set to record audio files when the sound pressure levels exceed 55 dBA in the daytime (7:00 a.m. – 7:00 p.m.) and 50 dBA in the nighttime (7:00 p.m. – 7:00 a.m.). Based on the recordings, the most common sounds for the monitoring locations include airplanes and wildlife.

The filtered A- and C-weighted daily sound level averages for Monitoring Points 1, 2, 3, and 4 can be found on the following pages in Table 2, Table 3, Table 4, and Table 5, respectively. The average values presented in these tables are based on filtered data, such that any measurements taken with wind speeds in excess of five miles per hour were removed from the averages reported (per WOGLA guidelines). Figure 2 to Figure 5 in Appendix 1 contain charts with the unfiltered hourly averages and wind speeds for each of the monitoring points.

Table 2. Filtered Daily and Overall Sound Level Averages for Monitoring Point 1

Description	Day 1	Day 2	Day 3	Overall Average
Average Wind Speed (mph)	2.9	3.4	3.4	3.2
A-Weighted Levels				
Daytime – LA _{Day} (dBA) (7:00 a.m. - 7:00 p.m.)	44.4	37.9	38.3	40.2
Nighttime – LA _{Night} (dBA) (7:00 p.m. - 7:00 a.m.)	42.3	41.3	40.5	41.4
Overall LA _{eq} (dBA)	42.9	39.7	39.8	41.0
C-Weighted Levels				
Daytime – LC _{Day} (dBC) (7:00 a.m. - 7:00 p.m.)	61.4	55.5	57.6	57.8
Nighttime – LC _{Night} (dBC) (7:00 p.m. - 7:00 a.m.)	57.4	59.6	57.3	58.1
Overall LC _{eq} (dBC)	58.9	57.7	57.4	58.0

Table 3. Filtered Daily and Overall Sound Level Averages for Monitoring Point 2

Description	Day 1	Day 2	Day 3	Overall Average
Average Wind Speed (mph)	2.9	3.4	3.4	3.2
A-Weighted Levels				
Daytime – LA _{Day} (dBA) (7:00 a.m. - 7:00 p.m.)	46.0	39.2	38.4	41.4
Nighttime – LA _{Night} (dBA) (7:00 p.m. - 7:00 a.m.)	45.4	43.3	42.1	43.9
Overall LA _{eq} (dBA)	45.6	41.4	41.1	43.0
C-Weighted Levels				
Daytime – LC _{Day} (dBC) (7:00 a.m. - 7:00 p.m.)	59.8	54.4	56.1	56.5
Nighttime – LC _{Night} (dBC) (7:00 p.m. - 7:00 a.m.)	58.6	59.7	57.2	58.5
Overall LC _{eq} (dBC)	58.9	57.4	56.9	57.8

Table 4. Filtered Daily and Overall Sound Level Averages for Monitoring Point 3

Description	Day 1	Day 2	Day 3	Overall Average
Average Wind Speed (mph)	2.9	3.4	3.4	3.2
A-Weighted Levels				
Daytime – LA _{Day} (dBA) (7:00 a.m. - 7:00 p.m.)	45.2	39.0	41.0	41.4
Nighttime – LA _{Night} (dBA) (7:00 p.m. - 7:00 a.m.)	46.6	43.0	44.2	45.0
Overall LA _{eq} (dBA)	46.2	41.1	43.3	43.9
C-Weighted Levels				
Daytime – LC _{Day} (dBC) (7:00 a.m. - 7:00 p.m.)	58.7	53.0	54.8	55.2
Nighttime – LC _{Night} (dBC) (7:00 p.m. - 7:00 a.m.)	58.8	56.5	55.7	57.3
Overall LC _{eq} (dBC)	58.8	54.8	55.4	56.5

Table 5. Filtered Daily and Overall Sound Level Averages for Monitoring Point 4

Description	Day 1	Day 2	Day 3	Overall Average
Average Wind Speed (mph)	2.9	3.4	3.4	3.2
A-Weighted Levels				
Daytime – LA _{Day} (dBA) (7:00 a.m. - 7:00 p.m.)	45.7	40.5	41.4	42.3
Nighttime – LA _{Night} (dBA) (7:00 p.m. - 7:00 a.m.)	47.1	42.8	44.2	45.2
Overall LA _{eq} (dBA)	46.7	41.6	43.4	44.2
C-Weighted Levels				
Daytime – LC _{Day} (dBC) (7:00 a.m. - 7:00 p.m.)	60.2	54.7	56.2	56.7
Nighttime – LC _{Night} (dBC) (7:00 p.m. - 7:00 a.m.)	59.6	56.5	56.3	57.9
Overall LC _{eq} (dBC)	59.8	55.5	56.2	57.4

4. Notations

The services provided for this project were performed in accordance with generally accepted professional consulting services. No warranty, expressed or implied, is made or intended, by rendition of these consulting services or by furnishing oral or written reports of the findings made. Sound level meter and accompanying equipment serial numbers, along with calibration information, may be provided upon request. Urban Solution Group generated this report for the exclusive use of Bison IV Operating, LLC.

Appendix 1 – Summary Data and Charts

Figure 2. Chart of Unfiltered Hourly Averages for Monitoring Point 1

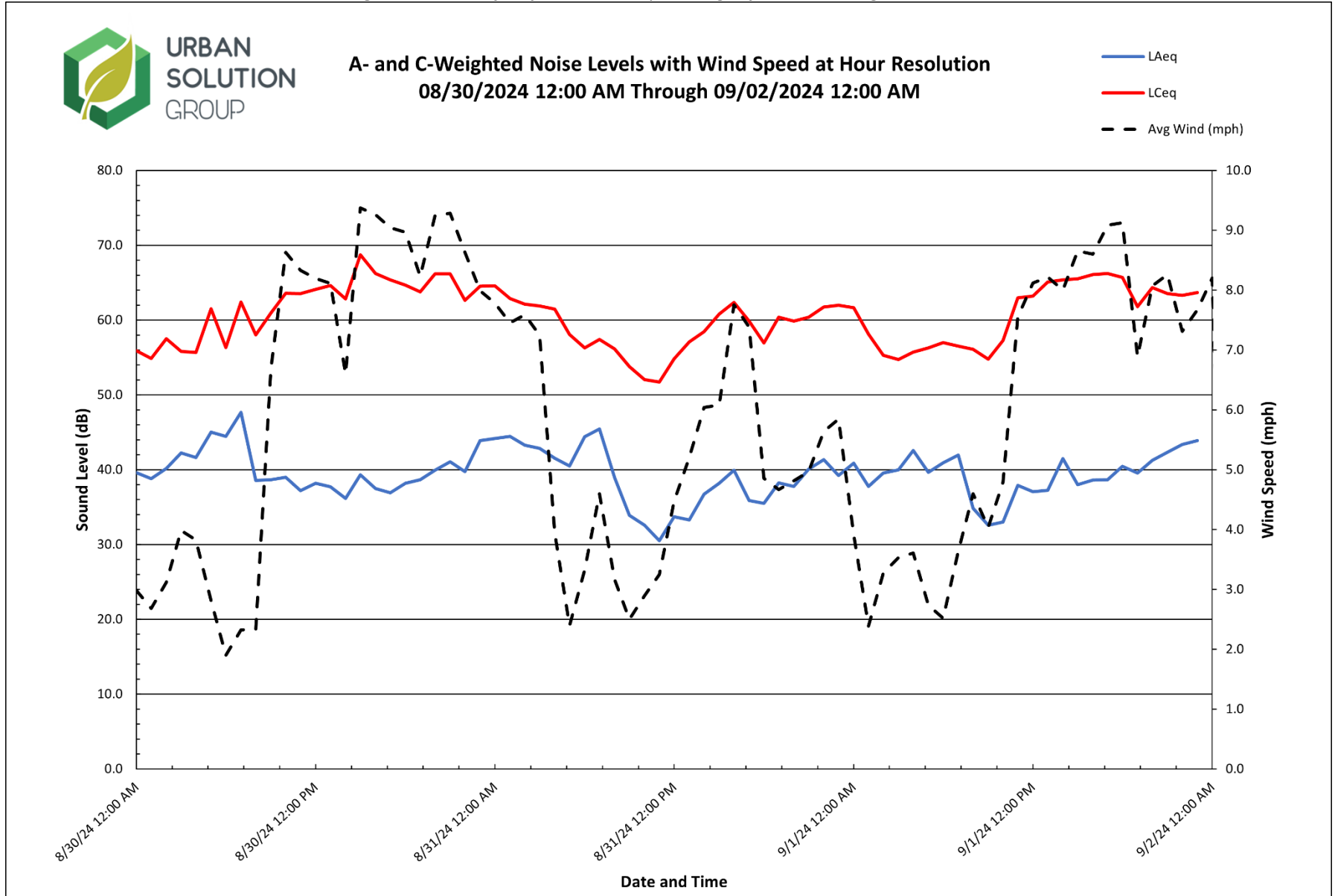


Figure 3. Chart of Unfiltered Hourly Averages for Monitoring Point 2

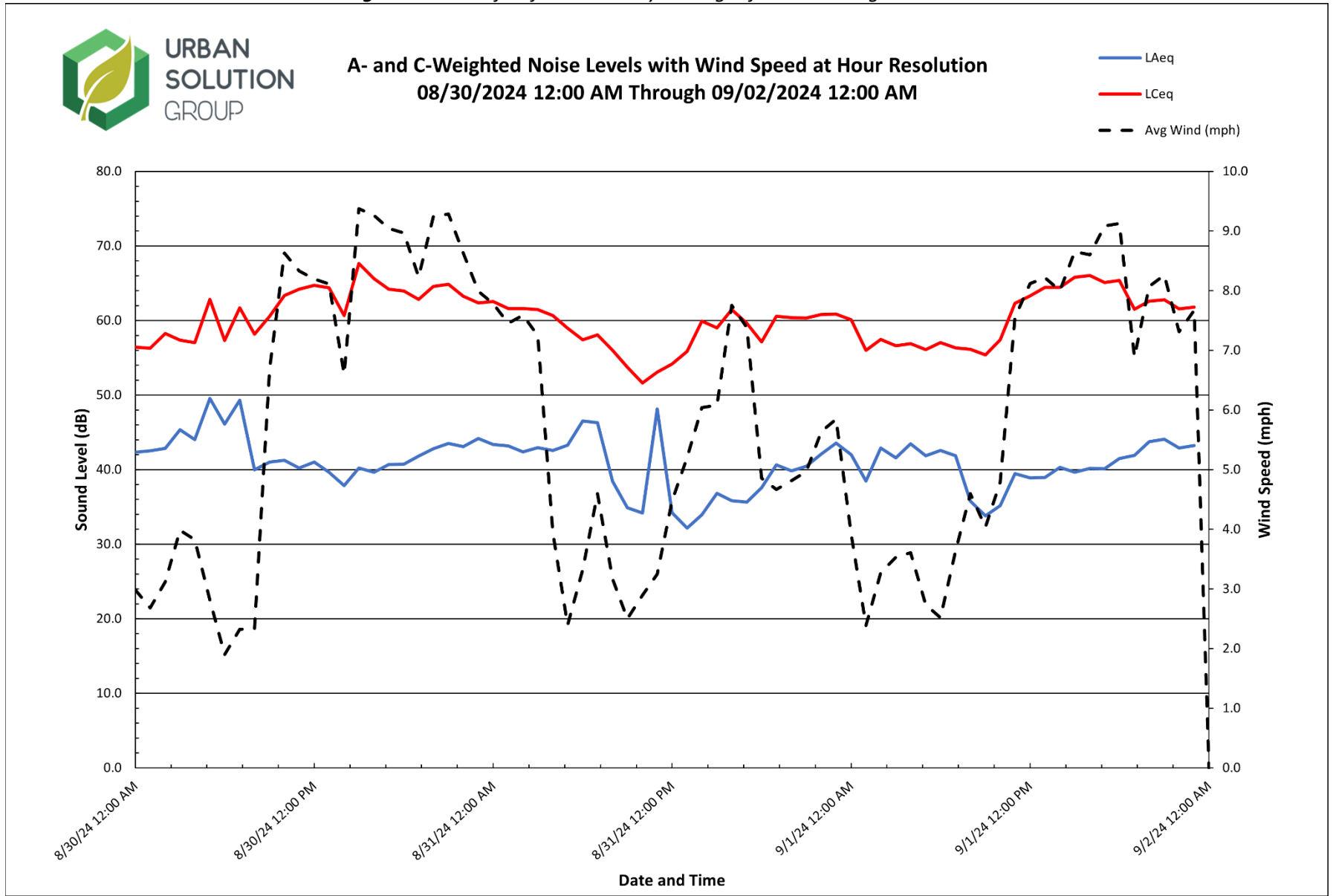


Figure 4. Chart of Unfiltered Hourly Averages for Monitoring Point 3

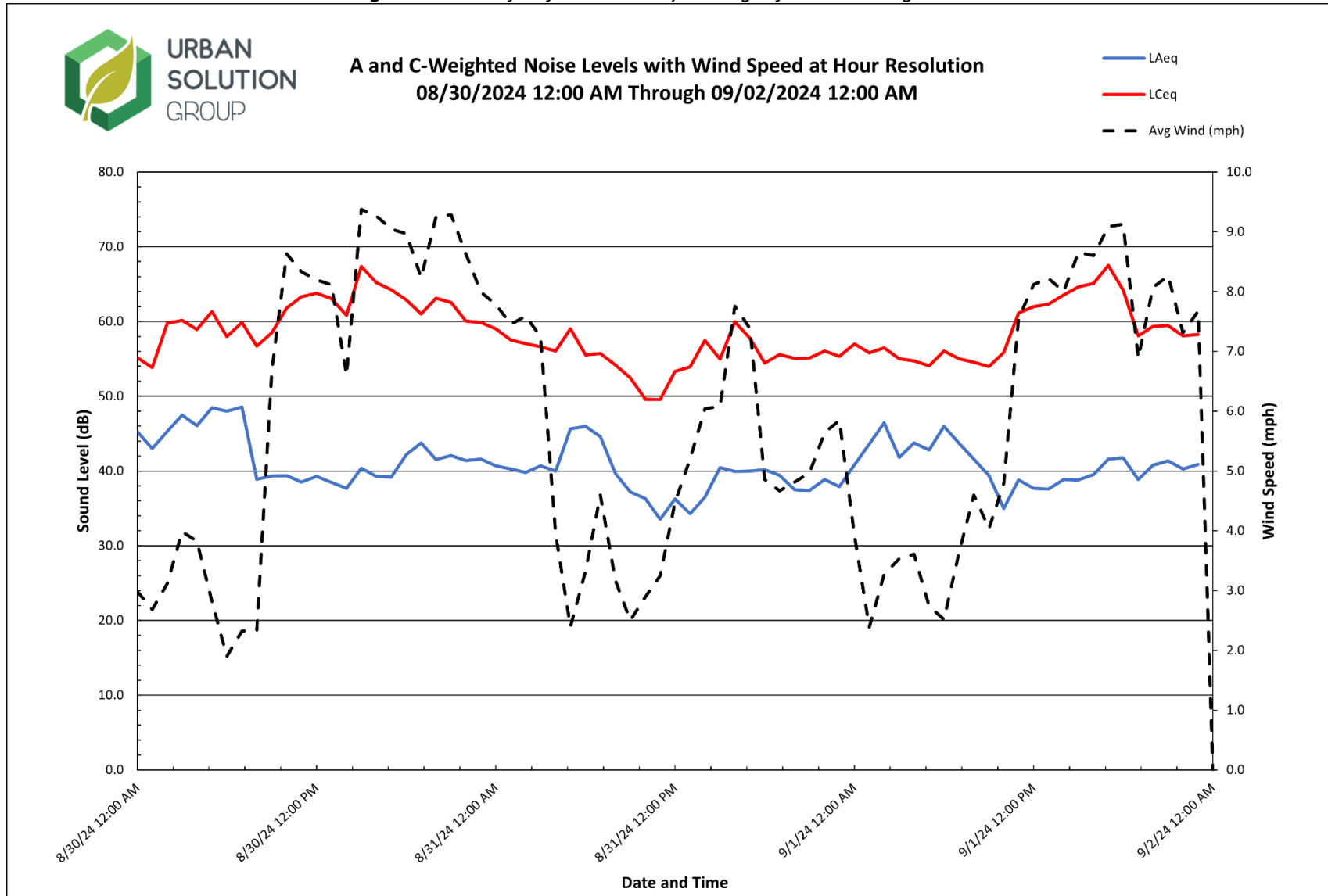
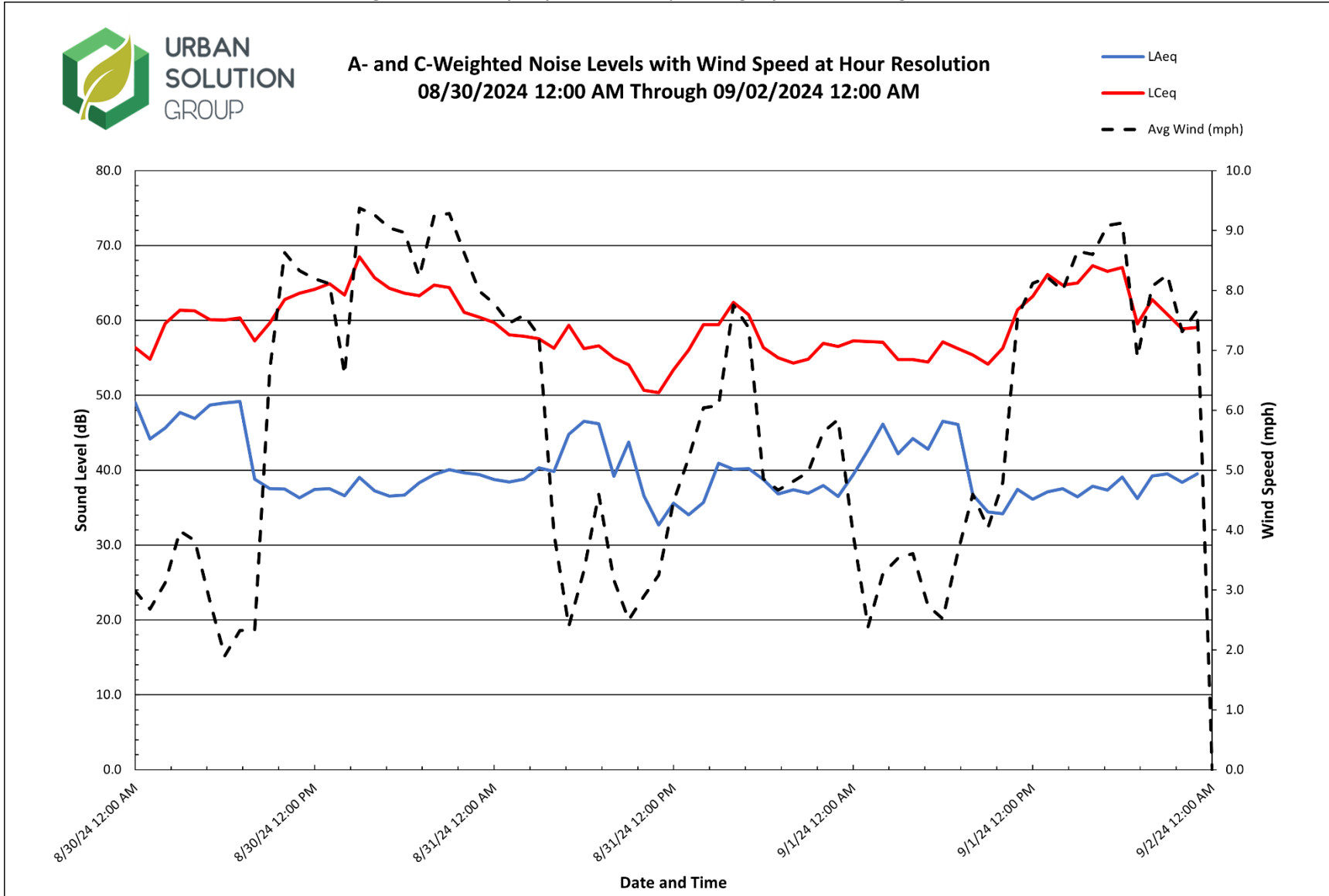


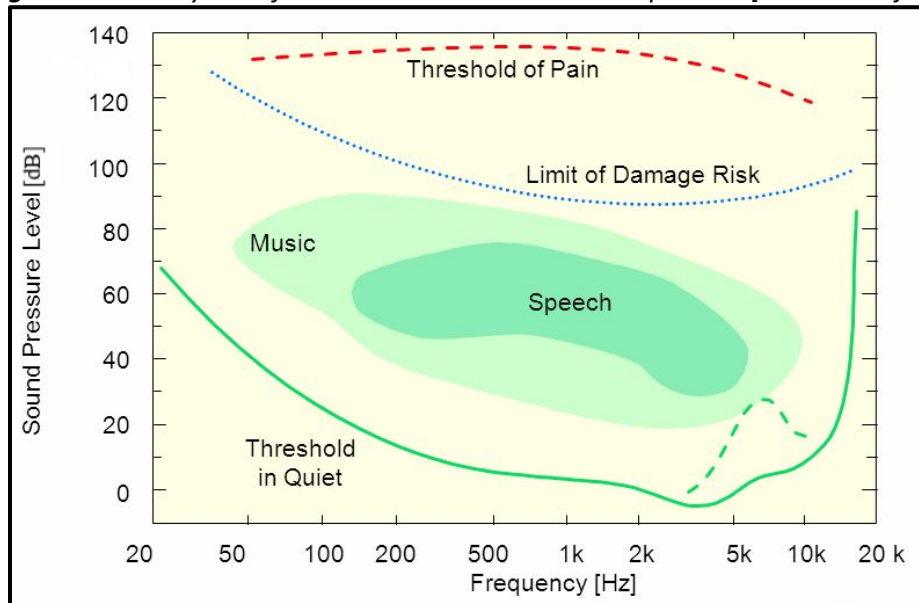
Figure 5. Chart of Unfiltered Hourly Averages for Monitoring Point 4



Appendix 2 – Sound Fundamentals

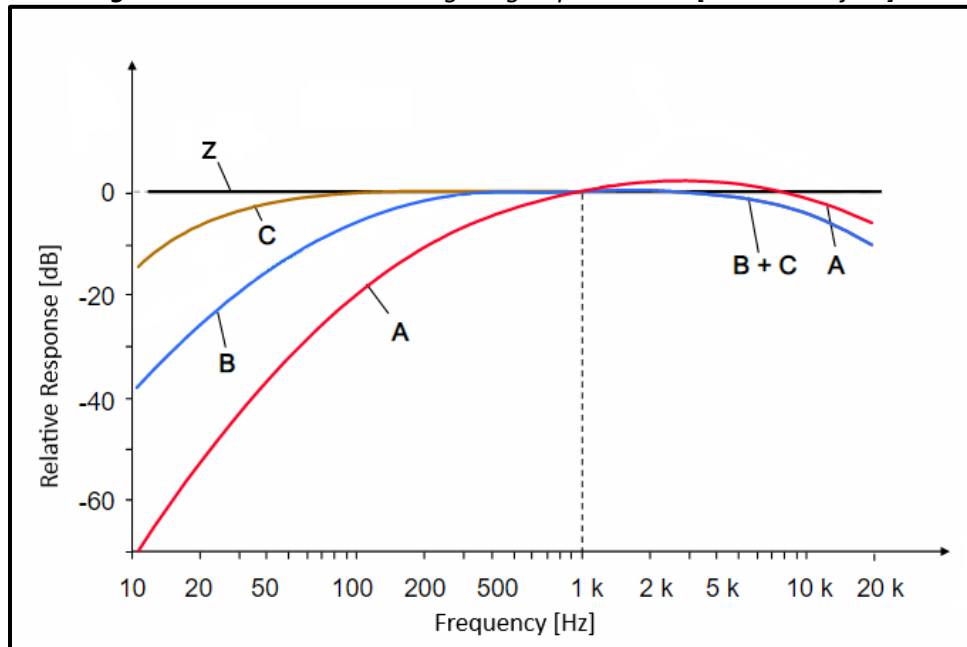
Sound is a series of vibrations transmitted through the air, or other medium, and can be heard when they are processed by the human ear. There are two important properties that describe sound; frequency and amplitude. Frequency is determined by the rate of movement and is measured in cycles per second, which is known as Hertz (Hz). A healthy human ear can hear 20 Hz – 20,000 Hz (Figure A). The sensation associated with frequency is commonly referred to as the pitch of a sound. High frequencies produce a higher pitch and vice versa. The amplitude of a sound is determined by the maximum displacement of air molecules produced by the vibrations. These displacements lead to pressure fluctuations in air, which are expressed in decibels (dB). Decibels are a logarithmic ratio of sound pressure over the standard threshold of hearing. The more energy a sound has, the larger the pressure fluctuations, resulting in a louder sound.

Figure A. Auditory Field for a Human Ear at Various Frequencies [Bruel and Kjaer]



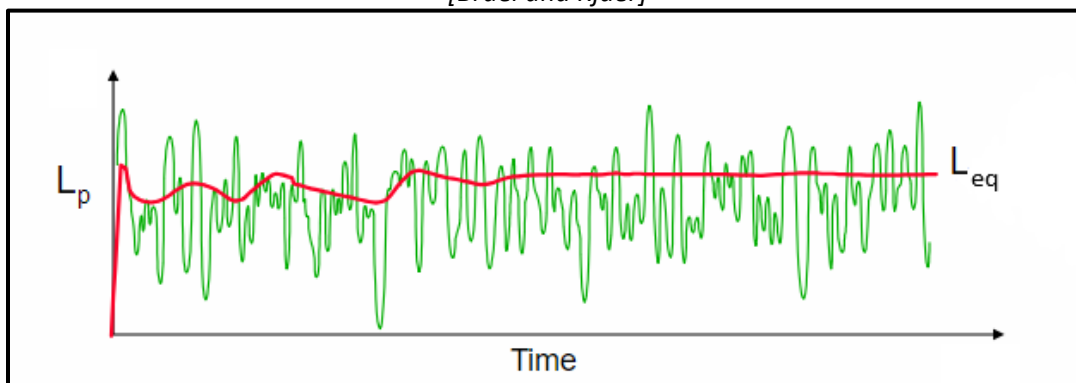
Frequency weightings are applied to measurements to provide a better match between measured results and human perception. Each weighting, in relation to their frequency components, allows for a consistent measurement of the different type of noise sources. A-weighted decibel sound pressure levels (dBA) are measurements recorded from a sound level meter measuring sounds similar to the response of the ear (Figure B). While C-weighted (dBC) measurements are for low-frequency components.

Figure B. Common Sound Weightings Up to 20 kHz [Bruel and Kjaer]



Each measurement has an exponential time factor. Slow time weighting is the most common for environmental noise measurements and will be used for these measurements. For recording over long periods of time, the sound level meter records each weighted decibel reading with an equivalent, or average, continuous sound level reading (L_{eq}). L_{eq} represents the same energy as the actual time varying sound signal (Figure C). L_{Aeq} refers to the equivalent continuous sound level for an A-weighted measurement.

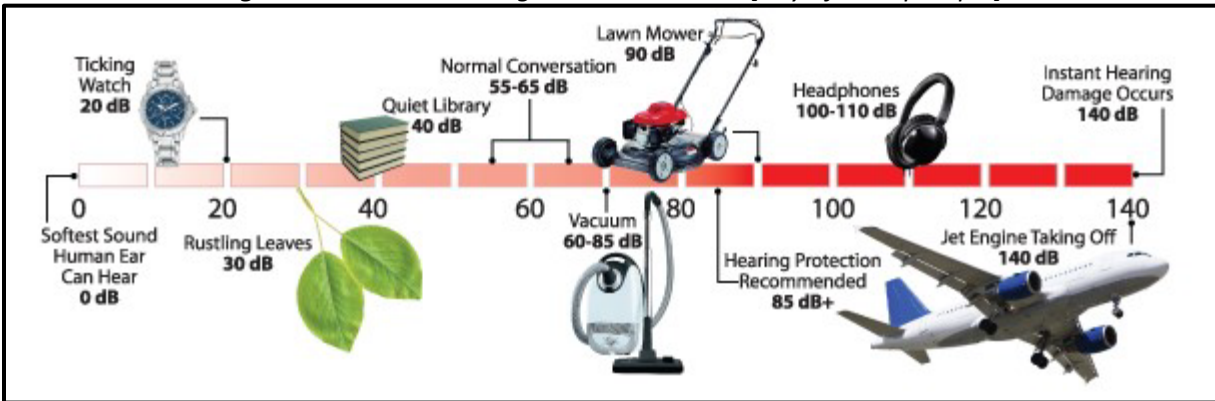
Figure C: Sound Level Recording Displaying L_{eq} , Steady-State Sound Level, Over a Noise Measurement [Bruel and Kjaer]



Environmental noise is a combination of various noise sources. These sources may include; vehicle traffic, aircraft flyovers, wind, weather disturbances, commercial or industrial activities, and other short-term events. These sources create “background noise”. Background noise varies throughout

the day, generally following the cycle of human activity. Figure D presents typical A-weighted (dBA) sound levels for multiple sources of sound.

Figure D: Common A-weighted Sound Levels [City of Albuquerque]



Appendix 3 – Glossary

Ambient Noise

All noises that exist in an area and are not related to facility. Ambient noise includes sound from other industrial noise not subject to this directive, transportation sources, animals and nature.

Average Sound Level

See Energy Equivalent Sound Level.

A-weighted sound level

The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear.

Calibration

A procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Calibration must take place before and after the sound level measurements.

C-weighted Sound Level

The C-weighting approximates the sensitivity of human hearing at the industrial noise levels (above 85 dBA). The C-weighted sound level is more sensitive to the sounds used to assess the low- frequencies than the A-weighted sound level. It is sometimes used to assess the low-frequency content of complex sound environments.

Day Night Sound Level (Ldn)

Is the average noise level over a 24-hour period. The noise between the hours of 22:00 and 07:00 is artificially increased by 10 dB. The nighttime noise is weighted to consider the decrease in community background noise.

Daytime Average Sound Level (Lday)

The time-averaged A-weighted sound level measured between the daytime hours, which are usually 7:00 am to 7:00 pm.

Decibel (dB)

A unit of measure of sound pressure that compresses a large range of numbers into a more meaningful scale. The basic unit of measurement for sound levels.

dBA

The decibel (dB) sound pressure level filtered through the A filtering network to approximate human hearing response. See dB and A-weighted Sound Level.

dBC

The decibel (dB) sound pressure level filtered through the C filtering network. See dB and C-weighted Sound Level.



Energy Equivalent Sound Level (Leq)

The Leq is a single-number average, sound level that represents cumulative acoustical energy as measured over a specified time interval.

Facility

Any operation used in exploration, processing, development and transportation of energy resources.

Frequency

The number of oscillations per second for a sound wave.

Impulse Noise

Unwanted, instantaneous sharp sounds that create sudden impulses of pressure similar to gunfire and explosions.

Noise Reduction

The difference in sound pressure level between two points

Ldn

See Day night sound level.

Leq

See Energy Equivalent Sound Level.

Nighttime Average Sound Level (Lnight)

The time-averaged A-weighted sound level measured between the nighttime hours, which are usually 7:00 pm to 7:00 am.

Noise

Generally understood as unwanted sound.

Noise Impact Assessment (NIA)

Identifies the expected sound level emanating from a facility as measured 15 m from the nearest or most impacted permanently or seasonally occupied dwelling. It also identifies what the permissible sound level is and how it was calculated.

Noise Reduction Coefficient (NRC)

A single number rating of the sound absorption properties for a material. An NRC value of zero indicates the material is purely reflective. An NRC value of one indicates perfect absorption.

Octave Band

An octave band is a frequency band that spans one octave. A band is said to be an octave in width when the upper band frequency is twice the lower band frequency. Octave bands are commonly used in engineering acoustics. The nine common octave bands used for the study of industrial noise are identified by their center frequencies as 31.5Hz, 63Hz, 125Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, and 8000 Hz.



Point Source

A source that radiates sound from a single point. Generally used to model equipment when looking at the sound impact over a large area.

Receiver

A person or piece of equipment that is affected by noise.

Sound

A series of vibrations transmitted through the air, or other medium, and can be heard when they are processed by the human ear.

Sound Level Meter (SLM)

An instrument that contains a microphone and filter used to measure sound levels, using standard frequency-weightings and exponentially weighted time averaging.

Sound Power Level

A physical measurement of the amount of power a sound source radiates into the surrounding air. It is the rate at which sound energy is emitted, or received, per unit time.

Sound Transmission Class (STC)

An integer rating that measures how well a barrier or building partition attenuates sound. Indicates how well a barrier is at stopping sound from transmitting through it.

1/3 Octave

The 1/3 octave band analysis provides a finer breakdown of sound distribution as a function of frequency.