Chapter 17: Noise

A. INTRODUCTION

This chapter considers the potential for the proposed actions, which would allow new development on the east end of Block 675 in Manhattan, to result in significant adverse noise impacts. As described in Chapter 1, "Project Description," and Chapter 2, "Analytical Framework," in the future with the proposed actions (the With Action condition), the Project Area would be redeveloped with two new mixed-use buildings on two project sites (project site A—601 West 29th Street and project site B—606 West 30th Street). The Project Area includes these two project sites as well as an intervening lot (Lot 38), which is not part of either project site but is assumed to be redeveloped for the purposes of environmental review. The two project sites and Lot 38 would be rezoned and included in the Special Hudson River Park District. Overall, it is assumed that the Project Area would contain residential apartments, retail, accessory parking, and a public facility (potentially a Fire Department of the City of New York-Emergency Medical Service [FDNY-EMS] Station).

Based on Chapter 14, "Transportation," the proposed actions would not generate sufficient traffic to have the potential to cause a significant noise impact (i.e., it would not result in a doubling of Noise passenger car equivalents [Noise PCEs] which would be necessary to cause a 3 dBA increase in noise levels). However, ambient noise levels adjacent to the Project Area were considered in order to address CEQR noise abatement requirements for the building. This potential is assessed below.

PRINCIPAL CONCLUSIONS

The analysis finds that the proposed actions would not result in any significant adverse noise impacts. The proposed projects would not generate sufficient traffic to have the potential to cause a significant noise impact. It is assumed that the proposed buildings' mechanical systems (i.e., HVAC systems) would be designed to meet all applicable noise regulations and to avoid producing levels that would result in any significant increase in ambient noise levels. Therefore, the proposed projects would not result in any significant adverse noise impacts related to building mechanical equipment (stationary sources).

Due to existing high levels of ambient noise in the area, building attenuation would be required to ensure that interior noise levels meet the City Environmental Quality Review (CEQR) criteria. The proposed designs for the Project Area include acoustically rated windows and an alternate means of ventilation. The proposed buildings would provide sufficient attenuation to achieve the CEQR interior $L_{10(1)}$ noise level guideline of 45 dBA or lower for residential uses and 50 dBA or lower for commercial uses. The window/wall attenuation and alternate means of ventilation requirements would be codified in a Noise (E) Designation for the Project Area.

Construction activities for the Hudson Tunnel Project would take place on the western portion of the project block immediately west of the Project Area between 2019 and 2026. In addition, a portion of Lot 12 on project site A may be used for construction staging. The Hudson Tunnel

DEIS identifies construction $L_{eq(8)}$ noise levels of 97 dBA at project sites A and B during the loudest period of construction (i.e., 12 months of pile driving). However, based on the conceptual construction schedule presented in the Hudson Tunnel DEIS, these activities would occur before the proposed projects would be completed and occupied. Therefore, the Hudson Tunnel DEIS concludes that there would be no significant adverse construction noise impact on the proposed projects as per the *CEQR Technical Manual* construction noise criteria.

In the event the proposed projects are completed and occupied during Hudson Tunnel construction when pile driving is still occurring, construction of the Hudson Tunnel Project would be producing noise levels of 97 dBA $L_{eq(8)}$ at the proposed projects' façades. The Hudson Tunnel DEIS assumed there would be no variation in construction noise levels throughout the work day. Therefore, 97 dBA is also assumed to be the worst-case peak hour construction noise levels in terms of $L_{eq(1)}$.However, the proposed projects will be designed to provide window/wall attenuation such that if pile driving for the Hudson Tunnel Project occurs when the units are occupied, interior noise levels would be in the mid-60s dBA. This would be up to approximately 20 dBA higher than the 45 dBA threshold recommended for residential use according to CEQR noise exposure guidelines. If this occurs, there would be a significant adverse noise impact for up to approximately 12 months. This significant adverse noise impact would be temporary as it is due to construction of the Hudson Tunnel Project. This potential significant adverse noise impact is discussed further in Chapter 18, "Public Health." Once construction of the Hudson Tunnel Project is complete, the interior noise levels would be expected to be below the 45 dBA threshold recommended for residential use according to CEQR noise exposure guidelines.

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 (a whistle compared with a French horn, 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 lower notes on the French horn).

"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 17-1**, the threshold of human hearing is defined as 0 dBA; quiet conditions (as in a library, for example) 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 17-1
Common Noise Levels

Sound Source	(dBA)
Military jet, air raid siren	130
Amplified rock music	110
Jet takeoff at 500 meters	100
Freight train at 30 meters	95
Train horn at 30 meters	90
Heavy truck at 15 meters	80–90
Busy city street, loud shout	80
Busy traffic intersection	70–80
Highway traffic at 15 meters, train	70
Predominantly industrial area	60
Light car traffic at 15 meters, city or commercial areas, or residential areas close to industry	50–60
Background noise in an office	50
Suburban areas with medium-density transportation	40–50
Public library	40
Soft whisper at 5 meters	30
Threshold of hearing	0

Note:
A 10 dBA increase in level appears to double the loudness, and a 10 dBA decrease halves the apparent loudness.
Sources:
Cowan, James P. *Handbook of Environmental Acoustics,* Van Nostrand Reinhold, New York, 1994. Egan, M. David, Architectural Acoustics. McGraw-Hill Book Company, 1988.

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}.

For purposes of the proposed actions, the L_{10} descriptor has been selected as the noise descriptor 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 for City environmental impact review classification.

C. NOISE STANDARDS AND CRITERIA

NEW YORK CEQR NOISE CRITERIA

The *CEQR Technical Manual* defines attenuation requirements for buildings based on exterior noise level (see **Table 17-2**). Recommended noise attenuation values for buildings are designed to maintain interior noise levels of 45 dBA or lower for residential uses and interior noise levels of 50 dBA or lower for commercial uses and are determined based on exterior $L_{10(1)}$ noise levels.

Table 17-2
Required Attenuation Values to Achieve Acceptable Interior Noise Levels

	Marginally Unacceptable				Clearly Unacceptable
Noise Level with Proposed Actions	$70 < L_{10} \leq 73$	$73 < L_{10} \leq 76$	$76 < L_{10} \leq 78$	$78 < L_{10} \leq 80$	$80 < L_{10}$
Attenuation[A]	(I) 28 dBA	(II) 31 dBA	(III) 33 dBA	(IV) 35 dBA	$36 + (L_{10} - 80)$[B] dBA

Notes:
[A] The above composite window-wall attenuation values are for residential development. Retail uses would be 5 dBA less in each category. All the above categories require a closed window situation and hence an alternate means of ventilation.
[B] Required attenuation values increase by 1 dBA increments for L_{10} values greater than 80 dBA.
Source: New York City Department of Environmental Protection.

D. EXISTING NOISE LEVELS

Existing noise levels at the Project Area were measured at four locations. Receptor site 1 was located on West 30th Street between 11th and 12th Avenues, Receptor site 2 was located on 11th Avenue between West 29th and West 30th Streets, Receptor site 3 was located on West 29th Street between 11th and 12th Avenues on the eastern side of the block, and Receptor site 4 was located on West 29th Street between 11th and 12th Avenues on the western side of the block (see **Figure 17-1**).

At the receptor sites, the existing noise levels were measured for 20-minute time periods during the three weekday peak periods—AM (7:30 AM to 9:00 AM), midday (MD) (12:00 PM to 2:00 PM), and PM (4:30 PM to 6:30 PM). Measurements were performed on March 24, 2016.

EQUIPMENT USED DURING NOISE MONITORING

Measurements were performed using Brüel & Kjær Sound Level Meters (SLMs) Types 2250 and 2260, Brüel & Kjær ½-inch microphones Type 4189, and Brüel & Kjær Sound Level Calibrators Type 4231. The SLMs had valid laboratory calibrations within 1 year, as is standard practice. The Brüel & Kjær SLMs are Type 1 instruments according to ANSI Standard S1.4-1983 (R2006). The microphone was mounted at a height of approximately five feet above the ground on a tripod and at least approximately five feet away from any large reflecting surfaces. The SLMs were calibrated before and after readings with Brüel & Kjær Type 4231 Sound Level Calibrators using the appropriate adaptors. Measurements were made on the A-scale (dBA). The data were digitally recorded by the sound level meters 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.

The results of the existing noise level measurements are summarized in **Table 17-3**.



BLOCK 675 EAST

Noise Receptor Locations

Figure 17-1

At the receptor sites, vehicular traffic was the dominant noise source. Measured levels are moderate to relatively high and reflect the level of vehicular activity on the adjacent roadways. In terms of the CEQR criteria, the existing noise levels at sites 1 to 4 are in the "marginally unacceptable" category.

Table 17-3
Existing Noise Levels in dBA

Receptor Site	Location	Time Period	L_{eq}	L_1	L_{10}	L_{50}	L_{90}
1	West 30th Street between 11th and 12th Avenues	AM	72.4	81.8	75.4	69.6	66.7
		MD	73.2	83.3	76.5	69.6	66.6
		PM	71.4	82.0	75.3	67.3	63.5
2	11th Avenue between West 29th and West 30th Streets	AM	73.7	83.5	77.0	70.2	65.9
		MD	71.0	78.1	73.4	69.6	66.9
		PM	70.3	80.0	72.8	66.6	61.9
3	West 29th Street between 11th and 12th Avenues (eastern side of the block)	AM	69.5	81.7	71.0	64.9	62.3
		MD	69.2	78.9	72.7	63.5	58.4
		PM	65.7	75.8	68.8	61.5	57.0
4	West 29th Street between 11th and 12th Avenues (western side of the block)	AM	72.3	79.8	72.8	70.7	69.7
		MD	67.7	76.2	69.0	64.3	60.4
		PM	70.1	76.2	72.1	69.5	62.5
Note: Noise measurements were performed on March 24, 2016.							

E. NOISE PREDICTION METHODOLOGY

GENERAL METHODOLOGY

Future noise levels (including in the future without the proposed actions and the future with the proposed actions) were calculated using a proportional modeling technique, which was used as a screening tool to estimate changes in noise levels. The proportional modeling technique is an analysis methodology recommended for analysis purposes in the *CEQR Technical Manual*. The noise analysis examined the weekday AM, MD, and PM peak hours at all receptor locations. The selected time periods are when the proposed projects would be expected to produce the maximum traffic generation (based on the traffic studies presented in Chapter 14, "Transportation") and therefore result in the maximum potential for significant adverse noise impacts. The proportional modeling used for the noise analysis is described below.

PROPORTIONAL MODELING

Proportional modeling was used to determine locations with the potential for having significant noise impacts. Proportional modeling is one of the techniques recommended in the *CEQR Technical Manual* for mobile source analysis.

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.

F. THE FUTURE WITHOUT THE PROPOSED ACTIONS

Using the methodology described above, No Action condition noise levels were calculated at the four mobile source noise analysis receptors for the 2022 analysis year. These No Action values are shown in **Table 17-4**.

By 2022, the maximum increase in $L_{eq(1)}$ noise levels for the No Action condition would be 2.4 dBA or less at all four mobile source noise analysis receptors. Changes of this magnitude would be considered barely perceptible and not significant according to *CEQR Technical Manual* noise impact criteria. In terms of CEQR noise exposure guidelines, No Action condition noise levels at receptors 1, 2, 3, and 4 would be in the "marginally unacceptable" category.

Table 17-4
2022 No Action Condition Noise Levels (in dBA)

Receptor Site	Location	Time Period	Existing $L_{eq(1)}$	No Action $L_{eq(1)}$	$L_{eq(1)}$ Change	No Action $L_{10(1)}$
1	West 30th Street between 11th and 12th Avenues	AM	72.4	72.5	0.1	75.5
		MD	73.2	73.3	0.1	76.6
		PM	71.4	71.5	0.1	75.4
2	11th Avenue between West 29th and West 30th Streets	AM	73.7	74.5	0.8	77.8
		MD	71.0	72.1	1.1	74.5
		PM	70.3	72.7	2.4	75.2
3	West 29th Street between 11th and 12th Avenues (eastern side of the block)	AM	69.5	70.0	0.5	71.5
		MD	69.2	69.4	0.2	72.9
		PM	65.7	65.9	0.2	69.0
4	West 29th Street between 11th and 12th Avenues (western side of the block)	AM	72.3	72.8	0.5	73.3
		MD	67.7	67.9	0.2	69.2
		PM	70.1	70.3	0.2	72.3

G. THE FUTURE WITH THE PROPOSED ACTIONS

Using the methodology previously described, With Action condition noise levels were calculated at the four mobile source noise analysis receptors for the 2022 analysis year. These With Action values are shown in **Table 17-5**.

By 2022, the maximum increase in $L_{eq(1)}$ noise levels for the With Action condition would be 0.2 dBA or less at all four mobile source noise analysis receptors. Changes of this magnitude would be considered imperceptible according to *CEQR Technical Manual* guidance and would fall below the CEQR threshold for a significant adverse noise impact. In terms of CEQR noise exposure guidelines, With Action condition noise levels at receptors 1, 2, 3, and 4 would be in the "marginally unacceptable" category.

Table 17-5
2022 With Action Condition Noise Levels (in dBA)

Receptor	Location	Time	No Action Leq(1)	With Action Leq(1)	Leq(1) Change	With Action L10(1)
1	West 30th Street between 11th and 12th Avenues	AM	72.5	72.6	0.1	75.6
		MD	73.3	73.4	0.1	76.7
		PM	71.5	71.7	0.2	75.6
2	11th Avenue between West 29th and West 30th Streets	AM	74.5	74.5	0.0	77.8
		MD	72.1	72.1	0.0	74.5
		PM	72.7	72.7	0.0	75.2
3	West 29th Street between 11th and 12th Avenues (eastern side of the block)	AM	70.0	70.2	0.2	71.7
		MD	69.4	69.5	0.1	73.0
		PM	65.9	66.0	0.1	69.1
4	West 29th Street between 11th and 12th Avenues (western side of the block)	AM	72.8	73.0	0.2	73.5
		MD	67.9	68.0	0.1	69.3
		PM	70.3	70.4	0.1	72.4

H. NOISE ATTENUATION MEASURES

The *CEQR Technical Manual* has set noise attenuation requirements for buildings based on exterior noise levels. Recommended noise attenuation values for buildings are designed to maintain interior noise levels of 45 dBA or lower for residential uses and 50 dBA or lower for commercial uses, and are determined based on exterior $L_{10(1)}$ noise levels.

Table 17-6 shows the minimum window/wall attenuation necessary to meet *CEQR Technical Manual* requirements for interior noise levels at each of the noise measurement locations.

Table 17-6
Required Attenuation at Noise Measurement Locations (in dBA)

Receptor Site	Location	Highest With Action $L_{10(1)}$ Value	Minimum Required Attenuation
1	West 30th Street between 11th and 12th Avenues	76.7	33
2	11th Avenue between West 29th and West 30th Streets	77.8	33
3	West 29th Street between 11th and 12th Avenues (eastern side of the block)	73.0	28
4	West 29th Street between 11th and 12th Avenues (western side of the block)	73.5	31
Notes: Attenuation values are shown for residential uses; commercial uses would require 5 dBA less attenuation.			

Based on the values shown in **Table 17-6**, required attenuation levels were determined for the Project Area. These values are shown in **Table 17-7**.

Table 17-7
Required Attenuation at Project Sites (in dBA)

Project Area	Façade(s)	Representative Receptor Site	Maximum Predicted L_{10} Value	Minimum Required Attenuation[1]
Project Site A	North	1	76.7	33
	East	2	77.8	33
	South	3	73.0	28
	West/Interior Façades	4	73.5	31
Project Site B[2]	All	1, 4	76.7	33
Lot 38	North	1	76.7	33
	East/South/West	4	73.5	31

Notes:
[1] Attenuation values are shown for residential uses; commercial uses would require 5 dBA less attenuation.
[2] Attenuation values shown for Project Site B will be refined for each façade between the Draft and Final EIS.

To implement the attenuation requirements shown in **Table 17-7**, it is anticipated that an (E) Designation for noise would be applied to the Project Area specifying the appropriate amount of window/wall attenuation and an alternate means of ventilation. The text for the (E) Designation would be as follows:

> **To ensure an acceptable interior noise environment, the building façade(s) or future development at the Project Area must provide minimum composite building façade attenuation as shown in Table 17-7 of the *Block 675 East EIS* in order to ensure an interior L_{10} noise level not greater than 45 dBA for residential uses or not greater than 50 dBA for commercial uses. To maintain a closed-window condition in these areas, an alternate means of ventilation that brings outside air into the buildings without degrading the acoustical performance of the building façade(s) must also be provided.**

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. Normally, a building façade is composed of the wall, glazing, and any vents or louvers for HVAC systems in various ratios of surface area. The proposed buildings would be designed to provide a composite Outdoor-Indoor Transmission Class ("OITC") rating greater than or equal to the attenuation requirements listed in **Table 17-7**. The OITC classification is defined by ASTM International (ASTM E1332-10) and provides a single-number rating that is used for designing a building façade including walls, doors, glazing, and combinations thereof. The OITC rating is designed to evaluate building elements by their ability to reduce the overall loudness of ground and air transportation noise.

By adhering to these design guidelines, the proposed projects would provide sufficient attenuation to achieve the *CEQR Technical Manual* interior noise level guidelines of 45 dBA L_{10} for residential uses and 50 dBA L_{10} for commercial uses.

I. CONSIDERATION OF THE HUDSON TUNNEL PROJECT

As discussed in Chapter 1, "Project Description," the Hudson Tunnel Project is expected to start in 2019 with completion of the project expected in 2026. Construction activities would take place on the western portion of the project block immediately west of the Project Area. In addition, a portion of Lot 12 on project site A may be used for construction staging.

The Hudson Tunnel DEIS identifies construction noise levels at 606 West 30th Street (i.e., project site B) and 601 West 29th Street (i.e., project site A). The $L_{eq(1)}$ noise levels predicted to occur with construction activities for the Hudson Tunnel Project at the project sites would be 97 dBA.

Based on the conceptual construction schedule presented in the Hudson Tunnel DEIS, the loudest period of construction (i.e., 12 months of pile driving) would occur before the proposed projects would be completed and occupied. Therefore, the Hudson Tunnel DEIS concludes that there would be no significant adverse construction noise impact on the proposed projects as per the *CEQR Technical Manual* construction noise criteria.

In the event the proposed projects are completed and occupied during Hudson Tunnel construction when pile driving is still occurring, construction of the Hudson Tunnel Project would be producing noise levels of 97 dBA $L_{eq(8)}$ at the proposed projects' façades. The Hudson Tunnel DEIS assumed there would be no variation in construction noise levels throughout the work day. Therefore, 97 dBA is also assumed to be the worst-case peak hour construction noise levels in terms of $L_{eq(1)}$. As discussed above, the proposed projects will be designed to provide a composite OITC rating greater than or equal to the attenuation requirements listed in **Table 17-7**. If pile driving for the Hudson Tunnel Project occurs when the units are occupied, interior noise levels would be in the mid-60s dBA, up to approximately 20 dBA higher than the 45 dBA threshold recommended for residential use according to CEQR noise exposure guidelines. If this occurs, there would be a significant adverse noise impact for up to approximately 12 months. This significant adverse noise impact would be temporary as it is due to construction of the Hudson Tunnel Project. This potential significant adverse noise impact is discussed further in Chapter 18, "Public Health." Once construction of the Hudson Tunnel Project is complete, the interior noise levels would be expected to be below the 45 dBA threshold recommended for residential use according to CEQR noise exposure guidelines.

J. MECHANICAL EQUIPMENT

It is assumed that the proposed projects' mechanical systems (i.e., HVAC 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 to avoid producing levels that would result in any significant increase in ambient noise levels. Therefore, the proposed projects would not result in any significant adverse noise impacts related to building mechanical equipment. ✷