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 the proposed building and other features on the project site is completed in 2013). Noise effects during construction are discussed qualitatively in Chapter 16, "Construction Impacts."

PRINCIPAL CONCLUSIONS

The analysis concludes that project-generated traffic would not be expected to produce significant increases in noise levels at any location near and/or adjacent to the project site. In addition, with the design measures the applicant would incorporate in the proposed building, noise levels within the proposed development would comply with all applicable requirements. Therefore, the proposed actions would not result in any significant adverse noise impacts.

Existing L_{10} noise levels at the proposed development site range from approximately the mid 50s dBA to mid 70s dBA. Noise levels within certain areas in the proposed new publicly accessible open spaces that would be created on-site as part of the proposed actions would be above the 55 dBA $L_{10(1)}$ noise level, recommended in the *City Environmental Quality Review (CEQR) Technical Manual* noise exposure guidelines for outdoor areas requiring serenity and quiet. While noise levels in this new open space area would be above the 55 dBA $L_{10(1)}$ guideline noise level, they would be comparable to noise levels in a number of open spaces and parks in New York City, including Prospect Park, Fort Greene Park, Hudson River Park, Riverside Park, Bryant Park, ~~Prospect Park, Fort Greene Park,~~ and other urban open space areas, and would not result in a significant noise impact. The proposed project would not create an impact on the nearby Bensonhurst Park.

B. ACOUSTICAL 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 pressure 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 this study, all measured noise levels are reported in A-weighted decibels (dBA). Common noise levels in dBA are shown in **Table 13-1**.

Table 13-1
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

Notes: 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.

ABILITY TO PERCEIVE CHANGES IN NOISE LEVELS

The average ability of an individual to perceive changes in noise levels is well documented (see **Table 13-2**). 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.

Table 13-2
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
Sources:	Bolt Beranek and Newman, Inc., *Fundamentals and Abatement of Highway traffic Noise*, Report No. PB-222-703. Prepared for Federal Highway Administration, June 1973.

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.

For the analysis 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 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.

NEW YORK CITY NOISE CONTROL CODE

The New York City Noise Control Code, amended in December 2005, contains prohibitions regarding unreasonable noise 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 13-3** at the specified receiving properties.

Table 13-3
New York City Noise Control Code

Octave Band Frequency (Hz)	Maximum Sound Pressure Levels (dB) as Measured Within a Receiving Property	
	Residential receiving property for mixed-use building and residential buildings[1]	Commercial receiving property[2]
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

Notes:
1. As measured within any room of the residential portion of the building with windows open, if possible.
2. As measured within any room containing offices within the building with windows open, if possible.

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 13-4** and **13-5**. 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 $L_{10(1)}$ less than or equal to 45 dBA (for commercial uses it would be the worst-case hour $L_{10(1)}$ less than or equal to 50 dBA).

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 scenario, 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 scenario, 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 scenario, 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 scenario, if the analysis period is a nighttime period (defined by the *CEQR Technical Manual* criteria as being between 10 PM and 7 AM).

Table 13-4
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]		$L_{10} \le 55$ dBA	-------- $Ldn \le 60$ dBA --------	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
Hospital, nursing home		$L_{10} \le 55$ dBA		$55 < L_{10} \le 65$ dBA	-------- $60 < Ldn \le 65$ dBA --------	$65 < L_{10} \le 80$ dBA	(I) $65 < Ldn \le 70$ dBA, (II) $70 \le Ldn$	$L_{10} > 80$ dBA	-------- $Ldn \le 75$ dBA --------
Residence, residential hotel, or motel	7 AM to 10 PM	$L_{10} \le 65$ dBA		$65 < L_{10} \le 70$ dBA		$70 < L_{10} \le 80$ dBA		$L_{10} > 80$ dBA	
	10 PM to 7 AM	$L_{10} \le 55$ dBA		$55 < L_{10} \le 70$ dBA		$70 < L_{10} \le 80$ 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 13-5~~
~~Required Attenuation Values to Achieve Acceptable Interior Noise Levels~~

	~~Marginally Acceptable~~	~~Marginally Unacceptable~~		~~Clearly Unacceptable~~		
~~Noise level with proposed action~~	~~$65<L_{10}\le70$~~	~~$70<L_{10}\le75$~~	~~$75<L_{10}\le80$~~	~~$80<L_{10}\le85$~~	~~$85<L_{10}\le90$~~	~~$90<L_{10}\le95$~~
~~Attenuation[1]~~	~~25 dB(A)~~	~~30 dB(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.~~

Table 13-5
Required Attenuation Values to Achieve Acceptable Interior Noise Levels

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

Notes:
[A] The above composite window-wall attenuation values are for residential dwellings. Retail uses 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.
[B] Required attenuation values increase by 1 dB(A) increments for L_{10} values greater than 80 dBA.
Source: New York City Department of Environmental Protection.

E. EXISTING CONDITIONS

SITE DESCRIPTION

The project site is located along the Gravesend Bay waterfront, in Brooklyn, New York. The site is located between Shore Parkway to the east and Gravesend Bay to the west, and between 24th Avenue to the north and Bay 37th Street to the south. The site is currently occupied by a bus parking facility.

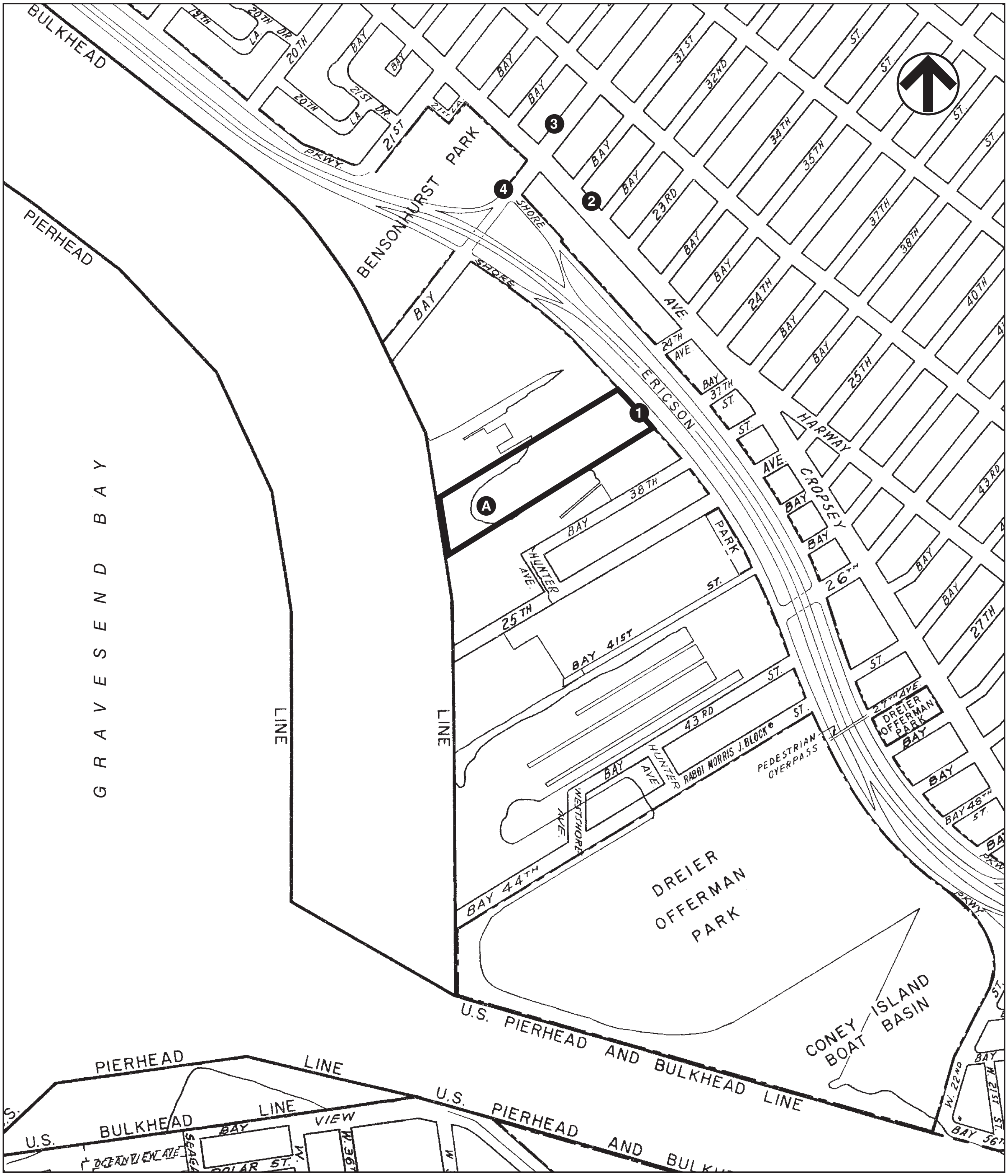
SELECTION OF NOISE RECEPTOR LOCATIONS

Five receptor locations were selected for the noise analysis. The selected receptors are located adjacent to the project site and along major feeder streets to and from the project site. These receptor locations are where the maximum increases in the project-generated traffic would be expected to occur. Consequently, these receptor locations have the highest potential for noise impacts from the project-generated traffic. **Table 13-6** presents the locations of each noise receptor site and their associated existing surrounding land uses. **Figure 13-1** shows the receptor site locations. Receptor sites 1, 2, 3, 4, and A include representative noise-sensitive locations, principally locations with residential, hotel and open space land uses, and locations where maximum project impacts would be expected. At other locations, particularly locations farther from the project sites, 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 to cause a significant increase in noise levels.

Table 13-6
Noise Receptor Locations

Receptor	Location	Associated Land Use
1	Shore Parkway Eastbound Service Road Adjacent to Project Site	Bus Parking and Hotel
2	Cropsey Avenue between Bay 32nd and Bay 31st Streets	Residential, Institutional
3	Bay Parkway between Bath and Cropsey Avenues	Residential
4	Bay Parkway between Cropsey Avenue and Belt Parkway	Open Space and Outdoor Recreation, Residential
A*	West End of Project Site	Bus Parking (Future Open Space)

Notes: * Receptor A was used to compare noise levels in the proposed new publicly accessible open space to CEQR guidelines.



Project Site Boundary

1 Noise Receptor Location

0 1000 FEET

SCALE

Noise Receptor Locations

Figure 13-1

NOISE MONITORING

At each receptor location, 20-minute noise measurements were made for two time periods during the weekday and one time period during a Saturday to determine existing noise levels. Measurements were taken on September 18, 2008, September 26, 2009, and October 10, 2009. (The bus parking facility was in the process of relocating its vehicles during this period.

EQUIPMENT USED DURING NOISE MONITORING

Measurements were performed using a Brüel & Kjær Sound Level Meter (SLM) Type 2260, a Brüel & Kjær Sound Level Calibrator Type 4231, and a Brüel & Kjær ½-inch microphone Type 4189. The Brüel & Kjær meter is a Type 1 sound level meter. The instrument was mounted on a tripod at a height of 5 feet above the ground. The meter was calibrated before and after readings using a Brüel & Kjær Type 4231 sound level calibrator with the appropriate adaptor. 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}, and L_{90}. A windscreen was used during all sound measurements except for calibration. All measurement procedures were based on the requirements of ANSI Standard S1.13-2005.

RESULTS OF BASELINE MEASUREMENTS

Table 13-7 summarizes the results of the baseline measurements for the weekday midday, PM and Saturday PM analysis hours. Values are shown for specific monitored weekday and Saturday time periods. At sites 1, 2, 3, and 4, noise levels are moderate to relatively high and reflect the level of vehicular activity on the adjacent streets. Noise levels at site A are moderate to relatively low and are a function of adjacent commercial uses and distant noise from the Belt Parkway.

Table 13-7
Measured Existing Noise Levels (in dBA)

Receptor	Location	Day	Time	$L_{eq(1)}$	L_1	L_{10}	L_{50}	L_{90}
1	Shore Parkway Eastbound Service Road Adjacent to Project Site	Weekday	MD	72.8	81.0	75.1	70.8	68.4
			PM	74.0	83.8	76.4	70.7	68.0
		Saturday	PM	73.5	82.5	75.4	71.7	69.2
2	Cropsey Avenue between Bay 32nd and Bay 31st Streets	Weekday	MD	70.6	79.6	74.4	67.2	60.7
			PM	70.4	79.5	74.0	67.5	60.1
		Saturday	PM	69.4	79.4	72.7	66.1	60.1
3	Bay Parkway between Bath and Cropsey Avenues	Weekday	MD	70.0	78.7	72.9	67.5	62.3
			PM	71.4	83.6	72.6	66.8	63.0
		Saturday	PM	70.3	80.5	72.9	67.5	62.8
4	Bay Parkway between Cropsey Avenue and Belt Parkway	Weekday	MD	73.6	82.8	76.6	70.8	65.5
			PM	72.9	81.3	75.8	70.8	66.6
		Saturday	PM	72.9	83.1	74.0	69.3	64.1
A	West End of Project Site	Weekday	MD	57.3	61.4	58.6	56.9	55.6
			PM	55.4	57.7	56.7	55.2	54.2
		Saturday	PM	54.5	57.7	55.8	54.3	53.1

Notes: Field measurements were performed by AKRF, Inc. on September 18, 2008, September 26, 2009, and October 10, 2009.

In terms of CEQR noise exposure guidelines (shown in **Table 13-4**), during the hour with the highest measured noise levels, existing noise levels at receptor sites 1, 2, 3, and 4 are in the "marginally unacceptable" category. Existing noise levels at receptor site A (future open space) and 4 (existing open space) exceed the CEQR recommended level of 55 dBA $L_{10(1)}$ for outdoor areas requiring serenity and quiet. These values are based on the measured $L_{10(1)}$ values.

F. NOISE PREDICTION METHODOLOGY

GENERAL METHODOLOGY

At all of the receptor sites in the study area, the dominant noise source is vehicular traffic on adjacent and nearby streets and roadways. Noise from other sources, including local commercial uses, is limited and does not contribute significantly to local ambient noise levels at all five receptor sites. Noise from the nearby Belt Parkway contributes to the local ambient noise levels at sites 1, A, and 4. At site 1 noise levels are due to a combination of traffic on the Belt Parkway and the eastbound Shore Parkway service road; at site A vehicular traffic on the Belt Parkway is the primary contribution of noise levels, and; at site 4 the dominant noise source is vehicular traffic on Bay Parkway, with the Belt Parkway and its service roads and exit/entrance ramps a contributing factor. Future noise levels were calculated using either a proportional modeling technique or the Federal Highway Administration (FHWA) *Traffic Noise Model* (TNM) Version 2.5. The proportional modeling technique was used as a screening tool to estimate changes in noise levels. At locations where proportional modeling indicated the potential for significant noise impacts the TNM was used to obtain more detailed results. Both the proportional modeling technique and the TNM are analysis methodologies recommended for analysis purposes in the *CEQR Technical Manual*. The noise analysis examined the weekday midday and PM, and Saturday PM peak hours. The selected time periods are when the proposed actions would result in maximum traffic generation and/or the maximum potential for significant adverse noise impacts, based on the traffic studies presented in Chapter 11, "Transportation." The proportional modeling and TNM procedures used for analysis are 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 Build and Build levels. Vehicular traffic volumes are converted into Passenger Car Equivalent (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 PCEs

E PCE = Existing 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 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.

TRAFFIC NOISE MODEL (TNM)

At Site 1 (i.e., the dominant noise sources are Shore Parkway eastbound service road and the Belt Parkway. Shore Parkway is immediately adjacent to the project site) and the Belt Parkway is immediately adjacent to Shore Parkway. To be conservative, preliminary modeling studies using proportional modeling techniques were performed based strictly on Shore Parkway (assuming all of the noise was generated by vehicles on Shore Parkway and ignoring the contribution from traffic on the Belt Parkway). This conservative approach indicated that the future traffic may have the potential to cause significant increases in noise levels because all project-generated traffic would use the Shore Parkway eastbound service road to access/egress the project site.at Site 1. Therefore, at this receptor location, a refined analysis was performed using the TNM to calculate noise levels(described below), which accounted for vehicle traffic on both Shore Parkway and the Belt Parkway.

TRAFFIC NOISE MODEL

The TNM is a computerized model developed for the FHWA that 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. The TNM provided more accurate results than proportional modeling for site 1 because a significant amount of noise is due to the large volume of traffic using the nearby Belt Parkway. The less refined proportional modeling technique could not account for the noise contributions from this more distant roadway, and thus, over predicts the project-generated traffic noise levels by attributing all of the noise due to traffic and traffic changes to the immediately adjacent street.

FTA PARKING GARAGE NOISE MODEL

Noise associated with the proposed project's parking garage was calculated using the procedures contained in Federal Transit Administration (FTA) May 2006 guidance manual, Transit Noise and Vibration Impact Assessment for parking garages. These procedures are detailed in Chapter 5 of the guidance manual, and are outlined in Tables 5-5 and 5-6.

ANALYSIS PROCEDURE

The following procedure was used in performing the noise analysis:

- Noise monitoring locations (receptor sites) were selected at noise-sensitive land uses (i.e., residential, church, school, etc.) located on the predicted traffic routes that project-generated traffic would use to access and egress the project site.

- Noise monitoring locations were selected adjacent to and on the proposed project site to determine the appropriate level of building attenuation required to satisfy CEQR interior noise level criteria and to compare noise levels at the proposed new publicly accessible open space with CEQR guidelines.
- Existing noise levels were determined at receptor sites listed above, for each analysis time period, by performing field measurements.
- Using the results of the analyses presented in Chapter 11, "Transportation" a screening analysis was performed using the proportional model to identify locations that had the potential for a significant increase in noise levels.
- At locations where the screening analysis indicated the potential for a significant increase in noise levels existing noise levels were calculated at each receptor site, for each analysis time period, using the TNM and traffic data for existing conditions.
- At locations where the screening analysis indicated the potential for a significant increase in noise levels (i.e., site 1) the calculated TNM existing noise level at site 1, for each analysis time period, was subtracted from the measured existing noise level. 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.).
- Future noise levels for the No Build and Build scenarios, for each receptor site and for each analysis time period, were determined using either the proportional model or the sum of calculated TNM results and the calculated correction factor based on projected traffic conditions.
- The level of building attenuation to satisfy CEQR requirements was determined for the proposed actions' building based on the noise monitoring and TNM results.
- Noise levels at the proposed new publicly accessible open spaces were examined and compared to CEQR guidelines based on the noise monitoring at Site A, TNM results, and calculated noise levels due to the proposed parking garage. ~~Noise associated with the proposed parking garage was calculated using the Federal Transit Administration (FTA) May 2006 guidance manual, *Transit Noise and Vibration Impact Assessment*.~~

Summary tables showing the specific components of the noise analysis are provided in Appendix ~~H~~ D.

G. THE FUTURE WITHOUT THE PROPOSED ACTIONS

Using the methodology previously described, future noise levels without the proposed actions were calculated at the four mobile source noise analysis receptors (1, 2, 3, and 4) for the 2013 Build year. These No Build values are shown in **Table 13-8**.

In 2013, the maximum increase in $L_{eq(1)}$ noise levels for the No Build scenario would be 0.4 dBA or less at all four mobile source noise analysis receptors. Changes of this magnitude would be imperceptible and would fall well below the CEQR threshold for a significant adverse impact. In terms of CEQR noise exposure guidelines, noise levels at receptor sites 1, 2, 3, and 4 would remain in the "marginally unacceptable" category; noise levels at receptor site 4 would continue to exceed the CEQR recommended level of 55 dBA $L_{10(1)}$ for outdoor areas requiring serenity and quiet.

Table 13-8
2013 Future Noise Levels Without the Proposed Actions (in dBA)

Receptor	Location	Day	Time	Existing $L_{eq(1)}$	No Build $L_{eq(1)}$	$L_{eq(1)}$ Change	No Build $L_{10(1)}$
1	Shore Parkway Eastbound Service Road Adjacent to Project Site	Weekday	MD	72.8	73.0	0.2	~~75.4~~75.3
			PM	74.0	74.2	0.2	~~76.7~~76.6
		Saturday	PM	73.5	73.7	0.2	~~69.7~~75.6
2	Cropsey Avenue between Bay 32nd and Bay 31st Streets	Weekday	MD	70.6	70.9	0.3	74.7
			PM	70.4	70.8	0.4	74.4
		Saturday	PM	69.4	69.7	0.3	~~72.2~~73.0
3	Bay Parkway between Bath and Cropsey Avenues	Weekday	MD	70.0	70.2	0.2	73.1
			PM	71.4	71.6	0.2	72.8
		Saturday	PM	70.3	70.5	0.2	~~70.7~~73.1
4	Bay Parkway between Cropsey Avenue and Belt Parkway	Weekday	MD	73.6	73.8	0.2	76.8
			PM	72.9	73.2	0.3	76.1
		Saturday	PM	72.9	73.2	0.3	~~71.7~~74.3

Notes: Noise levels at receptor 1 were calculated using TNM. Noise levels at the remaining receptor sites were calculated by using proportional modeling.

H. PROBABLE IMPACTS OF THE PROPOSED ACTIONS

Using the methodology previously described, future noise levels with the proposed action were calculated at the four mobile source noise analysis receptors (1, 2, 3, and 4) for the 2013 Build year. These Build values are shown in **Table 13-9**.

Table 13-9
2013 Future Noise Levels With the Proposed Actions (in dBA)

Receptor	Location	Day	Time	No Build $L_{eq(1)}$	Build $L_{eq(1)}$	$L_{eq(1)}$ Change	Build $L_{10(1)}$
1	Shore Parkway Eastbound Service Road Adjacent to Project Site	Weekday	MD	73.0	73.4	0.4	75.~~4~~7
			PM	74.2	74.5	0.3	76.~~7~~9
		Saturday	PM	73.7	74.3	0.6	~~69.7~~76.2
2	Cropsey Avenue between Bay 32nd and Bay 31st Streets	Weekday	MD	70.9	71.4	0.5	~~74.7~~75.2
			PM	70.8	71.0	0.2	74.~~4~~6
		Saturday	PM	69.7	70.2	0.5	~~72.2~~73.5
3	Bay Parkway between Bath and Cropsey Avenues	Weekday	MD	70.2	70.7	0.5	73.~~1~~6
			PM	71.6	71.8	0.2	~~72.8~~73.0
		Saturday	PM	70.5	70.9	0.4	~~70.7~~73.5
4	Bay Parkway between Cropsey Avenue and Belt Parkway	Weekday	MD	73.8	74.1	0.3	~~76.8~~77.1
			PM	73.2	73.3	0.1	76.~~1~~2
		Saturday	PM	73.2	73.4	0.2	~~71.7~~74.5

Notes: Noise levels at receptor 1 were calculated using TNM. Noise levels at the remaining receptor sites were calculated by using proportional modeling.

In 2013, the increase in $L_{eq(1)}$ noise levels would be less than 0.6 dBA at all four receptors. Changes of this magnitude would be imperceptible and would fall well below the CEQR threshold for a significant adverse impact. In terms of CEQR noise exposure guidelines, noise levels at receptor sites 1, 2, 3, and 4 would remain in the "marginally unacceptable" category; noise levels at receptor site 4 would continue to exceed the CEQR recommended level of 55 dBA $L_{10(1)}$ for outdoor areas requiring serenity and quiet.

Using the methodology previously described, noise levels within the new open space areas that would be created on-site as part of the proposed actions were calculated. Table 13-10 shows existing measured noise levels (at Site A), noise from adjacent roads (calculated using TNM), noise from the parking garage (calculated using the FTA parking garage methodology), and the total noise levels at three locations on the project site.

One-hour L_{10} noise levels throughout the open space area would be in the ~~high 40 to high~~mid 50 to low 60 dBA range. At ~~some~~most locations within the proposed open spaces noise levels would be above 55 dBA $L_{10(1)}$. This would exceed the noise level for outdoor areas requiring serenity and quiet recommended in the *CEQR Technical Manual* noise exposure guidelines (see **Table 13-4**). These noise levels would result principally from vehicular traffic on the Belt Parkway and Shore Parkway eastbound service road and the noise generated by traffic on the newly created project entrance/exit roadway~~ and the proposed development's parking garage in addition to noise from vehicular traffic on the Belt Parkway and Shore Parkway eastbound service road~~. One-hour L_{10} noise levels at the open spaces would decrease as the distance from adjacent roadways increases.

Table 13-10
Open Space Analysis

Location	Time		Measured L_{eq}	Noise from Adjacent Roadways	Parking Garage Only L_{eq}	2013 Build Total L_{eq}	Calculated L_{10}	Exceed 55 dBA L_{10}?
North of Parking Garage[1]	Weekday	MD	NA[2]	60.8	45.2	60.9	62.2	YES
		PM	NA[2]	60.7	45.0	60.8	63.2	YES
	Saturday	PM	NA[2]	61.8	47.8	62.0	63.3	YES
West End of Project Site[1]	Weekday	MD	57.3	57.2	38.8	57.4	58.7	YES
		PM	55.4	57.2	38.6	55.5	56.8	YES
	Saturday	PM	54.5	57.4	41.4	54.7	56.0	YES
South of Parking garage[1]	Weekday	MD	NA[2]	62.1	48.0	62.3	63.6	YES
		PM	NA[2]	62.0	47.8	62.2	63.5	YES
	Saturday	PM	NA[2]	62.1	50.6	62.4	63.7	YES

Notes:
(1) To be conservative, a correction factor of 9 dBA (based on the difference between Site A measured values and calculated values using the TNM) was applied to receptor locatios north and south of the parking garage
(2) Measurements were not taken at this location and predicted levels were based on TMN modeling results corrected as described in Note 1.

Although noise levels at some locations in these new open spaces would be above the 55 dBA $L_{10(1)}$ guideline noise level, they would be comparable to noise levels in a number of New York City open space areas that are also located adjacent to roadways, including Hudson River Park, Riverside Park, Bryant Park, Prospect Park, Fort Greene Park, and other urban open space areas. The 55 dBA $L_{10(1)}$ guideline is a goal for outdoor areas requiring serenity and quiet. However, due to the level of activity in most New York City open spaces and parks (except for areas far away from traffic and other typical urban activities), this relatively low noise level is often not achieved. Additionally, existing L_{10} noise levels exceed the 55 dBA $L_{10(1)}$ CEQR guideline value. 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 noise impact.

I. ATTENUATION REQUIREMENTS

As shown in **Table 13-5**, the *CEQR Technical Manual* has set noise attenuation quantities for buildings, based on exterior noise levels. Recommended noise attenuation values for buildings are designed to maintain interior noise levels of 50 dBA or lower for commercial uses, and are determined based on exterior L_{10} noise levels. The results of the building attenuation analysis are summarized in **Table 13-11.**

Table 13-11
Building Attenuation Requirements

Proposed Façade Locations	Associated Noise Monitoring Site	Attenuation Required (in dBA)
Bordering Shore Parkway	1	28

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 comprised of the wall, glazing, and any vents or louvers for HVAC/air conditioning units in various ratios of area. The proposed building's façade design, which would include a minimal amount of windows/glass, would include double glazed windows and central air conditioning (i.e., alternate means of ventilation). The proposed building's facades, including these elements, would be designed to provide a composite Outdoor-Indoor Transmission Class (OITC) rating greater than or equal to 30**.** The OITC classification is defined by the American Society of Testing and Materials (ASTM E1332-90 [Reapproved 2003]) 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 requirements, the proposed developments' building facades will thus provide sufficient attenuation to achieve the CEQR interior noise level guideline of 50 dBA L_{10} for commercial uses.

J. MECHANICAL SYSTEMS

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 addressing circulation devices and the New York City Department of Buildings and Mechanical Codes) to avoid producing levels that would result in any significant increase in ambient noise levels.

K. CONCLUSION

Based on the analyses presented above, the proposed actions would not be expected to result in any predicted increases in noise levels that would exceed the *CEQR Technical Manual* impact criteria. Therefore, the proposed actions would not be expected to result in significant adverse noise impacts. ✷