Chapter 20: Noise

A. INTRODUCTION

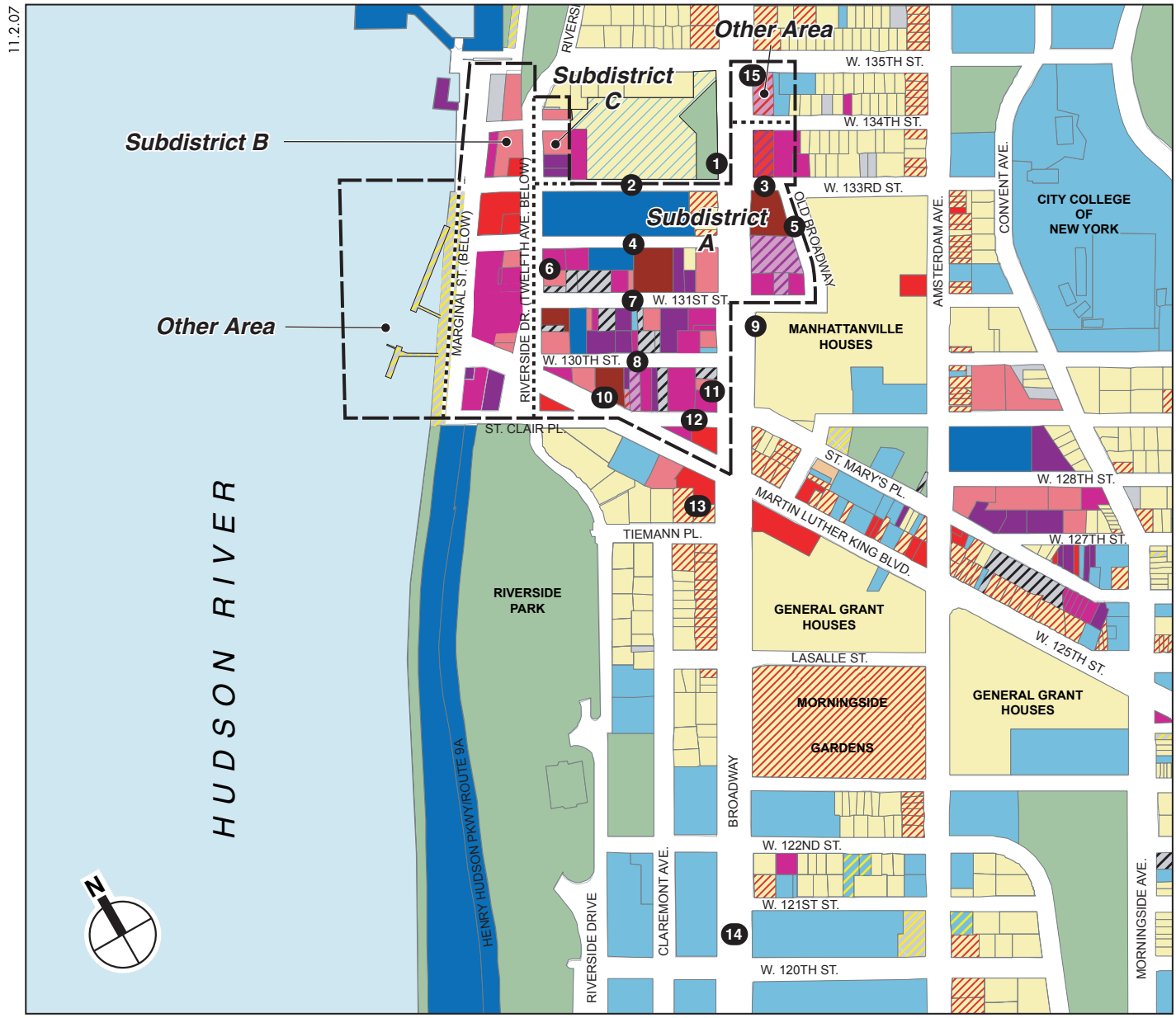
Noise pollution in an urban area comes from many sources. Some sources are activities essential to the health, safety, and welfare of a city's inhabitants, such as noise from emergency vehicle sirens, garbage collection operations, and construction and maintenance equipment. Other sources, such as traffic, are essential to the viability of a city as a place to live and do business. Although these and other noise-producing activities are necessary to a city, the noise they produce is undesirable. Urban noise detracts from the quality of the living environment, and there is increasing evidence that excessive noise represents a threat to public health.

The noise analysis presented in this chapter focuses on the traffic-generated changes in noise that would result from the operation of the Proposed Actions (i.e., when construction of Phase 1 and Phase 2 are completed in the years 2015 and 2030, respectively). Noise effects during construction of the Proposed Actions are analyzed and discussed in Chapter 21, "Construction." Cumulative effects of Phase 1 operation and Phase 2 construction are also discussed in Chapter 21.

PRINCIPAL CONCLUSIONS

The analysis concludes that in 2015, when construction of Phase 1 of the project is completed, the Proposed Actions would result in a significant noise impact at one location—Receptor Site 10 (see Figure 20-1) on West 125th Street at St. Clair Place and West 129th Street. At Receptor Site 10, $L_{eq(1)}$ values would increase by 3.2 and 5.0 dBA during the AM and PM peak periods, respectively. These increases would exceed the City Environmental Quality Review (CEQR) impact criteria and constitute a significant adverse impact. The impact is due to a combination of project-generated traffic and the installation of a traffic signal midblock (between Twelfth Avenue and Broadway) on West 125th Street to improve the flow of pedestrian traffic at this currently unsignaled intersection. There are no non-Columbia buildings immediately adjacent to this location that would be impacted. Development Sites 4 and 5 of the Proposed Project are immediately adjacent to this location. Site 4 is proposed for academic use (or for University housing), and Site 5 is proposed for retail use. These buildings would be designed with double-glazed windows and air conditioning to avoid significant adverse noise impacts on their users. Therefore, the noise impact at Receptor Site 10 would only impact pedestrians at ground level.

In 2030, the increase in noise levels from project-generated traffic at Receptor Site 10 would exceed the *CEQR Technical Manual* impact criteria in the AM and PM peak periods. Compared with $L_{eq(1)}$ 2030 No Build noise levels, 2030 Build noise levels at Receptor Site 10 would increase by 3.5 and 4.9 dBA during the AM and PM peak periods, respectively. Similar to the 2015 analysis results, these increases in noise levels would exceed the CEQR impact criteria and be considered a significant adverse impact. There are no non-Columbia buildings immediately adjacent to this location that would be impacted. Development Sites 4 and 5 of the Proposed Project are immediately adjacent to this location. Site 4 is proposed for academic use (or University housing), and Site 5 is proposed for retail use. These buildings would be designed



- Project and Rezoning Area Boundary
- Subdistrict Boundary
- 1 Noise Receptor Location
- Residential
- Residential (with Ground Floor Retail)
- Residential (with Institutional)
- Retail
- Retail and Parking
- Office
- Hotel
- Dormitory
- Institutional
- Entertainment
- Industrial
- Industrial with Open Space
- Auto-Related
- Warehouse/Storage
- Warehouse/Storage, Parking
- Warehouse/Storage, Retail
- Transportation/Utilities
- Open Space
- Vacant Parcel
- Vacant Building
- Under Construction

Figure 20-1

Existing Land Use: Noise Receptor Locations

with double-glazed windows and air conditioning to avoid significant adverse noise impacts on their users.

In addition, noise levels within the Proposed Actions' new open space areas would be above the *CEQR Technical Manual* noise exposure guideline of 55 dBA $L_{10(1)}$ for outdoor areas requiring serenity and quiet. Although noise levels in the new open space areas would be above the CEQR guideline, they would be comparable to noise levels in several other New York City open space areas and parks, including Hudson River Park, Riverside Park, Central Park, Bryant Park, and Paley Park, and would not result in a significant adverse noise impacts.

B. NOISE FUNDAMENTALS

Quantitative information on the effects of airborne noise on people is well-documented. If sufficiently loud, noise may interfere with human activities such as sleep, speech communication, and tasks requiring concentration or coordination. It may also cause annoyance, hearing damage, and other physiological problems. Several noise scales and rating methods are used to quantify the effects of noise on people, taking into consideration such factors as loudness, duration, time of occurrence, and changes in noise level with time. However, it must be noted that all the stated effects of noise on people vary greatly with each individual.

"A"-WEIGHTED SOUND LEVEL (dBA)

Noise is typically measured in units called decibels (dB), which are 10 times the logarithm of the ratio of the sound pressure squared to a standard reference presence squared. Because loudness is important in the assessment of the effects of noise on people, the dependence of loudness on frequency must be taken into account in the noise scale used in environmental assessments. One of the simplified scales that accounts for the dependence of perceived loudness on frequency is the use of a weighting network, known as "A"-weighting, in the measurement system to simulate the response of the human ear. For most noise assessments, the A-weighted sound pressure level in units of dBA is used in view of its widespread recognition and its close correlation with perception. In the current study, all measured noise levels are reported in A-weighted decibels (dBA). Common noise levels in dBA are shown in Table 20-1.

ABILITY TO PERCEIVE CHANGES IN NOISE LEVELS

The average ability of an individual to perceive changes in noise levels is well-documented (see Table 20-2). Generally, changes in noise levels of less than 3 dBA are barely perceptible to most listeners, whereas changes in noise levels of 10 dBA are normally perceived as doubling (or halving) of noise loudness. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

NOISE DESCRIPTORS USED IN IMPACT ASSESSMENT

Because the sound pressure level unit of dBA describes a noise level at just one moment, and because very few noises are constant, other ways of describing noise over more extended periods have been developed. One way is to describe the fluctuating noise heard over a specific 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 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 sometimes used to indicate noise levels that are exceeded 1, 10, 50, 90, and x percent of the time, respectively. Discrete event peak levels are given as L_{01} levels.

Table 20-1
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.

Table 20-2
Average Ability to Perceive Changes in Noise Levels

Change (dBA)	Human Perception of Sound
2–3	Barely perceptible
5	Readily noticeable
10	A doubling or halving of the loudness of sound
20	A "dramatic change"
40	Difference between a faintly audible sound and a very loud sound

Source: Bolt Beranek and Neuman, Inc., *Fundamentals and Abatement of Highway Traffic Noise*, Report No. PB-222-703. Prepared for Federal Highway Administration, June 1973.

For purposes of the Proposed Actions, the maximum 1-hour equivalent sound level ($L_{eq(1)}$) has been selected as the noise descriptor to be used in this noise impact evaluation. $L_{eq(1)}$ is the noise descriptor recommended for use in the *CEQR Technical Manual* for vehicular traffic and construction noise impact evaluation, and is used to provide an indication of highest expected sound levels. 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

Noise levels associated with the construction and operation of the Proposed Actions would be subject to the emission source provisions of the New York City Noise Control Code and to noise criteria set for the CEQR process. Other standards and guidelines promulgated by federal agencies

do not apply to project noise control, but are useful to review in that they establish measures of impacts. Construction equipment is regulated by the Noise Control Act of 1972.

NEW YORK CITY NOISE CONTROL CODE

The New York City Noise Control Code, amended in December 2005, contains prohibitions regarding unreasonable noise, requirements for noise due to construction activities, and specific noise standards, including plainly audible criteria for specific noise sources. In addition, the amended code specifies that no sound source operating in connection with any commercial or business enterprise may exceed the decibel levels in the designated octave bands shown in Table 20-3 at the specified receiving properties.

Table 20-3
New York City Noise Codes

Octave Band Frequency (Hz)	Maximum Sound Pressure Levels (dB) as Measured Within a Receiving Property as Specified Below	
	Residential receiving property for mixed-use building and residential buildings (as measured within any room of the residential portion of the building with windows open, if possible)	*Commercial receiving property (as measured within any room containing offices within the building with windows open, if possible)*
31.5	70	74
63	61	64
125	53	56
250	46	50
500	40	45
1000	36	41
2000	34	39
4000	33	38
8000	32	37

Source: Section 24-232 of the Administrative Code of the City of New York, as amended December 2005.

NEW YORK CEQR NOISE CRITERIA

The *CEQR Technical Manual* contains noise exposure guidelines for use in City environmental impact review, and required attenuation values to achieve acceptable interior noise levels. These values are shown in Tables 20-4 and 20-5. Noise exposure is classified into four categories: "acceptable," "marginally acceptable," "marginally unacceptable," and "clearly unacceptable." The *CEQR Technical Manual* criteria are based on maintaining an interior noise level for the worst-case hour L_{10} or less than or equal to 45 A-weighted decibels (dBA).

Table 20-4
Noise Exposure Guidelines For Use in City Environmental Impact Review[1]

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	---- Ldn ≤ 60 dBA ----	NA	---- 60 < Ldn ≤ 65 dBA ----	NA	(i) 65 < Ldn ≤ 70 dBA, (II) 70 ≤ Ldn	NA	---- Ldn ≤ 75 dBA ----
Hospital, nursing home		$L_{10} \leq 55$ dBA		55 < L_{10} ≤ 65 dBA		65 < L_{10} ≤ 80 dBA		L_{10} > 80 dBA	
Residence, residential hotel, or motel	7 AM to 10 PM	$L_{10} \leq 65$ dBA		65 < L_{10} ≤ 70 dBA		70 < L_{10} ≤ 80 dBA		L_{10} > 80 dBA	
	10 PM to 7 AM	$L_{10} \leq 55$ dBA		55 < L_{10} ≤ 70 dBA		70 < L_{10} ≤ 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-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)	
Commercial or office		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)		Same as Residential Day (7 AM-11 PM)	
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^{y}_{dn} (L_{dn} contour) value.

Table Notes:

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. Examples are grounds for ambulatory hospital patients and patients and residents of sanitariums and nursing homes.

3 One may use FAA-approved L_{dn} contours supplied by the Port Authority, or the noise contours may be computed from the federally approved 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 (adopted policy 1983).

Table 20-5
Required Attenuation Values to Achieve Acceptable Interior Noise Levels

	Marginally Acceptable	Marginally Unacceptable		Clearly Unacceptable		
Noise level with proposed action	65<L_{10}≤70	70<L_{10}≤75	75<L_{10}≤80	80<L_{10}≤85	85<L_{10}≤90	90<L_{10}≤95
Attenuation[1]	25 dB(A)	30dB(A)	35 dB(A)	40 dB(A)	45 dB(A)	50 dB(A)

Note: [1] The above composite window-wall attenuation values are for residential dwellings. Commercial office spaces and meeting rooms would be 5 dB(A) less in each category. All the above categories require a closed window situation and hence an alternate means of ventilation.

Source: New York City Department of Environmental Protection (DEP)

D. IMPACT DEFINITION

As recommended in the *CEQR Technical Manual*, this study uses the following criteria to define a significant adverse noise impact:

- An increase of 5 dBA, or more, in Build $L_{eq(1)}$ noise levels at sensitive receptors (including residences, play areas, parks, schools, libraries, and houses of worship) over those calculated for the No Build condition, if the No Build levels are less than 60 dBA $L_{eq(1)}$ and the analysis period is not a nighttime period.
- An increase of 4 dBA, or more, in Build $L_{eq(1)}$ noise levels at sensitive receptors over those calculated for the No Build condition, if the No Build levels are 61 dBA $L_{eq(1)}$ and the analysis period is not a nighttime period.
- An increase of 3 dBA, or more, in Build $L_{eq(1)}$ noise levels at sensitive receptors over those calculated for the No Build condition, if the No Build levels are greater than 62 dBA $L_{eq(1)}$ and the analysis period is not a nighttime period.
- An increase of 3 dBA, or more, in Build $L_{eq(1)}$ noise levels at sensitive receptors over those calculated for the No Build condition, if the analysis period is a nighttime period (defined by the *CEQR Technical Manual* criteria as being between 10 PM and 7 AM).

E. NOISE PREDICTION METHODOLOGY

GENERAL METHODOLOGY

At all of the receptor sites in the study area, the dominant operational noise sources are vehicular traffic on adjacent and nearby streets and roadways, and train traffic from the elevated No. 1 subway line, which runs along Broadway. Noise from other sources, such as the Metropolitan Transportation Authority (MTA) Manhattanville Bus Depot, the Con Edison transmission line cooling station, Amtrak rail operations, and industrial operations, contribute to ambient noise levels in the area. The TNM model (the Federal Highway Administration [FHWA] *Traffic Noise Model* version 2.5) was used to calculate noise from traffic on adjacent and nearby streets and roadways, and the Federal Transit Administration (FTA) model contained in FTA May 2006 guidance manual, *Transit Noise and Vibration Impact Assessment*, was used to calculate train noise from the elevated No. 1 subway line. The noise analysis examined two weekday conditions: AM and PM time periods. The selected time periods are when the Proposed Actions would have maximum traffic generation and/or the maximum potential for significant adverse noise impacts based on the traffic studies presented in Chapter 17, "Traffic and Parking." (During the weekday MD and late night time periods, and on the weekends, the Proposed Project would generate fewer vehicle trips and have less of a potential for significant adverse noise impacts than during the weekday AM and PM time periods.)

The TNM model and the FTA guidance manual procedures used for analysis are described below.

TNM MODEL

Noise from street and roadway traffic was calculated using the TNM model, which calculates the noise contribution of each roadway segment to a given noise receptor. The noise from each vehicle type is determined as a function of the reference energy-mean emission level, corrected for vehicle volume, speed, roadway grade, roadway segment length, and source-receptor distance. Further considerations included in modeling the propagation path include identifying the shielding

provided by rows of buildings, analyzing the effects of different ground types, identifying source and receptor elevations, and analyzing the effects of any intervening noise barriers.

FTA GUIDANCE MANUAL

Noise from trains on the elevated No. 1 subway line was calculated using the procedures detailed in FTA guidance manual *Transit Noise and Vibration Impact Assessment*, which provides methodologies for determining noise levels produced by transit operations. In general for rail noise, the noise level at a receptor location is a function of source noise level, the number of locomotives and cars per train, the train speed, average hourly volume of train traffic, track type (continuously welded or jointed) and profile (at-grade or elevated), source/receptor distance, shielding, and special operational characteristics (e.g., curve squeal).

ANALYSIS PROCEDURE

In general, the following procedure was used in performing the noise analysis:

- Existing noise levels were determined at each analysis (receptor) site, for each analysis time period, by performing field measurements;
- The traffic component of the existing noise levels was calculated based on existing traffic values (see Chapter 17) on adjacent and nearby streets, using the TNM model;
- The rail component of the existing noise level from trains on the No. 1 subway line was calculated based upon train schedules using FTA guidance manual procedures;
- The logarithmic sum of the calculated traffic and rail components of the existing noise level was subtracted either logarithmically from the measured existing (total) noise level and the remainder was assumed to be stationary source noise at receptor location immediately adjacent to the MTA Manhattanville Bus Depot, and/or from the Con Edison transmission line cooling station; or subtracted arithmetically from the measured existing noise level, and the remainder was assumed to be a correction factor (to account for noise from parking lots, street noise, noise from manufacturing operations, model inaccuracies, etc.); and
- Noise levels for existing, No Build, and Build conditions for the analysis time periods were determined as the sum of the calculated noise components from traffic (based upon traffic values developed in Chapter 17[1]), rail (based upon existing train schedules), and other sources or the calculated correction factor.

Summary tables showing the specific components of the noise analysis are provided in Appendix J.

BUILDING REFLECTIONS

An analysis was performed using the Cadna A model to examine whether reflections of sound from adding new buildings would increase noise levels along the Broadway corridor. The Cadna A model is a computerized model developed by DataKustik for noise prediction and assessment. The model can be used for the analysis of a wide variety of noise sources, including stationary sources (e.g., construction equipment, industrial equipment, power generation equipment, etc.), transportation sources (e.g., roads, highways, railroad lines, busways, airports, etc.), and other specialized sources (e.g., sporting facilities, etc.) The model takes into account the noise power

[1] These traffic values reflect the reasonable worst-case development scenario.

levels of the noise sources, attenuation with distance, ground contours, reflections from barriers and structures, attenuation due to shielding, etc. The Cadna A model is based on the acoustic propagation standards promulgated in International Standard ISO 9613-2. This standard is currently under review for adoption by the American National Standards Institute as an American standard. The Cadna A model is a state-of-the-art tool for noise analysis.

The model results showed that there would be no increase in noise levels at ground-level receptor sites, and at elevated locations the maximum increases would be approximately 0.2 to 0.9 dBA. Increases of this magnitude would be imperceptible. Since they occur at upper locations, the effects of these increases have not been included in the predictions of future noise levels at the receptor locations, which are located at ground level.

F. EXISTING CONDITIONS

SITE DESCRIPTION

The Project Area (described in detail in Chapter 1, "Project Description") is predominantly industrial, comprising mostly light manufacturing, automotive-related uses and parking, warehouses/storage facilities, and transportation and utility uses, with some housing. Immediately adjacent to the proposed Academic Mixed-Use Area (Subdistrict A) are three major housing complexes—Riverside Park Community, Manhattanville Houses, and 560 Riverside Drive, a Columbia University-owned housing complex—and a public school (I.S. 195). (See Chapter 3, "Land Use, Zoning, and Public Policy," and Chapter 5, "Community Facilities and Services," for further discussion.)

SELECTION OF NOISE RECEPTOR LOCATIONS

Fifteen receptor sites in the Project Area were selected for project impact assessment purposes. Table 20-6 lists the locations of each noise receptor site and their associated existing surrounding land uses. Figure 20-1 shows the receptor site locations and existing land uses, and Figure 20-2 shows the receptor locations and illustrative land use plan. The receptor sites include representative noise-sensitive locations, principally locations with residential land uses, and locations where maximum project impacts would be expected. With the exception of Receptor Site 14, at Broadway between West 120th and West 121st Streets, all of the receptor sites are within the proposed Manhattanville Special Mixed-Use District (i.e., the Project Area). At other locations, particularly locations outside the Project Area, project-generated traffic would be less and/or would constitute a small portion of the existing and/or No Build traffic volume, and consequently would not have the potential for causing a significant increase in noise levels.

NOISE MONITORING

At each receptor location, 20-minute noise measurements were made for four time periods to determine existing noise levels. measurements were taken on April 27–29, 2004; May 1, 4–6, 8, 9, and 15, 2004; October 12, 2004; August 15, 2006; and September 23, 2006.

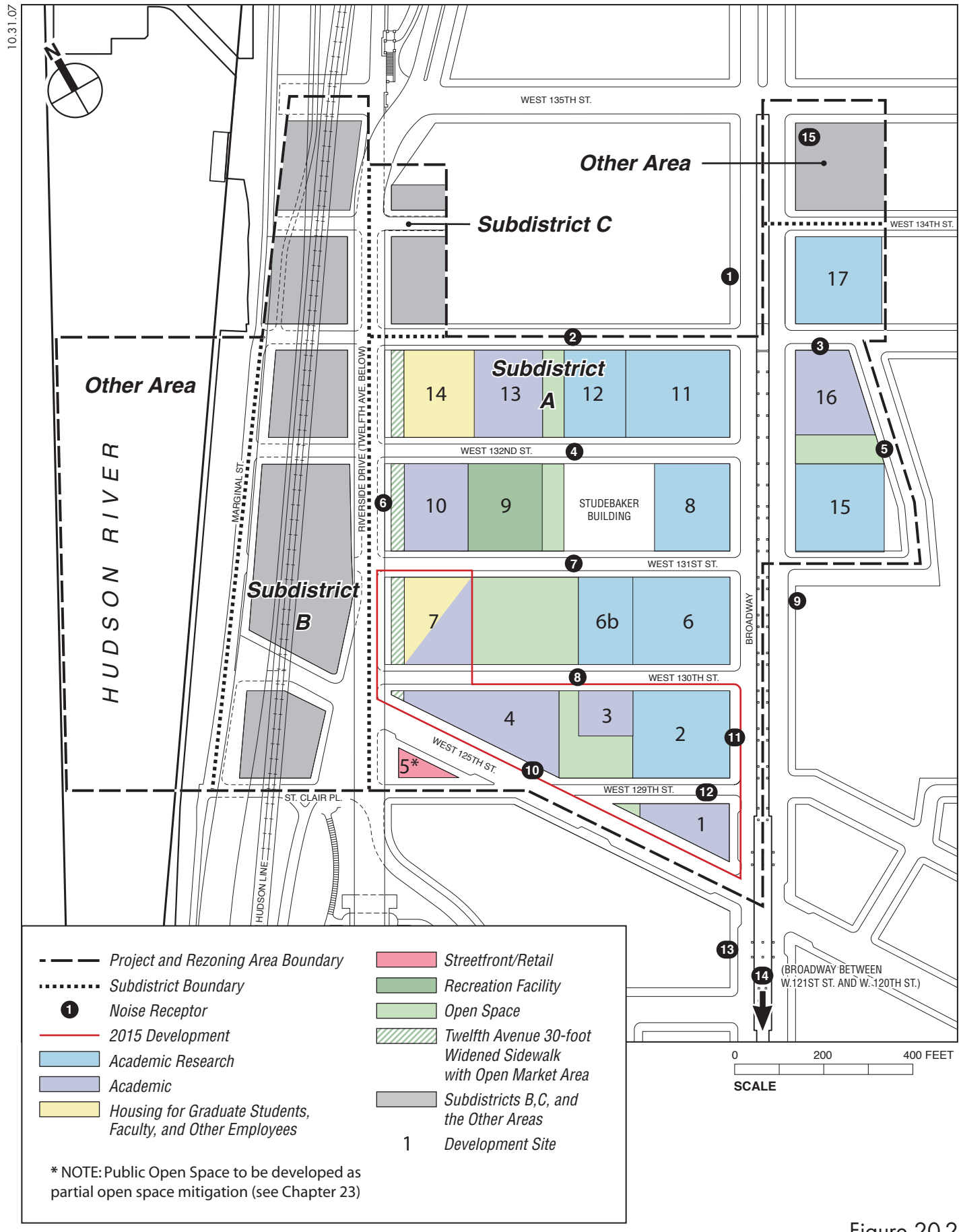


Figure 20-2

Noise Receptor Locations

Subdistrict A: Illustrative Land Use Plan

Table 20-6
Noise Receptor Locations

Receptor	Location	Associated Land Use
1	Broadway between West 133rd and West 135th Streets	Residential
2	West 133rd Street between Twelfth Avenue and Broadway	Residential/school
3	West 133rd Street between Broadway and Old Broadway	Commercial
4	West 132nd Street between Twelfth Avenue and Broadway	Commercial
5	Old Broadway between West 131st and West 133rd Streets	Residential
6	Twelfth Avenue between West 131st and West 132nd Streets	Commercial
7	West 131st Street between Twelfth Avenue and Broadway	Commercial
8	West 130th Street between Twelfth Avenue and Broadway	Commercial
9	Broadway between West 130th and West 131st Streets	Residential
10	West 125th Street between Twelfth Avenue and St. Clair Place	Residential/commercial
11	Broadway between West 129th and West 130th Streets	Commercial
12	West 129th Street between West 125th Street and Broadway	Commercial
13	Broadway between Tiemann Place and West 125th Street	Residential/commercial
14	Broadway between West 120th and West 121st Streets	Institutional
15	West 135th Street between Broadway and Amsterdam Avenue	Commercial

EQUIPMENT USED DURING NOISE MONITORING

Measurements were performed using Brüel & Kjær Noise Level Meters Type 2260, Brüel & Kjær Sound Level Calibrators Type 4231, and Brüel & Kjær ½-inch microphones Type 4189. The Brüel & Kjær meters are Type 1 noise meters. The instruments were mounted on a tripod at a height of 5 feet above the ground. The meters were calibrated before and after readings using Brüel & Kjær Type 4231 sound level calibrators with the appropriate adaptors. The data were digitally recorded by the sound 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}, and L_{90}. Windscreens were used during all sound measurements except for calibration. All measurement procedures conformed to the requirements of ANSI Standard S1.13-1971 (R1976).

RESULTS OF BASELINE MEASUREMENTS

Table 20-7 summarizes the results of the baseline measurements for the AM and PM analysis hours.[1] Values are shown for specific monitored weekday time periods. In general, noise levels are directly related to the volume of traffic on the immediately adjacent street and the proximity of the receptor location to train noise. Noise levels along Broadway, West 125th Street, and Twelfth Avenue are relatively high, while noise levels along lightly trafficked street and streets that are either shielded from train noise or have no above-grate trains, such as Broadway between West 120th and 121st Streets, are moderate during most hours.

In terms of CEQR noise exposure guidelines (shown in Table 20-4), during the hour with the highest measured noise levels, existing noise levels at receptors 9, 11, and 13 are in the "clearly unacceptable" category; receptors 1, 2, 3, 4, 6, 10, 12, 14, and 15 are in the "marginally unacceptable" category; and receptors 5, 7, and 8 are in the "marginally acceptable" category. These values are based on the measured L_{10} values.

[1] Impact analyses were performed for AM and PM peak periods only, since these are the periods where maximum project impacts would be expected to occur.

Table 20-7
Measured Existing Noise Levels (in dBA)

Receptor	Location		Time	$L_{eq(1)}$	L_1	L_{10}	L_{50}	L_{90}
1	Broadway between West 133rd and West 135th Streets	Weekday	AM	72.4	79.5	76.0	70.0	63.0
		Weekday	PM	72.4	80.5	76.0	69.0	64.0
2	West 133rd Street between Twelfth Avenue and Broadway	Weekday	AM	71.5	77.5	73.5	70.0	69.0
		Weekday	PM	70.0	77.4	71.4	66.0	64.2
3	West 133rd Street between Broadway and Old Broadway	Weekday	AM	71.9	81.0	76.5	69.0	65.0
		Weekday	PM	70.3	79.5	75.0	68.0	64.5
4	West 132nd Street between Twelfth Avenue and Broadway	Weekday	AM	72.9	78.0	73.5	72.0	71.5
		Weekday	PM	69.3	78.0	73.0	65.4	62.0
5	Old Broadway between West 131st and West 133rd Streets	Weekday	AM	64.9	72.8	68.2	62.4	58.0
		Weekday	PM	63.7	72.0	67.0	60.6	58.0
6	Twelfth Avenue between West 131st and West 132nd Streets	Weekday	AM	74.3	80.5	76.5	73.0	71.0
		Weekday	PM	67.4	79.0	73.0	68.0	66.0
7	West 131st Street between Twelfth Avenue and Broadway	Weekday	AM	67.3	74.5	69.0	65.5	63.0
		Weekday	PM	64.6	74.0	68.5	60.0	58.0
8	West 130th Street between Twelfth Avenue and Broadway	Weekday	AM	62.0	77.5	67.0	62.5	60.5
		Weekday	PM	60.6	74.5	68.0	62.0	58.5
9	Broadway between West 130th and West 131st Streets	Weekday	AM	79.1	90.0	84.5	70.5	64.5
		Weekday	PM	77.3	88.0	82.5	68.0	62.5
10	West 125th Street between Twelfth Avenue and St. Clair Place	Weekday	AM	70.3	81.5	73.5	69.5	66.0
		Weekday	PM	71.1	78.0	73.2	69.8	65.8
11	Broadway between West 129th and West 130th Streets	Weekday	AM	79.8	92.0	82.5	71.0	65.5
		Weekday	PM	79.2	93.0	81.5	67.5	60.0
12	West 129th Street between West 125th Street and Broadway	Weekday	AM	69.9	81.5	75.0	66.5	61.5
		Weekday	PM	68.3	81.5	72.5	62.0	59.5
13	Broadway between Tiemann Place and West 125th Street	Weekday	AM	76.6	86.5	81.5	71.5	66.5
		Weekday	PM	75.7	85.0	81.0	69.5	65.0
14	Broadway between West 120th and West 121st Streets	Weekday	AM	72.8	82.5	77.0	70.0	62.5
		Weekday	PM	66.3	78.0	72.0	67.0	62.5
15	West 135th Street between Broadway and Amsterdam Avenue	Weekday	AM	73.7	82.2	77.0	70.4	66.2
		Weekday	PM	74.6	84.2	78.4	70.6	66.7

Note: Field measurements were performed by AKRF, Inc. on April 27–29, 2004; May 1, 4–6, 8, 9, and 15, 2004; and October 12, 2004; and August 15, 2006, and September 23, 2006.

G. 2015 FUTURE WITHOUT THE PROPOSED ACTIONS

Using the methodology previously described, future noise levels without the Proposed Actions were calculated for the 15 receptor sites for the 2015 analysis year. These No Build values are shown in Table 20-8. (Backup materials are provided in Appendix J.)

In 2015, at most locations and during most time periods, the increase in $L_{eq(1)}$ noise levels would be less than 1.0 dBA, an imperceptible change. The maximum increase in $L_{eq(1)}$ noise levels, comparing 2015 No Build noise levels with existing noise levels, would be 1.3 dBA. This would occur at noise Receptor Site 4, at West 132nd Street between Twelfth Avenue and Broadway during the AM time period. A change of this magnitude would be barely perceptible. (At one location, a small decrease in noise levels is predicted to occur during one time period due to projected changes in vehicle speeds.)

In terms of CEQR noise exposure guidelines (shown in Table 20-4), during the hour with the highest measured noise levels, future 2015 noise levels without the Proposed Actions at receptors 9, 11, and 13 would remain in the "clearly unacceptable" category; receptors 1, 2, 3, 4, 6, 10, 12, 14, and 15 would remain in the "marginally unacceptable" category; and receptors 5, 7, and 8 would remain in the "marginally acceptable" category. These values are based on the calculated L_{10} values.

Table 20-8
2015 No Build Noise Levels (in dBA)

Receptor	Location	Time Period	Existing $L_{eq(1)}$	No Build $L_{eq(1)}$	$L_{eq(1)}$ Increase	No Build L_{10}
1	Broadway between West 133rd and West 135th Streets	Weekday AM	72.4	72.4	0.0	76.0
		Weekday PM	72.4	72.7	0.3	76.3
2	West 133rd Street between Twelfth Avenue and Broadway	Weekday AM	71.5	71.8	0.3	73.8
		Weekday PM	70.0	70.2	0.2	71.6
3	West 133rd Street between Broadway and Old Broadway	Weekday AM	71.9	72.7	0.8	77.3
		Weekday PM	70.3	70.8	0.5	75.5
4	West 132nd Street between Twelfth Avenue and Broadway	Weekday AM	72.9	74.2	1.3	74.8
		Weekday PM	69.3	69.5	0.2	73.2
5	Old Broadway between West 131st and West 133rd Streets	Weekday AM	64.9	65.3	0.4	68.6
		Weekday PM	63.7	63.8	0.1	67.1
6	Twelfth Avenue between West 131st and West 132nd Streets	Weekday AM	74.3	75.4	1.1	77.6
		Weekday PM	67.4	68.6	1.2	74.2
7	West 131st Street between Twelfth Avenue and Broadway	Weekday AM	67.3	68.2	0.9	69.9
		Weekday PM	64.6	65.8	1.2	69.7
8	West 130th Street between Twelfth Avenue and Broadway	Weekday AM	62.0	62.5	0.5	67.5
		Weekday PM	60.6	61.1	0.5	68.5
9	Broadway between West 130th and West 131st Streets	Weekday AM	79.1	79.7	0.6	85.1
		Weekday PM	77.3	77.7	0.4	82.9
10	West 125th Street between Twelfth Avenue and St. Clair Place	Weekday AM	70.3	70.6	0.3	73.8
		Weekday PM	71.1	70.1	-1.0	72.2
11	Broadway between West 129th and West 130th Streets	Weekday AM	79.8	80.3	0.5	83.0
		Weekday PM	79.2	79.6	0.4	81.9
12	West 129th Street between West 125th Street and Broadway	Weekday AM	69.9	70.1	0.2	75.2
		Weekday PM	68.3	69.0	0.7	73.2
13	Broadway between Tiemann Place and West 125th Street	Weekday AM	76.6	77.1	0.5	82.0
		Weekday PM	75.7	76.1	0.4	81.4
14	Broadway between West 120th and West 121st Streets	Weekday AM	72.8	73.4	0.6	77.6
		Weekday PM	66.3	67.3	1.0	73.0
15	West 135th Street between Broadway and Amsterdam Avenue	Weekday AM	73.7	74.2	0.5	77.5
		Weekday PM	74.6	74.8	0.2	78.6

H. 2015 FUTURE WITH THE PROPOSED ACTIONS

Using the methodology previously described, future noise levels with the Proposed Actions and with the proposed traffic improvements were calculated for the 15 receptor sites for the 2015 analysis year. These Build values are shown in Table 20-9. The results in Table 20-9 show noise impacts due to operational noise after the completion of the Phase 1 construction only. (Backup materials are provided in Appendix J.)

Excluding the effects of construction, in 2015, when construction of Phase 1 of the Proposed Actions would be completed, with the proposed traffic improvements, the increase in $L_{eq(1)}$ noise levels at most locations and during most time periods would be less than 1.0 dBA, an imperceptible change. (At several locations, a small decrease in noise levels is predicted to occur during one or more time periods. These decreases are due to projected changes in vehicle speeds, changes in street configuration, and additional shielding from new buildings.)

Table 20-9
2015 Build Noise Levels (in dBA)

Receptor	Location	Time Period	No Build $L_{eq(1)}$	Build $L_{eq(1)}$	$L_{eq(1)}$ Increase	Build L_{10}
1	Broadway between West 133rd and West 135th Streets	Weekday AM	72.4	72.5	0.1	76.1
		Weekday PM	72.7	72.5	-0.2	76.1
2	West 133rd Street between Twelfth Avenue and Broadway	Weekday AM	71.8	71.7	-0.1	73.7
		Weekday PM	70.2	70.3	0.1	71.7
3	West 133rd Street between Broadway and Old Broadway	Weekday AM	72.7	72.9	0.2	77.5
		Weekday PM	70.8	70.9	0.1	75.6
4	West 132nd Street between Twelfth Avenue and Broadway	Weekday AM	74.2	74.4	0.2	75.0
		Weekday PM	69.5	69.7	0.2	73.4
5	Old Broadway between West 131st and West 133rd Streets	Weekday AM	65.3	64.0	-1.3	67.3
		Weekday PM	63.8	62.8	-1.0	66.1
6	Twelfth Avenue between West 131st and West 132nd Streets	Weekday AM	75.4	76.4	1.0	78.6
		Weekday PM	68.6	69.4	0.8	75.0
7	West 131st Street between Twelfth Avenue and Broadway	Weekday AM	68.2	67.8	-0.4	69.5
		Weekday PM	65.8	65.6	-0.2	69.5
8	West 130th Street between Twelfth Avenue and Broadway	Weekday AM	62.5	63.5	1.0	68.5
		Weekday PM	61.1	62.4	1.3	69.8
9	Broadway between West 130th and West 131st Streets	Weekday AM	79.7	80.3	0.6	85.7
		Weekday PM	77.7	78.3	0.6	83.5
10	West 125th Street between Twelfth Avenue and St. Clair Place	Weekday AM	70.6	73.6	**3.0**	76.8
		Weekday PM	70.1	74.9	**4.8**	77.0
11	Broadway between West 129th and West 130th Streets	Weekday AM	80.3	80.3	0.0	83.0
		Weekday PM	79.6	79.9	0.3	82.2
12	West 129th Street between West 125th Street and Broadway	Weekday AM	70.1	69.9	-0.2	75.0
		Weekday PM	69.0	68.9	-0.1	73.1
13	Broadway between Tiemann Place and West 125th Street	Weekday AM	77.1	76.5	-0.6	81.4
		Weekday PM	76.1	75.8	-0.3	81.1
14	Broadway between West 120th and West 121st Streets	Weekday AM	73.4	73.4	0.0	77.6
		Weekday PM	67.3	67.4	0.1	73.1
15	West 135th Street between Broadway and Amsterdam Avenue	Weekday AM	74.2	75.1	0.9	78.4
		Weekday PM	74.8	75.8	1.0	79.6

Notes: Noise levels in bold denotes values that exceed CEQR significant impact criteria.
Noise levels shown for Build conditions assume implementation of proposed traffic improvements.

However, the Proposed Actions would result in a significant adverse noise impact at one location—Receptor Site 10, located on West 125th Street between Twelfth Avenue and St. Clair Place. Comparing 2015 Build noise levels with 2015 No Build noise levels at Receptor Site 10, $L_{eq(1)}$ values would increase by 3.0, and 4.8 dBA, during the AM, and PM peak periods, respectively.[1] These increases would exceed the CEQR impact criteria and constitute a significant adverse impact. The impact is due to a combination of project-generated traffic and assumes the installation of a traffic signal midblock (between Twelfth Avenue and Broadway) on West 125th Street to improve the flow of pedestrian traffic at this unsignaled intersection. There are no non-Columbia buildings immediately adjacent to this location that would be impacted. Development Sites 4 and 5 of the Proposed Project are immediately adjacent to this location. Site 4 is proposed for academic use (or for University housing), and Site 5 is proposed for retail use. These buildings

[1] Increases of this magnitude would occur both at exterior (pedestrian) and interior (within adjacent building) locations.

would be designed with double-glazed windows and air conditioning. These measures would provide a minimum of 35 dBA attenuation on the façades of the buildings on Sites 4 and 5 facing West 125th Street, and avoid significant adverse noise impacts on the users of these buildings. On the south side of 125th Street are 560 Riverside Drive and Prentis Hall, two Columbia buildings. 560 Riverside Drive (a residential building) has double-glazed windows and central air conditioning, and Prentis Hall (an academic building) also contains double-glazed windows and air conditioning. Both buildings provide approximately 35 dBA of attenuation. Therefore, except for the effect on Columbia properties, the noise impact at Receptor Site 10 would only impact pedestrians at ground level.[1] There are no feasible mitigation measures that could be implemented to eliminate the significant noise impacts at this location and allow for a pedestrian crossing at this location.

Noise levels in any open space areas build as part of the Proposed Actions would be above 55 dBA $L_{10(1)}$, exceeding the *CEQR Technical Manual* noise exposure guidelines for outdoor areas requiring serenity and quiet (see Table 20-5). One-hour L_{10} noise levels would be in the low-70 dBA range. 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. However, the noise levels in these new open space areas would be comparable to noise levels in several other open space areas that are also located adjacent to heavily trafficked roadways, including Hudson River Park, Riverside Park, Bryant Park, and Central Park. Although the 55 dBA $L_{10(1)}$ guideline is a worthwhile goal for outdoor areas requiring serenity and quiet, this relatively low noise level is typically not achieved in parks and open space areas in New York City. Consequently, noise levels in the Proposed Actions' new open space areas, while exceeding the 55 dBA $L_{10(1)}$ CEQR guideline value, would not result in a significant adverse noise impacts.

In terms of CEQR noise exposure guidelines (shown in Table 20-4), during the hour with the highest measured noise levels, future 2015 noise levels with the Proposed Actions at receptors 9, 11, and 13 would remain in the "clearly unacceptable" category; receptors 1, 2, 3, 4, 6, 10, 12, 14, and 15 would remain in the "marginally unacceptable" category; and receptors 5, 7, and 8 would remain in the "marginally acceptable" category. These values are based on the calculated L_{10} values.

I. 2030 FUTURE WITHOUT THE PROPOSED ACTIONS

Using the methodology previously described, future noise levels without the Proposed Actions in the year 2030 were calculated for the 15 receptor sites. These No Build values are shown in Table 20-10. (Backup materials are provided in Appendix J.)

In 2030, at most locations and during most time periods, the increase in $L_{eq(1)}$ noise levels would be less than 1.0, an imperceptible change. The maximum increase in $L_{eq(1)}$ noise levels, comparing 2030 No Build noise levels with existing noise levels, would be 1.4 dBA. This would occur at receptor Receptor Site 4, at West 132nd Street between Twelfth Avenue and Broadway, during the AM peak time period; at Receptor Site 6, at Twelfth Avenue between West 131st and West 132nd Streets, during the AM peak time period; and at Receptor Site 7, at West 131st Street between Twelfth Avenue and Broadway, during the PM peak time period. A change of this magnitude would be barely perceptible. (At one location, a small decrease in noise levels is predicted to occur during both time periods due to projected changes in vehicle speeds.)

[1] The projected increases at Site 10 would not affect projected development sites in Subdistrict B.

Table 20-10
2030 No Build Noise Levels (in dBA)

Receptor	Location	Time Period	Existing $L_{eq(1)}$	No Build $L_{eq(1)}$	Increase	No Build L_{10}
1	Broadway between West 133rd and West 135th Streets	Weekday AM	72.4	72.6	0.2	76.2
		Weekday PM	72.4	72.8	0.4	76.4
2	West 133rd Street between Twelfth Avenue and Broadway	Weekday AM	71.5	71.8	0.3	73.8
		Weekday PM	70.0	70.2	0.2	71.6
3	West 133rd Street between Broadway and Old Broadway	Weekday AM	71.9	72.9	1.0	77.5
		Weekday PM	70.3	71.0	0.7	75.7
4	West 132nd Street between Twelfth Avenue and Broadway	Weekday AM	72.9	74.3	1.4	74.9
		Weekday PM	69.3	69.6	0.3	73.3
5	Old Broadway between West 131st and West 133rd Streets	Weekday AM	64.9	65.5	0.6	68.8
		Weekday PM	63.7	63.9	0.2	67.2
6	Twelfth Avenue between West 131st and West 132nd Streets	Weekday AM	74.3	75.7	1.4	77.9
		Weekday PM	67.4	68.1	0.7	73.7
7	West 131st Street between Twelfth Avenue and Broadway	Weekday AM	67.3	68.3	1.0	70.0
		Weekday PM	64.6	66.0	1.4	69.9
8	West 130th Street between Twelfth Avenue and Broadway	Weekday AM	62.0	62.6	0.6	67.6
		Weekday PM	60.6	61.2	0.6	68.6
9	Broadway between West 130th And West 131st Streets	Weekday AM	79.1	79.9	0.8	85.3
		Weekday PM	77.3	77.9	0.6	83.1
10	West 125th Street between Twelfth Avenue and St. Clair Place	Weekday AM	70.3	69.9	-0.4	72.9
		Weekday PM	71.1	69.8	-1.3	71.9
11	Broadway between West 129th And West 130th Streets	Weekday AM	79.8	80.5	0.7	83.2
		Weekday PM	79.2	79.7	0.5	82.0
12	West 129th Street between West West 125th Street and Broadway	Weekday AM	69.9	70.3	0.4	75.4
		Weekday PM	68.3	69.2	0.9	73.4
13	Broadway between Tiemann Place and West 125th Street	Weekday AM	76.6	77.5	0.9	82.4
		Weekday PM	75.7	76.2	0.5	81.5
14	Broadway between West 120th And West 121st Streets	Weekday AM	72.8	73.6	0.8	77.8
		Weekday PM	66.3	67.0	0.7	72.7
15	West 135th Street between Broadway and Amsterdam Avenue	Weekday AM	73.7	74.4	0.7	77.7
		Weekday PM	74.6	75.1	0.5	78.9

In terms of CEQR noise exposure guidelines (shown in Table 20-4), during the hour with the highest measured noise levels, future 2030 noise levels without the Proposed Actions at receptors 9, 11, and 13 would remain in the "clearly unacceptable" category; receptors 1, 2, 3, 4, 6, 10, 12, 14, and 15 would remain in the "marginally unacceptable" category; and receptors 5 and 8 would remain in the "marginally acceptable" category. Future 2030 noise levels without the Proposed Project would now be in the "marginally unacceptable" category for receptor 7. These values are based on the calculated L_{10} values.

J. 2030 FUTURE WITH THE PROPOSED ACTIONS

Using the methodology previously described, future noise levels with the Proposed Actions and with the proposed traffic improvements in 2030 were calculated for the 15 receptor sites. These Build values are shown in Table 20-11. (Backup materials are provided in Appendix J.) The results shown for 2030 assume completion of construction of the Proposed Actions. Values that exceed *CEQR Technical Manual* impact criteria are shown in bold.

Excluding the effects of construction, in 2030, when construction of the Proposed Project is completed, with the proposed traffic improvements, the increase in $L_{eq(1)}$ noise levels at most locations and during most time periods would be less than 2.0, a barely perceptible or imperceptible change. (At a few locations, a decrease in noise levels is predicted to occur during one or more time periods. In general, these decreases would be due to projected changes in vehicle speeds, changes in street configuration, and additional shielding from new buildings.

Noise levels at Receptor Site 2 are projected to decrease significantly due to the elimination of noise from MTA Manhattanville Bus Depot's exhausts on West 133rd and West 132nd Streets.)

Comparing 2030 Build noise levels with 2030 No Build noise levels, $L_{eq(1)}$ noise levels from project-generated traffic at Receptor Site 10, located on West 125th Street between Twelfth Avenue and St. Clair Place (as noted in 2015) would increase by 3.8 and 5.7 dBA during the AM and PM peak time periods, respectively. These increases in noise levels would be readily noticeable, would exceed the CEQR impact criteria, and would constitute a significant adverse impact. The impacts are due to a combination of project-generated traffic and assume the installation of a traffic signal midblock (between Twelfth Avenue and Broadway) on West 125th Street (as noted in 2015). There are no non-Columbia buildings immediately adjacent to these locations that would be impacted. Development Sites 4 and 5 of the Proposed Project are immediately adjacent to this location. Site 4 is proposed for academic use (or University housing), and Site 5 is proposed for retail use. These buildings would be designed with double-glazed windows and air conditioning. These measures would provide a minimum of 35 dBA attenuation on the façades of Sites 4 and 5 facing West 125th Street, and avoid significant adverse noise impacts on users of these buildings. On the south side of 125th Street are 560 Riverside Drive and Prentis Hall, two Columbia buildings. 560 Riverside Drive (a residential building) has double-glazed windows and central air conditioning, and Prentis Hall (an academic building) also contains double-glazed windows and air conditioning. Both buildings provide approximately 35 dBA of attenuation. Therefore, except for the effect on Columbia properties, the noise impact at Receptor Site 10 would only impact pedestrians at ground level. There are no feasible mitigation measures that could be implemented to eliminate the significant noise impacts at this location and allow for a pedestrian crossing at this location.

Within the Proposed Actions' new 40,000-sf open space (the Square) located midblock between Twelfth Avenue and Broadway, and West 130th and West 131st Streets, and other open space areas, noise levels would be above 55 dBA $L_{10(1)}$, exceeding the *CEQR Technical Manual* noise exposure guidelines for outdoor areas requiring serenity and quiet (see Table 20-5). One-hour L_{10} noise levels in the Square would be in the low-70 dBA range and are due to a combination of traffic and rail noise. 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. However, the noise levels in these new open space areas would be comparable to noise levels in several other open space areas that are also located adjacent to heavily trafficked roadways, including Hudson River Park, Riverside Park, Bryant Park, and Central Park. Although the 55 dBA $L_{10(1)}$ guideline is a worthwhile goal for outdoor areas requiring serenity and quiet, this relatively low noise level is typically not achieved in parks and open space areas in New York City. Consequently, noise levels in the Proposed Actions' new open space areas, while exceeding the 55 dBA $L_{10(1)}$ CEQR guideline value, would not result in a significant adverse noise impacts.

In terms of CEQR noise exposure guidelines (shown in Table 20-4), during the hour with the highest-measured noise levels, future 2030 noise levels with the Proposed Actions at receptors 9, 11, and 13 would remain in the "clearly unacceptable" category; receptors 1, 3, 4, 6, 7, 12, and 14 would remain in the "marginally unacceptable" category; and receptors 5 and 8 would remain in the "marginally acceptable" category. Future 2030 noise levels with the Proposed Project would now be in the "clearly unacceptable" category for receptors 10 and 15, and the "marginally acceptable" category for receptor 2. These values are based on the calculated L_{10} values.

Table 20-11
2030 Build Noise Levels (in dBA)

Receptor	Location	Time Period	No Build $L_{eq(1)}$	Build $L_{eq(1)}$	Increase	Build L_{10}
1	Broadway between West 133rd and West 135th Streets	Weekday AM	72.6	73.0	0.4	76.6
		Weekday PM	72.8	73.1	0.3	76.7
2	West 133rd Street between Twelfth Avenue and Broadway	Weekday AM	71.8	66.7	-5.1	68.7
		Weekday PM	70.2	66.4	-3.8	67.8
3	West 133rd Street between Broadway and Old Broadway	Weekday AM	72.9	73.0	0.1	77.6
		Weekday PM	71.0	71.1	0.1	75.8
4	West 132nd Street between Twelfth Avenue and Broadway	Weekday AM	74.3	73.3	-1.0	73.9
		Weekday PM	69.6	69.9	0.3	73.6
5	Old Broadway between West 131st and West 133rd Streets	Weekday AM	65.5	64.9	-0.6	68.2
		Weekday PM	63.9	63.5	-0.4	66.8
6	Twelfth Avenue between West 131st and West 132nd Streets	Weekday AM	75.7	77.3	1.6	79.5
		Weekday PM	68.1	69.6	1.5	75.2
7	West 131st Street between Twelfth Avenue and Broadway	Weekday AM	68.3	70.3	2.0	72.0
		Weekday PM	66.0	68.7	2.7	72.6
8	West 130th Street between Twelfth Avenue and Broadway	Weekday AM	62.6	64.3	1.7	68.3
		Weekday PM	61.2	62.4	1.2	68.8
9	Broadway between West 130th and West 131st Streets	Weekday AM	79.9	80.6	0.7	86.0
		Weekday PM	77.9	78.9	1.0	84.1
10	West 125th Street between Twelfth Avenue and St. Clair Place	Weekday AM	69.9	73.7	**3.8**	76.7
		Weekday PM	69.8	75.5	**5.7**	77.6
11	Broadway between West 129th and West 130th Streets	Weekday AM	80.5	80.8	0.3	83.5
		Weekday PM	79.7	80.6	0.9	82.9
12	West 129th Street between West 125th Street and Broadway	Weekday AM	70.3	70.3	0.0	75.4
		Weekday PM	69.2	69.3	0.1	73.5
13	Broadway between Tiemann Place and West 125th Street	Weekday AM	77.5	77.1	-0.4	82.0
		Weekday PM	76.2	76.4	0.2	81.7
14	Broadway between West 120th Street and West 121st Streets	Weekday AM	73.6	74.0	0.4	78.2
		Weekday PM	67.0	68.0	1.0	73.7
15	West 135th Street between Broadway and Amsterdam Avenue	Weekday AM	74.4	75.3	0.9	78.6
		Weekday PM	75.1	76.9	1.8	80.7

Note: Noise levels in bold denotes values that exceed CEQR significant impact criteria.
Noise levels shown for Build conditions assume implementation of proposed traffic improvements.

K. PROBABLE IMPACTS OF THE PROPOSED ACTIONS WITHOUT PROPOSED IMPROVEMENTS

In Appendix M, analyses are presented which examined potential impacts of the Proposed Actions without the traffic improvements that are proposed as part of the Proposed Actions. The analyses presented include an analysis of potential noise impacts at noise Receptor Sites 6, 10, and 13. These three noise receptor sites were selected for analysis because they are the locations which, based upon the analyses of the Proposed Actions with proposed transportation improvements, have the largest incremental change in noise levels (i.e., comparing Build with No Build values). At most other locations the incremental change in noise levels was less then 1 dBA, an imperceptible difference. Noise levels for Build conditions without transportation improvements were calculated using the methodology previously described that was used for determining No Build and Build (with transportation improvements) noise levels.

As shown in Appendix M, with one exception, Build noise levels, both with and without the proposed transportation improvements, would be comparable. The exception would be Receptor Site 10, where the midblock crossing traffic light that is part of the transportation improvements proposed as part of the Proposed Actions would result in a significant adverse noise impact. For Build conditions without the traffic improvements (i.e., without the midblock traffic signal), no

significant adverse noise impacts would occur at this location.

Based upon the analysis results presented in Appendix M, it can be concluded that the Proposed Actions without the proposed traffic improvements would not result in any significant adverse noise impacts.

L. BUILDING ATTENUATION FOR PROJECT BUILDINGS

The *CEQR Technical Manual* also requires an analysis of the effect of bringing a sensitive use, such as a residential use, into an urban environment. As shown in Table 20-5, the *CEQR Technical Manual* has set noise attenuation values for new buildings that are to be constructed as part of the Proposed Actions, 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 use areas. The level of building attenuation necessary is determined based on exterior $L_{10(1)}$ noise levels.

Table 20-12 shows the maximum building attenuation required to comply with the CEQR 45 dBA L_{10} requirement. The values shown in the table are for the full build-out of the project in the year 2030. (Maximum building attenuation values for each development site on a façade-by-façade basis are provided in Appendix J.) Noise levels in the year 2015 would be less than in 2030 and consequently only the 2030 building attenuation values are shown. In the case of buildings with façades along either Broadway or Twelfth Avenue, the values shown in the table are based upon calculated noise levels at an elevated location adjacent to either the elevated train tracks or the elevated roadway. Noise levels at these elevated locations would be higher than noise levels at ground-level locations or at the upper stories of the building.

The proposed buildings that would be built by Columbia University within Subdistrict A would include both double-glazed windows and central air conditioning (i.e., alternative ventilation). These measures would provide a minimum of 35 dBA attenuation. At Sites 1, ~~4~~, 6, 7 8, 10, 14 and 15 the building design would provide for achieving at least 40 dBA of attenuation at the noisiest façades. At Site 16 the building design would provide for achieving at least 45 dBA attenuation at the noisiest façade(s). With these measures, interior levels within these buildings would satisfy CEQR requirements, as shown in Table 20-12. To ensure that the levels of attenuation shown in Table 20-12 are provided, noise attenuation requirements for the development site within the Academic Mixed-Use Area (Subdistrict A) will be provided in a Restrictive Declaration. Buildings within the Subdistrict B (Sites 18, 19, 20, 21, 22, and 23) would require 30 dBA of attenuation at their noisiest façades to satisfy CEQR requirements, and buildings within the Other Area east of Broadway (sites 24 and 25) would require 40 dBA of attenuation at their noisiest façades to satisfy CEQR requirements. Sites within Subdistrict B and the Other Area east of Broadway that would be rezoned would have an E-designation to ensure that CEQR interior noise requirements are met.

M. MECHANICAL SYSTEMS

Design and specifications for mechanical equipment, such as heating, ventilation, and air conditioning (HVAC), and elevator motors, are currently under way. However, this equipment would be designed to incorporate sufficient noise reduction devices to comply with applicable noise regulations and standards (including the standards contained in the revised New York City Noise Control Code), and to ensure that this equipment does not result in any significant increases in noise levels by itself or cumulatively with other project noise sources.

Table 20-12
Maximum Building Attenuation to Comply with CEQR Requirements in the Year 2030

Location	Phase 2	
	Build L_{10} (dBA)	Building Attenuation (dBA)
Subdistrict A-Site 1	83.5	40
Subdistrict A-Site 2	83.5	35
Subdistrict A-Site 3	75.4	35
Subdistrict A-Site 4	79.9	35*,***
Subdistrict A-Site 5	79.9	30*
Subdistrict A-Site 6	86.0	40
Subdistrict A-Site 6b	72.6	25
Subdistrict A-Site 7	81.8	40*,***
Subdistrict A-Site 8	86.0	40
Subdistrict A-Site 9	73.9	30
Subdistrict A-Site 10	81.8	40*
Subdistrict A-Site 11	83.5	35
Subdistrict A-Site 12	73.9	25
Subdistrict A-Site 13	73.9	30***
Subdistrict A-Site 14	81.8	40*,***
Subdistrict A-Site 15	86.0	40*
Subdistrict A-Site 16	86.0	45*
Subdistrict A-Site 17	77.5	35*,***
Subdistrict B**-Site 18	79.5	30*
Subdistrict B**-Site 19	79.5	30*
Subdistrict B**-Site 20	79.5	30*
Subdistrict B**-Site 21	79.5	30*
Subdistrict B**-Site 22	79.5	30*
Subdistrict B**-Site 23	79.5	30*
Other Area east of Broadway**-Site 24	80.7	40
Other Area east of Broadway**-Site 25	80.7	40***

Note:

* Building attenuation levels are based upon calculated elevated values adjacent to the Riverside Drive viaduct. Less attenuation may be sufficient to satisfy CEQR requirements at elevations below the viaduct, and at elevations a few stories above the viaduct. Similarly, less attenuation may be sufficient to satisfy CEQR requirements at locations shielded from the Riverside Drive viaduct.

** Block and lot description are shown in Table 2-2.

*** Possible residential use. All other sites are non-residential use.

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