Chapter 16: Noise

A. INTRODUCTION

This chapter considers the potential for the Proposed Project to result in significant adverse noise impacts. The Proposed Project includes the adaptive reuse of the vacant, approximately 588,765-gross-square-foot (gsf) Armory providing up to 735,800 gsf including a mix of community facility and cultural space, light manufacturing space, commercial office space, a 17,000-person-capacity live event venue, and other entertainment uses, along with parking and loading docks. The National Guard Site would be redeveloped with a new residential building (up to approximately 494,500 gsf) containing 500 new permanently affordable dwelling units (DUs) and approximately 14,400 gsf of ground floor retail, replacing a one-story garage and a two-story office building. The Proposed Project would also create approximately 64,800 square feet (sf) of new, publicly accessible open space that would be largely concentrated in the areas southwest of the Armory along Reservoir Avenue and West Kingsbridge Road, but would also include areas along the west side of the Armory along Reservoir Avenue. This attachment considers whether the Proposed Project would result in increases in noise levels that could have a significant adverse impact on nearby sensitive receptors and also considers the effect of existing and future noise levels on the Proposed Project. The analysis year is 2032.

According to the guidelines established in the 2021 *City Environmental Quality Review (CEQR) Technical Manual*, an initial noise impact screening considers whether a proposed action would generate any mobile or stationary source noise or be located in an area with high ambient noise levels. A noise analysis examines an action for its potential effects on sensitive noise receptors, and the effects on the interior noise levels of residential, commercial, and institutional uses.

A mobile source analysis was conducted to determine whether there are any noise-sensitive locations where project-generated traffic would have the potential to result in significant adverse noise impacts. The noise analysis also considered the level of building attenuation necessary to ensure that interior noise levels within the proposed building would satisfy applicable interior noise criteria.

PRINCIPAL CONCLUSIONS

A noise assessment was undertaken to evaluate whether the Proposed Project would result in a significant increase in noise levels at any existing noise-sensitive uses and to evaluate noise exposure at noise-sensitive uses newly introduced by the Proposed Project in accordance with *CEQR Technical Manual* guidance. With Action Condition noise levels were determined by adjusting measured existing noise levels to account for future increases in traffic with the Proposed Project. During all time periods except for weekend evenings, the With Action Condition noise levels were determined to be within approximately 1 dBA of No Action noise levels, which would be considered imperceptible

and not significant according to *CEQR Technical Manual* impact criteria. During the Saturday Evening time period (i.e., 6PM to 8PM) on event days, With Action Condition noise levels would be up to approximately 5 dBA greater than No Action levels at receptors along West 195th Street between Jerome and Reservoir Avenues and along Reservoir Avenue between West 195th Street and West Kingsbridge Road. Since the school receptors along West 195th Street between Jerome and Reservoir Avenues would not be occupied during the weekend evening time period, such increases would not rise to the level of a significant adverse impact at these receptors.

However, due to the predicted incremental increase in noise levels at residences along Reservoir Avenue between West 195th Street and West Kingsbridge Road during the Saturday Evening time period (i.e., 6PM to 8PM) on event days, the Proposed Project would have the potential to result in a significant adverse noise impact at these receptors. The analysis of noise due to traffic at this receptor will be refined further between the Draft and Final EIS, and the refined analysis may find that noise due to the Proposed Project would not rise to the level of a significant adverse impact.

Based on the projected noise levels, 31 to 42 dBA window/wall attenuation would be required to achieve acceptable interior noise levels per the *CEQR Technical Manual* noise exposure guideline at newly introduced residential and community facility uses on the Project Site. The window-wall attenuation measures would be provided as part of the Proposed Project and required through the Lease Agreement between NYCEDC and the Applicant. Noise exposure at newly introduced publicly accessible open space was determined to be greater than the threshold considered acceptable for “open space areas requiring serenity and quiet,” however it is comparable to typical open space areas in New York City proximate to roadways and/or elevated rail lines.

For interior noise-generating uses, such as the event space, a combination of controls on source levels at the event venue, physical separation, and operational controls would be used to ensure that interior noise exposure at community facility uses does not exceed 45 dBA L_{10} and interior noise exposure at commercial office uses does not exceed 50 dBA L_{10} as a result of event noise. If this were to be achieved by physical separation alone, it would require a minimum of 65 dBA attenuation between the venue and community facility uses and a minimum of 60 dBA attenuation between the venue and office uses. These noise attenuation measures will be required by the Lease Agreement between NYCEDC and the Applicant. As an alternative, a noise analysis demonstrating that lesser attenuation will avoid a significant adverse impact may be provided between DEIS and FEIS and is subject to approval by DEP.

Therefore, there would be no significant adverse noise impact with respect to building attenuation.

B. ACOUSTICS FUNDAMENTALS

Sound is a fluctuation in air pressure. Sound pressure levels are measured in units called “decibels” (dB). The particular character of the sound that we hear (e.g., a whistle compared with a diesel engine, for example) is determined by the speed, or “frequency,” at which the air pressure fluctuates, or “oscillates.” Frequency defines the oscillation of sound pressure in terms of cycles per second. One cycle per second is known as 1 Hertz (Hz). People can hear over a relatively limited range of sound frequencies, generally between 20 Hz and 20,000 Hz, and the human ear does not perceive all frequencies

equally well. High frequencies (e.g., a whistle) are more easily discernable and therefore more intrusive than many of the lower frequencies (e.g., the left-most keys on a piano).

"A"-WEIGHTED SOUND LEVEL (DBA)

In order to establish a uniform noise measurement that simulates people's perception of loudness and annoyance, the decibel measurement is weighted to account for those frequencies most audible to the human ear. This is known as the A-weighted sound level, or "dBA," and it is the descriptor of noise levels most often used for community noise. As shown in **Table 16-1**, the threshold of human hearing is defined as 0 dBA; very quiet conditions (e.g., a library) are approximately 40 dBA; levels between 50 dBA and 70 dBA define the range of noise levels generated by normal daily activity; levels above 70 dBA would be considered noisy, and then loud, intrusive, and deafening as the scale approaches 130 dBA.

In considering these values, it is important to note that the dBA scale is logarithmic, meaning that each increase of 10 dBA describes a doubling of perceived loudness. Thus, the background noise in an office, at 50 dBA, is perceived as twice as loud as a library at 40 dBA. For most people to perceive an increase in noise, it must be at least 3 dBA. At 5 dBA, the change will be readily noticeable.

Table 16-1
Noise Levels of Common Sources

Sound Source	SPL (dBA)
Air Raid Siren at 50 feet	120
Maximum Levels at Rock Concerts (Rear Seats)	110
On Platform by Passing Subway Train	100
On Sidewalk by Passing Heavy Truck or Bus	90
On Sidewalk by Typical Highway	80
On Sidewalk by Passing Automobiles with Mufflers	70
Typical Urban Area	60-70
Typical Suburban Area	50–60
Quiet Suburban Area at Night	40–50
Typical Rural Area at Night	30-40
Isolated Broadcast Studio	20
Audiometric (Hearing Testing) Booth	10
Threshold of Hearing	0
Source: 2021 *CEQR Technical Manual*	

SOUND LEVEL DESCRIPTORS

Because the sound pressure level unit of dBA describes a noise level at just one moment and few noises are constant, other ways of describing noise that fluctuates over extended periods have been developed. One way is to describe the fluctuating sound heard over a specific time period as if it had been a steady, unchanging sound. For this condition, a descriptor called the "equivalent sound level," L_{eq}, can be computed. L_{eq} is the constant sound level that, in a given situation and time period (e.g., 1 hour, denoted by $L_{eq(1)}$, or 24 hours, denoted by $L_{eq(24)}$), conveys the same sound energy as the actual time-varying sound. Statistical sound level descriptors such as L_1, L_{10}, L_{50}, L_{90}, and L_x, are used to indicate noise levels that are exceeded 1, 10, 50, 90, and x percent of the time, respectively.

The relationship between L_{eq} and levels of exceedance is worth noting. Because L_{eq} is defined in energy rather than straight numerical terms, it is not simply related to the levels of exceedance. If the noise fluctuates little, L_{eq} will approximate L_{50} or the median level. If the noise fluctuates broadly, the L_{eq} will be approximately equal to the L_{10} value. If extreme fluctuations are present, the L_{eq} will exceed L_{90} or the background level by 10 or more decibels. Thus, the relationship between L_{eq} and the levels of exceedance will depend on the character of the noise. In community noise measurements, it has been observed that the L_{eq} is generally between L_{10} and L_{50}.

A descriptor for cumulative 24-hour exposure is the day-night average sound level, abbreviated as L_{dn}. This is a 24-hour measurement that accounts for the moment-to-moment fluctuations in A-weighted noise levels due to all sound sources, combined. Mathematically, the L_{dn} noise level is the energy average of all $L_{eq(1)}$ noise levels over a 24-hour period, where nighttime noise levels (10 PM to 7 AM) are increased by 10 dBA before averaging because of increased noise sensitivity during nighttime, when people are typically sleeping.

The L_{10} and L_{dn} have been selected as the noise descriptors to be used in this noise impact evaluation. The 1-hour L_{10} is the noise descriptor used in the *CEQR Technical Manual* noise exposure guidelines when vehicular traffic is the dominant noise source. The L_{dn} is the noise descriptor used in the *CEQR Technical Manual* noise exposure guidelines when rail is the dominant noise source.

C. NOISE STANDARDS AND CRITERIA

NEW YORK CEQR NOISE CRITERIA

The *CEQR Technical Manual* sets external noise exposure standards; these standards are shown in **Table 16-2**. Noise exposure is classified into four categories: acceptable, marginally acceptable, marginally unacceptable, and clearly unacceptable. The noise level specified for outdoor areas requiring serenity and quiet is 55 dBA $L_{10(1)}$.

Table 16-2
Noise Exposure Guidelines for Use in City Environmental Impact Review

Receptor Type	Time Period	Acceptable General External Exposure	Airport[3] Exposure	Marginally Acceptable General External Exposure	Airport[3] Exposure	Marginally Unacceptable General External Exposure	Airport[3] Exposure	Clearly Unacceptable General External Exposure	Airport[3] Exposure
Outdoor area requiring serenity and quiet[2]		$L_{10} \leq 55$ dBA	DNL ≤ 60 dBA	**NA**	60 < DNL ≤ 65 dBA	**NA**	(i) 65 < DNL ≤ 75 dBA	**NA**	75 dBA < DNL
Hospital, nursing home		$L_{10} \leq 55$ dBA		$55 < L_{10} \leq 65$ dBA		$65 < L_{10} \leq 80$ dBA		$L_{10} > 80$ dBA	
Residence, residential hotel, or motel	7 AM to 10 PM	$L_{10} \leq 65$ dBA		$65 < L_{10} \leq 70$ dBA		$70 < L_{10} \leq 80$ dBA		$L_{10} > 80$ dBA	
	10 PM to 7 AM	$L_{10} \leq 55$ dBA		$55 < L_{10} \leq 70$ dBA		$70 < L_{10} \leq 80$ dBA		$L_{10} > 80$ dBA	
School, museum, library, court, house of worship, transient hotel or motel, public meeting room, auditorium, outpatient public health facility		Same as Residential Day (7 AM–10 PM)		Same as Residential Day (7 AM–10 PM)		Same as Residential Day (7 AM–10 PM)		Same as Residential Day (7 AM–10 PM)	
Commercial or office		Same as Residential Day (7 AM–10 PM)		Same as Residential Day (7 AM–10 PM)		Same as Residential Day (7 AM–10 PM)		Same as Residential Day (7 AM–10PM)	
Industrial, public areas only[4]	Note 4	Note 4		Note 4		Note 4		Note 4	

Notes:

(i) In addition, any new activity shall not increase the ambient noise level by 3 dBA or more.

(ii) *CEQR Technical Manual* noise criteria for train noise are similar to the above aircraft noise standards; the noise category for train noise is found by taking the L_{dn} value for such train noise to be an L_{dn} (L_{dn} contour) value.

[1] Measurements and projections of noise exposures are to be made at appropriate heights above site boundaries as given by American National Standards Institute (ANSI) Standards; all values are for the worst hour in the time period.

[2] Tracts of land where serenity and quiet are extraordinarily important and serve an important public need, and where the preservation of these qualities is essential for the area to serve its intended purpose. Such areas could include amphitheaters, particular parks, or portions of parks, or open spaces dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.

[3] One may use Federal Aviation Administration (FAA)-approved L_{dn} contours supplied by the Port Authority of New York and New Jersey, or the noise contours may be computed from the federally approved Integrated Noise Model (INM) Computer Model using flight data supplied by the Port Authority of New York and New Jersey.

[4] External Noise Exposure standards for industrial areas of sounds produced by industrial operations other than operating motor vehicles or other transportation facilities are spelled out in the New York City Zoning Resolution, Sections 42-20 and 42-21. The referenced standards apply to M1, M2, and M3 manufacturing districts and to adjoining residence districts (performance standards are octave band standards).

Source: New York City Department of Environmental Protection (DEP) (adopted policy 1983).

The *CEQR Technical Manual* defines attenuation requirements for buildings based on exterior noise level (see **Table 16-3**). Where vehicular traffic is the dominant noise source or for noise-sensitive uses where there are no sleeping accommodations, recommended noise attenuation values for buildings are designed to maintain an interior L_{10} noise level of 45 dBA for residential and community facility uses and 50 dBA for commercial office uses. Where rail activity is the dominant noise source, recommended noise attenuation values for buildings are designed to maintain an interior L_{dn} noise level of 40 dBA for residential and community facility uses with sleeping accommodations.

Table 16-3
Required Attenuation Values to Achieve Acceptable Interior Noise Levels

	Marginally Unacceptable				Clearly Unacceptable
Vehicular Traffic	$70 < L_{10} \leq 73$	$73 < L_{10} \leq 76$	$76 < L_{10} \leq 78$	$78 < L_{10} \leq 80$	$80 < L_{10}$
Aircraft[A]	$65 < DNL \leq 68$	$68 < DNL \leq 71$	$71 < DNL \leq 73$	$73 < DNL \leq 75$	$75 < DNL$
Train	$65 < L_{dn} \leq 68$	$68 < L_{dn} \leq 71$	$71 < L_{dn} \leq 73$	$73 < L_{dn} \leq 75$	$75 < L_{dn}$
Attenuation[B]	(I) 28 dBA	(II) 31 dBA	(III) 33 dBA	(IV) 35 dBA	See note [C]

Notes:
[A] DNL descriptor based on average values of L_{dn} over a year period.
[B] The above composite window-wall attenuation values are for residential dwellings and community facility development. Commercial office spaces and meeting rooms would be 5 dBA less in each category. All the above categories require a closed window situation and hence an alternate means of ventilation.
[C] The required attenuation value is the difference between L_{build} and $L_{interior}$, using the appropriate noise descriptor
Where:
L_{build} is the projected noise level under the build condition rounded up to the whole number
$L_{interior}$ is the designed interior noise level (45 dBA for vehicular noise, 40 dBA for aircraft and train noise)
Source: DEP

D. EXISTING NOISE LEVELS

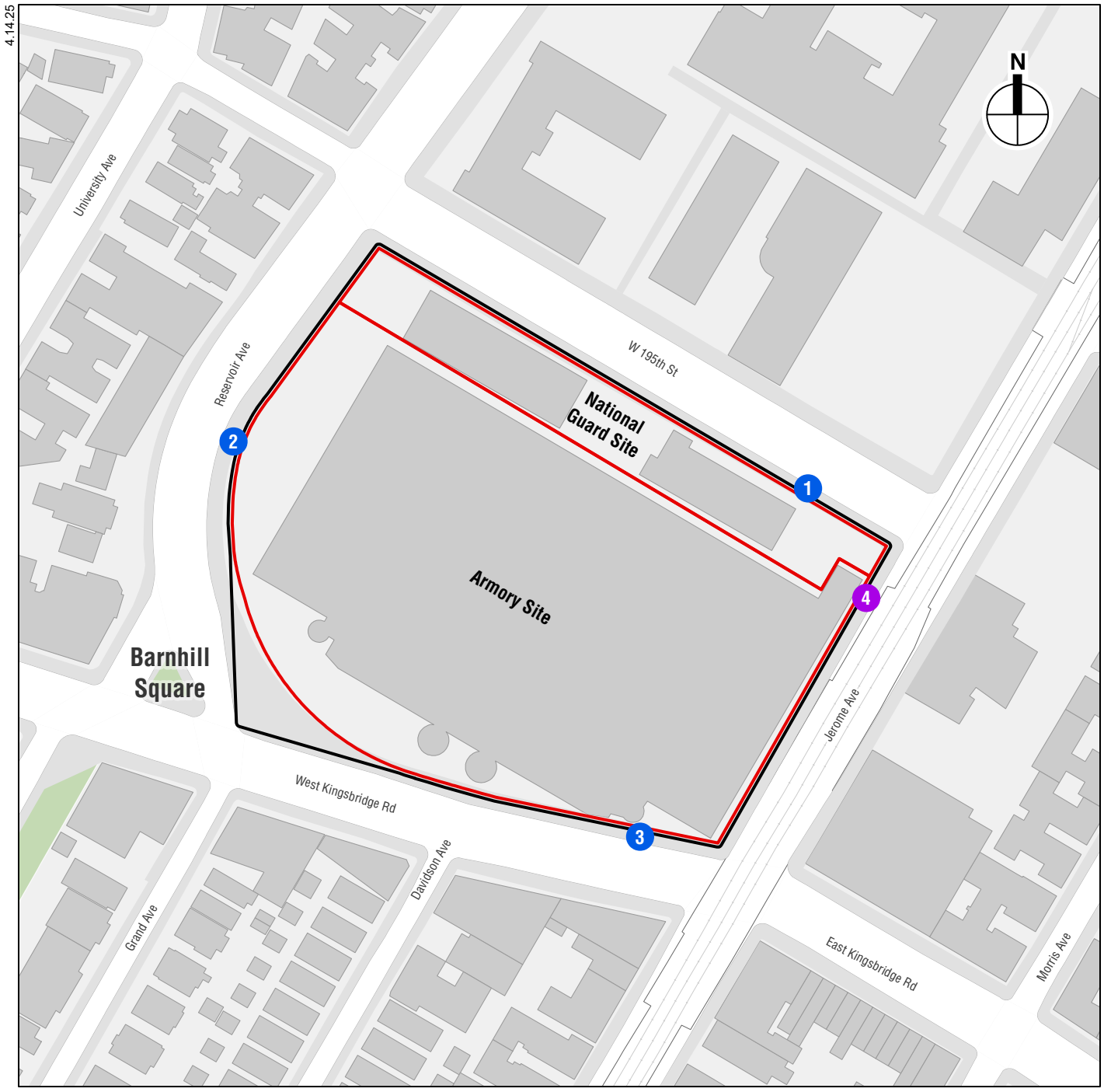
A total of 4 receptor locations adjacent to the Project Site were selected for evaluation of noise attenuation requirements. These locations are detailed below in **Table 16-4** and shown in **Figure 16-1**.

Table 16-4
Noise Measurement Locations

Site	Location	Duration
1	West 195th Street between Jerome Avenue and Reservoir Avenue	20 minutes
2	Reservoir Avenue between West 195th Street and West Kingsbridge Road	20 minutes
3	West Kingsbridge Road between Jerome Avenue and Reservoir Avenue	20 minutes
4	Elevated Pole along Jerome Avenue between West 195th Street and West Kingsbridge Road	60 minutes

At receptor Sites 1 through 3, 20-minute spot noise measurements were conducted during the typical weekday AM (7:15 AM—9:15 AM), midday (12:00 PM—2:00 PM), Pre-PM (2:30 PM—3:30 PM), PM (4:00 PM—6:00 PM), weekend midday (12:00 PM—2:00 PM), and weekend evening (6:00 PM—8:00 PM) peak periods, approximately 5 feet above grade. Measurements were performed according to noise measurement guidance contained in the *CEQR Technical Manual*.

At receptor Site 4, which is along Jerome Avenue where the elevated rail line is the dominant source of noise, measurements sufficient to establish L_{dn} were necessary. At this location (i.e., Site 4), 1-hour spot noise measurements were conducted during weekday AM (7:15 AM—9:15 AM), midday (12:00 PM—2:00 PM), PM (4:00 PM—6:00 PM), and late-night (10:00 PM—12:00 AM) periods, as needed to establish the L_{dn}. At this location, the microphone was on a pole at a height of approximately 15 feet above the ground surface to obtain line of sight of trains passing by on the closest track. The



Noise Receptor Locations

KINGSBRIDGE ARMORY REDEVELOPMENT

Figure 16-1

microphone was approximately six feet or more away from any large sound-reflecting surface to avoid major interference with sound propagation. The L_{dn} at receptor Site 4 was calculated in accordance with the 2018 *FTA Transit Noise and Vibration Impact Assessment Manual,* Appendix E, Option 3; although 2 dBA were added to the resulting L_{dn} to ensure a conservative result in considering noise exposure from the rail line.

As the National Guard Site is farther from the rail source than the locations where rail noise was measured (i.e., Site 4), a distance calculation was used to adjust the measured rail-dominated L_{dn} to reflect the noise exposure at the development site. The distance calculation followed the guidance of the Federal Transit Administration (FTA) guidance manual, equation 4-46 with the assumption of hard ground (i.e., pavement).

Measurements were conducted on March 13 and March 15, 2025.

EQUIPMENT USED DURING NOISE MONITORING

Measurements were performed using one Brüel & Kjær Type 2250 Sound Level Meter (SLM), one NTi Type XL2 SLM, one Brüel & Kjær Type 4189 1/2-inch microphone, one NTi Type M2230 1/2-inch microphone, one Brüel & Kjær Type 4231 Sound Level Calibrator, and one Larson Davis Type CAL200 Sound Level Calibrator. The SLMs have a valid laboratory calibration within 1 year, as is standard practice. The SLMs are Class 1 instruments according to ANSI Standard S1.4-1983 (R2006). The SLMs were calibrated before and after readings using either a Brüel & Kjær Type 4231 or Larson Davis Type CAL200 Sound Level Calibrator using the appropriate adaptor. Measurements were made on the A-scale (dBA). The data were digitally recorded by the sound level meter and displayed at the end of the measurement period in units of dBA. Measured quantities included L_{eq}, L_1, L_{10}, L_{50}, L_{90}, and 1/3 octave band levels. A windscreen was used during all sound measurements except for calibration. All measurement procedures were based on the guidelines outlined in ANSI Standard S1.13-2005.

NOISE MEASUREMENT RESULTS

The results of the existing noise level measurements are summarized in **Table 16-5**.

Table 16-5
Existing Noise Levels at Receptor Sites (in dBA)

Receptor Site	Location	Time[1]	L_{eq}	L_1	L_{10}	L_{50}	L_{90}	L_{dn}
1	West 195th Street between Jerome Avenue and Reservoir Avenue	AM	71.2	82.2	74.6	65.5	61.3	N/A
		MD	70.4	82.9	73.5	63.0	59.2	
		Pre-PM	69.3	82.1	71.2	63.3	60.1	
		PM	70.0	82.5	73.3	62.9	58.9	
		WE MD	61.2	69.6	63.8	58.0	54.8	
		WE Eve	69.3	82.7	70.4	62.4	59.4	
2	Reservoir Avenue between West 195th Street and West Kingsbridge Road	AM	64.3	70.6	67.2	63.1	59.3	N/A
		MD	62.0	71.3	65.5	58.8	54.3	
		Pre-PM	63.9	72.7	66.4	60.7	55.8	
		PM	63.0	70.3	65.9	61.4	57.0	
		WE MD	61.4	72.6	63.6	55.8	51.2	
		WE Eve	61.9	71.9	64.9	58.3	52.7	
3	West Kingsbridge Road between Jerome Avenue and Reservoir Avenue	AM	70.5	79.3	73.8	67.4	62.9	N/A
		MD	69.7	78.8	72.5	66.8	62.0	
		Pre-PM	70.4	78.5	73.1	68.5	64.4	
		PM	70.8	80.2	72.2	67.4	63.5	
		WE MD	67.4	74.5	70.1	65.5	62.2	
		WE Eve	69.6	76.0	72.4	68.1	64.4	
4	Armory Low-Rise Rooftop along Jerome Avenue between West 195th Street and West Kingsbridge Road	AM	77.8	89.6	80.5	69.6	66.4	81.1
		MD	75.0	87.7	76.1	68.6	65.4	
		PM	77.6	90.2	80.3	69.4	66.3	
		LN	74.5	87.8	75.9	67.2	64.6	

Note: [1] Measurements were performed on March 13 and March 15, 2025.

For receptor Sites 1, 2, and 3, vehicular traffic on the adjacent roadways was the dominant noise source. For receptor Site 4, the elevated rail line was the dominant noise source. In terms of the CEQR criteria, the existing noise levels at Site 4 are in the “clearly unacceptable” category, the existing noise levels at Sites 1 and 3 are in the “marginally unacceptable” category, and the existing noise levels at Site 2 are in the “marginally acceptable” category.

E. NOISE PREDICTION METHODOLOGY

GENERAL METHODOLOGY

Future noise levels (including in the future without the Proposed Project [the No Action condition] and the future with the Proposed Project [the With Action condition]) at the sites where traffic was the dominant source of noise (i.e., Sites 1 through 3) were conservatively estimated using a proportional modeling technique. The proportional modeling technique is an analysis methodology recommended for analysis purposes in the *CEQR Technical Manual*. The selected time periods are when the Proposed Project would be expected to result in the maximum traffic generation and therefore result in the maximum noise exposure and potential for significant adverse noise impacts. Specifically, the proportional modeling for the With Action condition was conducted using traffic for an Event Day (as opposed to a Non-Event Day), since the additional project-generated traffic on an Event Day would tend to result in higher noise levels and noise level increments, which is conservative for both the noise impact analysis and building attenuation analysis. The proportional modeling used for the noise analysis is described below.

PROPORTIONAL MODELING

Proportional modeling is one of the techniques recommended in the *CEQR Technical Manual* for mobile source analysis and was used to estimate noise levels in the future No Action and With Action conditions.

Using this technique, the prediction of future noise levels where traffic is the dominant noise source is based on a calculation using measured existing noise levels and predicted changes in traffic volumes to determine No Action condition and With Action condition noise levels. Vehicular traffic volumes are converted into Noise Passenger Car Equivalent (Noise PCE) values, for which one medium-duty truck (having a gross weight between 9,900 and 26,400 pounds) is assumed to generate the noise equivalent of 13 cars, and one heavy-duty truck (having a gross weight of more than 26,400 pounds) is assumed to generate the noise equivalent of 47 cars, and one bus (vehicles designed to carry more than nine passengers) is assumed to generate the noise equivalent of 18 cars. Future noise levels are calculated using the following equation:

$F\ NL - E\ NL = 10 * \log_{10} (F\ PCE / E\ PCE)$

where:

F NL = Future Noise Level

E NL = Existing Noise Level

F PCE = Future Noise PCEs

E PCE = Existing Noise PCEs

Sound levels are measured in decibels and therefore increase logarithmically with sound source strength. In this case, the sound source is traffic volumes measured in Noise PCEs. For example, assume that traffic is the dominant noise source at a particular location. If the existing traffic volume on a street is 100 PCE and if the future traffic volume were increased by 50 PCE to a total of 150 PCE, the noise level would increase by 1.8 dBA. Similarly, if the future traffic were increased by 100 PCE, or doubled to a total of 200 PCE, the noise level would increase by 3.0 dBA.

EVENT VENUE NOISE

The live event venue included in the Proposed Project would have the potential to result in noise at nearby noise-sensitive uses during events. While events would be required to meet New York City Noise Control Code requirements, which are more stringent than *CEQR Technical Manual* noise impact criteria, an evaluation was also conducted to determine the potential for impacts at existing receptors and determine noise exposure at noise-sensitive uses introduced by the Proposed Project (e.g., residential, community facility).

The maximum sound pressure level shown in **Table 16-1** for a Rock Concert is 110 dBA. This serves as a very conservative estimate of the L_{eq} noise level during an event and is assumed to occur at least 10 feet from the source of sound (e.g., speaker arrays). This level was projected to nearby receptors, also accounting for attenuation of the Armory building structure (including building façade and interior partitions separating the event venue from the façade). The predicted levels were compared to measured ambient noise levels and evaluated according to *CEQR Technical Manual* noise impact criteria.

For noise-sensitive uses within the Armory building, measures to avoid the potential for unacceptable noise exposure resulting from the event venue were determined and are described.

F. THE FUTURE WITHOUT THE PROPOSED PROJECT

Using the methodology previously described, in the future without the Proposed Project, the No Action condition noise levels were projected at the three mobile source noise analysis receptors. These No Action values are shown in **Table 16-6**.

The maximum increase in $L_{eq(1)}$ noise levels for the No Action condition would be less than 1 dBA. Changes of this magnitude would not be perceptible. In terms of CEQR noise exposure guidelines, the No Action condition noise levels at Sites 1 and 3 would remain in the "marginally unacceptable" category and the No Action noise levels at Site 2 would remain in the "marginally acceptable" category.

Table 16-6
No Action Condition Noise Levels (in dBA)

Receptor	Location	Time	Existing $L_{eq(1)}$	No Action $L_{eq(1)}$	$L_{eq(1)}$ Change	No Action $L_{10(1)}$
1	West 195th Street between Jerome Avenue and Reservoir Avenue	AM	71.2	71.2	0.0	74.7
		MD	70.4	70.5	0.1	73.6
		Pre-PM	69.3	69.4	0.1	71.3
		PM	70.0	70.1	0.1	73.4
		WE MD	61.2	61.3	0.1	63.9
		WE Eve	69.3	69.3	0.0	70.4
2	Reservoir Avenue between West 195th Street and West Kingsbridge Road	AM	64.3	64.3	0.0	67.2
		MD	62.0	62.1	0.1	65.6
		Pre-PM	63.9	63.9	0.1	66.4
		PM	63.0	63.1	0.1	66.0
		WE MD	61.4	61.5	0.1	63.7
		WE Eve	61.9	62.0	0.1	65.0
3	West Kingsbridge Road between Jerome Avenue and Reservoir Avenue	AM	70.5	70.6	0.1	73.9
		MD	69.7	69.8	0.1	72.6
		Pre-PM	70.4	70.4	0.1	73.2
		PM	70.8	70.9	0.1	72.4
		WE MD	67.4	67.6	0.2	70.2
		WE Eve	69.6	69.8	0.2	72.6

Note:
Noise levels at all receptor locations were calculated by using proportional modeling.

G. THE FUTURE WITH THE PROPOSED PROJECT

Using the methodology previously described, in the future with the Proposed Project, the With Action condition noise levels were calculated at the three mobile source noise analysis locations. These With Action values are shown in **Table 16-7**.

Table 16-7
With Action Condition Noise Levels (in dBA)

Receptor	Location	Time	No Action $L_{eq(1)}$	With Action $L_{eq(1)}$	$L_{eq(1)}$ Change	With Action $L_{10(1)}$
1	West 195th Street between Jerome Avenue and Reservoir Avenue	AM	71.2	72.4	1.2	75.9
		MD	70.5	71.6	1.1	74.7
		Pre-PM	69.4	70.1	1.1	72.0
		PM	70.1	70.6	0.5	73.9
		WE MD	61.3	62.3	1.0	64.9
		WE Eve	69.3	74.6	5.3	75.7
2	Reservoir Avenue between West 195th Street and West Kingsbridge Road	AM	64.3	64.6	0.3	67.5
		MD	62.1	62.6	0.5	66.1
		Pre-PM	63.9	64.5	0.6	67.0
		PM	63.1	63.6	0.5	66.5
		WE MD	61.5	62.4	0.9	64.6
		WE Eve	62.0	66.4	4.4	69.4
3	West Kingsbridge Road between Jerome Avenue and Reservoir Avenue	AM	70.6	70.6	0.0	73.9
		MD	69.8	69.8	0.0	72.6
		Pre-PM	70.4	70.5	0.0	73.3
		PM	70.9	70.9	0.0	72.4
		WE MD	67.6	67.7	0.1	70.3
		WE Eve	69.8	69.9	0.1	72.7

Note: Noise levels at all receptor locations were calculated by using proportional modeling.

The maximum increase in $L_{eq(1)}$ noise levels for the With Action condition would be less than 3 dBA at all noise analysis receptors during all time periods except the weekend evening time period. Changes of this magnitude, apart from the weekend evening time period, would be considered imperceptible and not significant according to *CEQR Technical Manual* noise impact criteria. In terms of CEQR noise exposure guidelines, the With Action condition noise levels at Sites 1 and 3 would remain in the "marginally unacceptable" category, and the With Action noise levels at Site 2 would remain in the "marginally acceptable" category.

As shown in **Table 16-7**, during the weekend evening time period (6PM to 8PM), predicted noise level increments at Receptors 1 and 2 would be up to 5.3 dBA, which would be considered a readily noticeable change. However, Receptor Site 1 represents school uses, which would not generally be in use during weekend evenings[1].

At Receptor Site 2, which represents residences along Reservoir Avenue between West 195th Street and West Kingsbridge Road, the maximum predicted With Action $L_{10(1)}$ values would be approximately 69 dBA, i.e., in the "marginally acceptable" range according to *CEQR Technical Manual* noise exposure guidance. With standard building façade construction, these residences would be expected to provide approximately 25 dBA window/wall attenuation. As such, interior noise levels at these residences would be less than the 45 dBA threshold considered acceptable for residential use. However, due to the predicted 4.4 dBA incremental increase in noise levels at this receptor, the Proposed Project would have the potential to result in a significant adverse noise impact at residences along Reservoir Avenue between West 195th Street and West Kingsbridge

[1] https://340bronx.org/calendars

Road. These residences are discussed further in Chapter, 22 “Mitigation.” The analysis of noise due to traffic at this receptor will be refined further between the Draft and Final EIS, and the refined analysis may find that noise due to the Proposed Project would not rise to the level of a significant adverse impact.

H. NOISE ATTENUATION MEASURES

As shown in **Table 16-3**, the *CEQR Technical Manual* has set noise attenuation values for buildings based on exterior noise levels. **Table 16-8** shows the minimum window/wall attenuation necessary to meet the *CEQR Technical Manual* requirements for internal noise levels at each of the noise measurement locations.

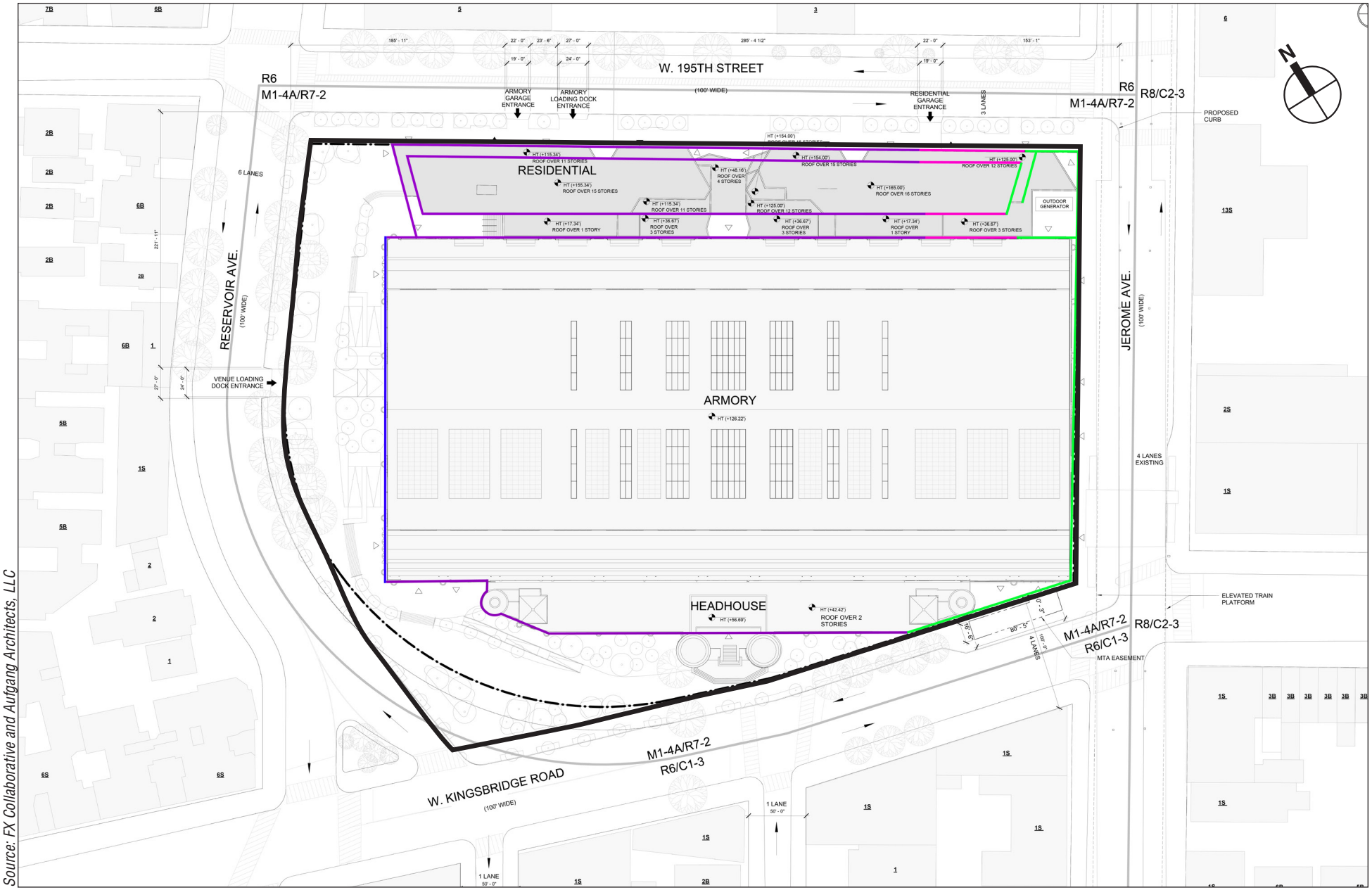
Table 16-8
CEQR-Required Attenuation at Noise Measurement Locations (in dBA)

Receptor	Location	Applicable Noise Exposure Descriptor	Highest With Action Noise Exposure	Minimum Required Attenuation[1]
1	West 195th Street between Jerome Avenue and Reservoir Avenue	L_{10}	75.9	31
2	Reservoir Avenue between West 195th Street and West Kingsbridge Road	L_{10}	69.4	N/A[2]
3	West Kingsbridge Road between Jerome Avenue and Reservoir Avenue	L_{10}	73.9	31
4	Armory Low-Rise Rooftop along Jerome Avenue between West 195th Street and West Kingsbridge Road	L_{dn}	81.1	42

Notes:
[1] Attenuation values are shown for residential or community facility uses; commercial office uses would require 5 dBA less attenuation.
[2] “N/A” indicates that the highest calculated L_{10} is below 70 dBA. The *CEQR Technical Manual* does not specify minimum attenuation guidance for exterior $L_{10(1)}$ values below this level.

Based on the values shown in **Table 16-8**, required attenuation levels to provide an interior noise level of 45 dBA for residential or community facility uses and 50 dBA for commercial office uses were determined for the future with the Proposed Project. These values are shown in **Table 16-9**.

The attenuation of a composite structure is a function of the attenuation provided by each of its component parts and how much of the area is made up of each part. A building façade typically consists of wall, glazing, and any vents or louvers associated with the building mechanical systems in various ratios of area. The design for the proposed new residential building would include acoustically rated windows and air conditioning (a means of alternate ventilation). The proposed residential building’s façades, including these elements, would be designed to provide a composite attenuation rating greater than or equal to those attenuation ratings listed in **Table 16-9** and shown in **Figure 16-2**, along with an alternative means of ventilation in all residential uses.



Source: FX Collaborative and Aufgang Architects, LLC

FOR ILLUSTRATIVE PURPOSES ONLY

Project Site

42 dBA

35 dBA

31 dBA

NA

Noise Attenuation Zones

Figure 16-2

KINGSBRIDGE ARMORY REDEVELOPMENT

Table 16-9
Minimum Required Attenuation at Development Site (in dBA)

Location	Façade(s)	Associated Noise Measurement Site(s)	Required Attenuation[1,2]
Residential	East	4	42
	North and South (within 70 feet of rail line)	4	42
	North and South (70 feet to 160 feet from rail line)	4 (adjusted for distance)	35
	North and South (at least 160 feet from rail line)	1	31
	West	1	31
Armory	East and all façades within 160 feet of elevated 4 rail line	4	42
	North (at least 160 feet from elevated 4 rail line)	1	31
	South (at least 160 feet from elevated 4 rail line)	3	31
	West	2	N/A[2]

Notes:
[1] Attenuation values are shown for residential or community facility uses; commercial office uses would require 5 dBA less attenuation.
[2] "N/A" indicates that the highest calculated L_{10} is below 70 dBA. The *CEQR Technical Manual* does not specify minimum attenuation guidance for exterior $L_{10(1)}$ values below this level.

With the Proposed Project, it is anticipated that the opaque fiberglass panels on the Armory's east and west façades would be replaced with glazing within the large end openings. These openings are not located along any residential, community facility, or commercial office spaces within the building, and are therefore not subject to window/wall attenuation requirements. Windows on the Armory's north and south façades, including façades within the Armory's headhouse, that open into community facility and commercial office areas would be acoustically rated and designed to result in a composite attenuation rating of at least 31 dBA, along with an alternative means of ventilation allowing for the maintenance of a closed-window condition. To achieve 42 dBA or more of building attenuation at these locations, special design features that go beyond the standard double-glazed window and central air conditioning would be necessary and may include using specially designed windows (i.e., windows with small sizes, windows with air gaps, windows with thicker glazing, etc.), and additional building insulation.

Consequently, interior noise levels would be acceptable according to the *CEQR Technical Manual* for newly introduced noise receptors, including the approximately 64,800 sf of project-generated publicly accessible open space on the Project Site. The window-wall attenuation measures would be provided as part of the Proposed Project and required through the Lease Agreement between NYCEDC and the Applicant. With these measures, the Proposed Project would not result in a significant adverse impact.

I. NEWLY INTRODUCED OPEN SPACE

The Proposed Project would include new publicly accessible open space, which is expected to be primarily passive space, although it would not require serenity and quiet. In the With Action condition, predicted noise levels at the proposed open space would be in the high 60s dBA, which would be above the 55 dBA $L_{10(1)}$ noise level recommended for outdoor areas in the *CEQR Technical Manual* noise exposure guidelines (see **Table 16-2**). As the existing $L_{10(1)}$ noise levels at this location are above 55 dBA, there are no practical and feasible mitigation measures that could be implemented to reduce noise levels to below the 55 dBA $L_{10(1)}$ guideline on the proposed new open space. Although

noise levels in these areas would be above the guideline noise levels, they would be comparable to noise levels in a number of existing open space areas that are located adjacent to roadways, including Hudson River Park, Riverside Park, Bryant Park, Fort Greene Park, and other urban open space areas. The guidelines are a worthwhile goal for outdoor areas requiring serenity and quiet, such as passive open spaces. However, due to the mix of recreational activity and activity on the surrounding streets present at most New York City open space areas and parks, a relatively low noise level is often not achieved. Further, the new publicly accessible open space would not require serenity and quiet. Therefore, the future projected noise levels would not constitute a significant adverse noise impact to the proposed open space on the Project Site.

J. EVENT VENUE AND INTERIOR NOISE-GENERATING USES

As described above, the Proposed Project would include a 17,000-person capacity live event venue, at which concerts or other entertainment events would occur. It is assumed that evening events would occur approximately from 8 PM to 11 PM.

All interior noise-generating uses (including the live event venue) would be designed and operated to comply with all applicable noise regulations (i.e., Subchapter 5, §24-231 and §24-232 of the New York City Noise Control Code). This includes restrictions on noise emissions from commercial music (as would be applicable to the proposed live event venue or other entertainment uses) and operation of any commercial business enterprise (including light industrial uses) throughout all hours of operation for the live event venue or any other noise-generating uses. These restrictions limit the noise from commercial music or any business enterprise to less than 45 dBA, which would ensure no more than a 3 dBA increase over existing noise levels at any nearby receptors. As such, they would be prohibited from producing noise levels that would exceed acceptable noise level thresholds according to *CEQR Technical Manual* noise exposure guidance at noise-sensitive uses in adjacent buildings or within the Armory itself. These uses include the Music Museum, which would be located under the event venue separated by a floor-ceiling assembly yet to be designed and constructed, and the Cultural Center, which would be in the headhouse south of the event venue separated by an existing wall as well as interior fit-out walls yet to be designed and constructed.

The live event venue would include exceptional design measures to ensure sufficient sound isolation to ensure compliance with the above-mentioned noise regulations. Such measures may include a sound barrier ceiling using spring hangers and multiple layers of sheetrock, independent stud walls with structural isolation and no cross-bracing, an isolated flooring system, a distributed sound system (i.e., multiple smaller speakers throughout the venue rather than a single speaker array) with Digital Signal Processing (DSP) capable of limiting overall noise level output, and/or other measures to provide sufficient sound isolation.

Using the methodology described above, in the future with the Proposed Project, the noise levels during an event at the venue were determined for each of the noise receptors. The results of the live event venue noise analysis for receptors other than those within the Armory building are shown in **Table 16-10**.

Table 16-10
Live Event Venue Noise Analysis (in dBA)

Receptor Location	Representative Noise Receptor Site	Minimum Noise Level During Event Hours	Event Source Level[1]	Distance Attenuation	Source Building Attenuation	Total Noise Level	Noise Level Increment
National Guard Site Residences	1	69.3	110	0.0	41[3]	72.2[2]	2.9
Reservoir Avenue Between West 195th Street and Kingsbridge Road	2	61.9	110	24.8	25[4]	64.1	2.2
West Kingsbridge Road between Reservoir and Jerome Avenues	3	69.6	110	27.8	41[3]	69.6	0.0
Jerome Avenue between West 195th Street and West Kingsbridge Road	4	74.5	110	20.5	42	74.5	0.0

Notes:
[1] Sound Pressure Level serves as very conservative representation of L_{eq}. It does not account for any source limiting that may be implemented.
[2] Since this calculation is based on SPL, this value also conservatively represents L_{10}. This value is below the maximum noise exposure for the National Guard Site residences' south façade shown in Table 16-8 and therefore would not change the required window/wall attenuation.
[3] Conservative estimate of attenuation provided by the Armory building masonry wall on its north façade.
[4] Conservative estimate of attenuation for standard façade construction.

The maximum increase in noise levels during an event would be less than 3 dBA at all noise analysis receptors. Changes of this magnitude would be considered imperceptible and not significant according to *CEQR Technical Manual* noise impact criteria.

Additionally, noise-sensitive uses within the Armory building would be separated from the event venue by interior partitions. Should any such noise-sensitive uses be occupied during events, sufficient controls would be necessary to ensure compliance with applicable Code regulations and noise exposure not exceeding the acceptable thresholds according to *CEQR Technical Manual* noise exposure guidance. As such, some combination of controls on source levels at the event venue (achieved by DSP capable of limiting overall noise level output), physical separation (i.e., construction of interior partitions), and operational controls (i.e., restrictions on operating hours to avoid occupancy in noise-sensitive uses during events) would be used to ensure that interior noise exposure at community facility uses does not exceed 45 dBA L_{10} and interior noise exposure at commercial office uses does not exceed 50 dBA L_{10} as a result of event noise. If this were to be achieved by physical separation alone, it would require a minimum of 65 dBA attenuation between the venue and community facility uses and a minimum of 60 dBA attenuation between the venue and office uses.

These noise attenuation measures will be required by the Lease Agreement between NYCEDC and the Applicant. As an alternative, a noise analysis demonstrating that lesser attenuation will avoid a significant adverse impact may be provided between DEIS and FEIS and is subject to approval by DEP.

Consequently, interior noise-generating uses would not result in any significant adverse noise impacts at receptors within the Armory, residences at the National Guard Site, or other existing receptors adjacent to the Project Site.

K. MECHANICAL SYSTEM

The building mechanical systems (i.e., heating, ventilation, and air conditioning systems) would be designed to meet all applicable noise regulations (i.e., Subchapter 5, §24-227 of the New York City Noise Control Code and the New York City Department of Buildings Code) and to avoid producing levels that would result in any significant increase in ambient noise levels. ✷