Seaside Park and Community Arts Center
Chapter 11: Greenhouse Gas Emissions

A. INTRODUCTION

As discussed in the *City Environmental Quality Review (CEQR) Technical Manual*, increased concentrations of greenhouse gases (GHGs) are changing the global climate, resulting in wide-ranging effects on the environment, including rising sea levels, increases in temperature, and changes in precipitation levels. Although this is occurring on a global scale, the environmental effects of climate change are also likely to be felt at the local level. Through the PlaNYC 2011 Update, the City has established sustainability initiatives and goals for both greatly reducing GHG emissions and adapting to climate change in the City. The goal to reduce citywide GHG emissions to 30% below 2005 levels by 2030 was codified by Local Law 22 of 2008, known as the New York City Climate Protection Act (the "GHG reduction goal"). This goal was developed for the purpose of planning for an increase in population of almost one million residents while achieving significant greenhouse gas reductions. Seeking to expand its goal, the City is undertaking a study to determine potential strategies to reduce its GHG emissions by more than 80% by 2050.

Although the contribution of a proposed project's GHG emissions to global GHG emissions is likely to be considered insignificant when measured against the scale and magnitude of global climate change, certain projects' contribution of GHG emissions still should be analyzed to determine their consistency with the City's citywide GHG reduction goal, which is currently the most appropriate standard by which to analyze a project under CEQR. The *CEQR Technical Manual* notes that while the need for a GHG emissions assessment is highly dependent on the nature of the project and its potential impacts, the GHG consistency assessment currently focuses on city capital projects, projects proposing power generation or a fundamental change to the City's solid waste management system, and projects being reviewed in an EIS that would result in development of 350,000 square feet or greater (or smaller projects that would result in the construction of a building that is particularly energy-intense, such as a data processing center or health care facility).

The proposed project is a city capital project and, therefore, a GHG assessment has been conducted. GHG emissions that would be generated as a result of the proposed project—and measures that would be implemented to limit those emissions—are presented in this chapter, along with an assessment of the proposed project's consistency with the citywide GHG reduction goal.

B. PRINCIPAL CONCLUSIONS

Following the methodology provided in the *CEQR Technical Manual*, it is estimated that the proposed project would annually result in approximately 628 metric tons of GHG emissions from operations, and 2,707 additional metric tons of GHG emissions from mobile sources. This would result in an annual total of approximately 3,335 metric tons of GHG emissions, as compared to New York City's 2011 annual total of 53.4 million metric tons. As such, the contribution of the proposed project's GHG emissions to GHG emissions citywide is insignificant.

The proposed project would seek certification under LEED®, with a commitment to attaining a Silver rating for the renovated Childs Restaurant building. Further, the proximity of the proposed project to public transportation, reuse of an existing historic building, and measures to minimize non-renewable energy use are all factors that contribute to the proposed project's energy efficiency. In addition, the proposed project is being designed to meet all current building code requirements regarding potential flooding elevations.

C. POLLUTANTS OF CONCERN

Some GHGs, such as carbon dioxide (CO2), occur naturally and are emitted into the atmosphere through natural processes and human activities. The principal GHGs emitted as a result of human activities are described below.

Carbon Dioxide (CO2)

CO2 enters the atmosphere via the combustion of fossil fuels (oil, natural gas, and coal), solid waste, and trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). CO2 is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.

Methane (CH4)

CH4 is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, as well as from the decay of organic waste in municipal solid waste landfills.

Nitrous Oxide (N2O)

N2O is emitted during agricultural and industrial activities, as well as during the combustion of fossil fuels and solid waste.

Fluorinated Gases

Hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride are powerful synthetic greenhouse gases that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (e.g., chlorofluorocarbons [CFCs], hydrochlorofluorocarbons [HCFCs], and halons). These gases are typically emitted in smaller quantities. However, because they are potent greenhouse gases, they are sometimes referred to as High Global Warming Potential gases (High GWP gases).

The *CEQR Technical Manual* lists six GHGs that could potentially be included in the scope of an EIS: CO2, nitrous oxide (N2O), methane, Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulfur Hexafluoride (SF6). This analysis focused on CO2, N2O, and methane as there are no significant direct or indirect sources of HFCs, PFCs, or SF6 associated with the Proposed Action.

GHGs differ in their ability to trap heat. To compare emissions of GHGs, compilers use a weighting factor called a Global Warming Potential (GWP), where the heat-trapping ability of 1 metric ton (1,000 kilograms (kg)) of CO2 is taken as the standard, and emissions are expressed in terms of CO2 equivalents (CO2e), but can also be expressed in terms of carbon equivalents. The GWPs for the main GHGs are presented in Table 11-1.

TABLE 11-1
Global Warming Potential for Primary Greenhouse Gases

Greenhouse Gas	Common sources	Global Warming Potential
CO_2 - Carbon Dioxide	Fossil fuel combustion, forest clearing, cement production	1
CH_4 - Methane	Landfills, production and distribution of natural gas and petroleum, anaerobic digestion, rice cultivation, fossil fuel combustion	21
N_2O - Nitrous Oxide	Fossil fuel combustion, fertilizers, nylon production, manure	310
HFCs - Hydrofluorocarbons	Refrigeration gases, aluminum smelting, semiconductor manufacturing	140-11,700*
PFCs - Perfluorocarbons	Aluminum production, semiconductor manufacturing	6,500-9,200*
SF_6 - Sulfur Hexafluoride	Electrical transmissions and distribution systems, circuit breakers, magnesium production	23,900

Notes: Since the Second Assessment Report (SAR) was published in 1995, the International Panel on Climate Change (IPCC) has published updated GWP values in its Third Assessment Report (TAR) and Fourth Assessment Report (AR4) that reflect new information on atmospheric lifetimes of greenhouse gases and an improved calculation of the radiative forcing of CO_2. However, GWP values from the SAR are still used by international convention to maintain consistency in GHG reporting, including by the United States when reporting under the United Nations Framework Convention on Climate Change.

* The GWPs of HFCs and PFCs vary depending on the specific compound emitted. A full list of these GWPs is available in Table ES-1 of the U.S. Environmental Protection Agency's *Inventory of Greenhouse Gas Emissions and Sinks: 1990-2008*, available at: http://epa.gov/climatechange/emissions/usinventoryreport.html.

D. METHODOLOGY

A project's GHG emissions can generally be assessed in two steps: the first would be to estimate the GHG emissions of the proposed project and the second would be to examine the action in terms of the qualitative goals for reducing GHG emissions. The *CEQR Technical Manual* recommends that the project's emissions be estimated with respect to the following main emissions sources: on-site operational emissions (direct and indirect); mobile source emissions (direct and indirect); and, when applicable, construction emissions and emissions from solid waste management.

Operational emissions and mobile source emissions were considered for this analysis. As the construction schedule for the proposed project is not expected to take longer than 15 months, and the construction activities associated with the proposed project would be minimal (refer to Chapter 17, "Construction"), a quantitative construction emissions analysis, according to the *CEQR Technical Manual*, is not required. Similarly, because the project is not expected to fundamentally change the City's solid waste management system, no estimate of emissions from solid waste management is required.

The analysis of GHG emissions that would be generated by the proposed project is based on the methodology presented in the *CEQR Technical Manual*. Estimates of emissions of GHGs from the proposed project have been quantified, including emissions associated with use of electricity, on-site

emissions from heat and hot water systems, and emissions from vehicle use attributable to the proposed project. GHG emissions that would result from construction and renovation of the proposed project are discussed qualitatively below.

The GHG analysis is based on the program for the proposed project. As described in Chapter 1, "Project Description," the land uses that would result from the proposed project consist of a 60,000 square foot (sf) restaurant and 2.41 acres of publicly accessible open space, including an approximately 5,100-seat amphitheater (6,000 total attendees assumed for analysis purposes).

BUILDING OPERATIONAL EMISSIONS

Rates for commercial uses were based on the emission factors referenced in the *CEQR Technical Manual*. As noted in Chapter 10, "Air Quality," the proposed amphitheater would not have any HVAC systems. The amphitheater's emissions due to electricity were calculated using average energy rates for concert venues provided by the applicant.[1]

MOBILE SOURCE EMISSIONS

The number of annual weekday vehicle trips by mode (cars, taxis, and trucks) that would be generated by the proposed project was calculated using the transportation planning assumptions developed for the analysis and presented in Chapter 10, "Transportation." The assumptions used in the calculation include average daily weekday person trips and delivery trips by use, the percentage of vehicle trips, and the average vehicle occupancy. As described in Chapter 1, "Project Description," the amphitheater would be a seasonal venue, operating from May to October, with approximately 40 to 50 total concerts per season. For this analysis, a total of 100 events annually was assumed, to account for other events that may occur during the season (public events, community-based cultural events, school graduations, etc.). The 100 annual events are assumed to be equally split between weekend days and weekdays.

Travel distances shown in Tables 18-4 and 18-5 and page 18-9 of the *CEQR Technical Manual* were used in the calculations of annual vehicle miles traveled by cars, taxis, and trucks. The average truck trip was assumed to be 38 miles as per the *CEQR Technical Manual*, and the average one way taxi trip distance of 7.88 miles was obtained from Table 18-5 of the *CEQR Technical Manual*. For the amphitheater, an average trip distance of 19.5 miles was used in calculating the annual auto Vehicle Miles Traveled (VMT) for the peak events.[2] Table 18-6 of the *CEQR Technical Manual* was used to determine the percentage of vehicle miles traveled by road type and the mobile GHG emissions calculator was used to obtain an estimate of car, taxi, and truck GHG emissions attributable to the proposed project.

The projected annual vehicle miles traveled for the proposed project[3], forming the basis for the GHG emissions calculations from mobile sources, are summarized in Table 11-2.

[1] Information was provided by SPEC Technologies via Energy Concepts.
[2] Source: *Kingsbridge Armory National Ice Center DEIS*, July 17, 2013 (13DME013X)
[3] It should be noted that the amphitheater component is a seasonal use, operating from May to October, and therefore the annual number of concerts is 40 to 50 per season. However, for conservative purposes, the analysis assumes 100 total events annually to account for other events during the season.

TABLE 11-2
Annual Vehicle Miles Traveled (miles per year)

Use	Passenger Vehicles	Taxis	Trucks	Total
With-Action Conditions				
Amphitheater	3,834,675	54,372	30,400	3,919,447
Restaurant	767,136	114,228	291,270	1,172,634
Total VMT	4,601,811	168,600	321,670	5,092,081

CONSTRUCTION EMISSIONS

Emissions associated with construction have not been estimated explicitly for the proposed project. Unlike typical ground-up construction, the proposed project would not involve extensive demolition, foundation, or superstructure construction activities, which often generate the highest levels of construction activity emissions. In addition, construction of the proposed project would result in a moderate number of construction-related vehicle trips and a need for new construction materials primarily for interior work at the Childs restaurant building and the erection of several structural steel arches, which will be utilized for the installation of the amphitheater's tensile roof membrane. Therefore, GHG emissions associated with construction (both direct emissions and emissions embedded in the production of materials, including on-site construction equipment, delivery trucks, and upstream emissions from the production of steel, rebar, aluminum, and cement used for construction) would not be substantial and have not been estimated explicitly.

EMISSIONS FROM SOLID WASTE MANAGEMENT

The proposed project would not fundamentally change the City's solid waste management system. Therefore, as per the *CEQR Technical Manual*, the GHG emissions from solid waste generation, transportation, treatment, and disposal are not quantified.

E. PROJECT GHG EMISSIONS FROM THE PROPOSED PROJECT

Operational Emissions

Table 11-3 shows the estimated GHG emissions associated with the operation emissions of the proposed project. As shown in the table, the proposed project would result in operational GHG emissions of approximately 627,784 kilograms (kg), or an estimated 628 metric tons of carbon dioxide equivalents.

TABLE 11-3
Operational Emissions

Building Type	Carbon Dioxide Equivalent (CO_2e) kilogram (kg) / square foot / year[1]	Floor Area (square ft)	CO_2e (kg/year)
Commercial	9.43	60,000	565,800
Amphitheater	(see note below)	6,000 attendees	61,984
		TOTAL	**627,784**

[1] **Source: CEQR Technical Manual, Table 18-3**

Note: Annual energy use for the proposed amphitheater is based on average energy rates for concert venues provided by the applicant. During the peak concert season, which is expected to consist of up to 50 concerts, the proposed amphitheater is anticipated to use approximately 160 Kilowatts per hour with 16 hour days for a total energy usage of approximately 128,000 Kilowatts per year. Average energy use for the amphitheater during the remainder of the year would be less and is expected to be approximately 120 Kilowatts per hour with 10 hour days for a total energy usage of approximately 378,000 Kilowatts per year. Therefore, the proposed amphitheater's annual average energy usage would be approximately 506,000 Kilowatts per year. Emissions calculated based on conversion rate in Table 18-2 of *CEQR Technical Manual*.

Mobile Source Emissions

The mobile source related GHG emissions for the proposed project are presented in detail in Table 11-4. As shown in the table, annual mobile source emissions related to the proposed project would result in approximately 2,707 metric tons of carbon dioxide equivalents.

TABLE 11-4
Mobile Source Emissions – With-Action Conditions (2016)

Carbon Dioxide Equivalent (CO_2e) Emissions (metric tons/year)				
Road type	**Passenger Vehicles**	**Taxis**	**Trucks**	**TOTAL**
Local	604	20	144	768
Arterial	902	30	231	1,163
Interstate/Expressway	606	20	150	776
TOTAL	**2,112**	**70**	**525**	**2,707**

Summary

A summary of GHG emissions for the proposed project, by emission source type, is presented below in Table 11-5. The operational emissions from building energy use include on-site emissions from fuel consumption as well as emissions associated with the production and delivery of the electricity to be used on-site. As described in the "Methodology" section above, construction emissions were not modeled explicitly, and the proposed project is not expected to fundamentally change the City's solid waste management system, and therefore emissions associated with construction and solid waste are not presented Table 11-5.

TABLE 11-5
Total Projected Annual GHG Emissions (metric tons CO2e)

Source	Annual Emissions
Building Operations	628
Mobile	2,707
TOTAL	**3,335**

F. CONSISTENCY WITH THE GHG REDUCTION GOAL

According to the *CEQR Technical Manual*, the assessment of consistency with the City GHG reduction goal should answer the following question: Is the project consistent with the goal of reducing GHG emissions, specifically the attainment of the City's established GHG reduction goal of reducing citywide GHG emissions by 30% below 2005 levels by 2030. Four major goals are cited in the Manual, as follows:

- Pursue transit-oriented development;
- Generate clean, renewable power through replacement of inefficient power plants with state-of-the-art technology and expanding the use of clean distributed generation; (not applicable in the case of this proposed project);
- Construct new resource- and energy-efficient buildings (including the use of sustainable construction materials and practices) and improve the efficiency of existing buildings; and
- Encourage sustainable transportation through improving public transit, improving the efficiency of private vehicles, and decreasing the carbon intensity of fuels.

Elements of the Proposed Project that would Reduce GHG Emissions

The proposed project would seek certification under LEED®, with a commitment to attaining a Silver rating for the renovated Childs Restaurant building. Additionally, the proposed project is subject to Local Law 86 of 2005 and will comply with the requirements thereof, including the achievement of a minimum LEED Silver for New Construction and Major Renovations for the (Former) Childs Restaurant Building and the appropriate energy cost reduction. The proposed project's reuse of an existing building and underdeveloped land, with access to transit and existing roadways, is consistent with sustainable land use planning and smart growth strategies to reduce the carbon footprint of new development. A number of sustainable features that would reduce GHG emissions would be considered in achieving LEED® certification and the project's sustainability goals. The following text outlines features of the proposed project and measures that would be considered in achieving LEED® certification. The features listed would most directly reduce GHG emissions, addressing the GHG reduction goals as outlined in the CEQR Technical Manual. The GHG reduction measures, LEED rating requirements, and requirements of Local Law 86 of 2005 would be incorporated into the development agreements and/or other legally binding agreement.

Build Efficient Buildings

The proposed project would include the rehabilitation and redevelopment of an existing historic structure, which would inherently reduce the carbon footprint compared to new development, and is consistent with sustainable land use planning and smart growth strategies. The new construction associated with the proposed project would be minimal, and would consist of the erection of several structural steel arches, which will be utilized for the installation of the tensile roof membrane; the construction of temporary restroom facilities at the southern end of the amphitheater; and the installation of all associated subsurface infrastructure associated with the viability and functionality of the project. To the extent feasible, low-flow and/or ultra-low flow plumbing fixtures would be incorporated into the rehabilitation program of the Childs Restaurant building in order to reduce hot and cold water consumption and water pumping energy. High efficient mechanical systems would also be incorporated in the rehabilitation program, as well as efficient lighting (including high efficiency

fluorescent and LED, where cost effective) with advanced controls such as occupancy sensors and daylight dimming controls, which would reduce energy consumption.

Use Clean Power

The amphitheater project will not employ any HVAC systems, while the renovated Childs Restaurant building's heating and domestic hot water needs would be provided by natural gas fired mechanical equipment. Natural gas fired mechanical equipment has lower carbon content per unit of energy than other fossil fuels, which would result in the generation of less GHG emissions.

Transit-Oriented Development and Sustainable Transportation

The project site's location near subway and bus lines would reduce automobile dependence, and therefore GHG emissions from travel. As detailed in Chapter 9, "Transportation," up to approximately 46% of concert attendees, as well as approximately 52% of the Childs Restaurant's patrons, are expected to use mass transit (subway and bus). The proposed project's access to transit and existing roadways is consistent with sustainable land use planning and smart growth strategies to reduce the carbon footprint of new development.

Reduce Construction Operation Emissions

As discussed, the proposed project would not involve extensive long-term construction activity and therefore would not generate substantial GHG emissions during construction.

Use Building Materials with Low Carbon Intensity

The proposed project would involve the rehabilitation and redevelopment of an existing historic structure, and would not require a substantial amount of new material. The primary concern in rehabilitating the Childs Restaurant building structure would be long-term stabilization and historic preservation. Because the proposed project involves the rehabilitation of a historic structure rather than new ground-up construction, opportunities to select construction materials with low embedded GHG emissions (emissions from material production and transport) may be limited.

For the proposed amphitheater, as noted above, the use of building materials would be minimal, and mostly limited to several structural steel arches, which will be utilized for the installation of the tensile roof membrane; and the construction of temporary restroom. Where appropriate, construction waste would be diverted from landfill through reuse and recycle efforts.

G. ADAPTATION TO CLIMATE CHANGE

As discussed in Chapter 2, "Land Use, Zoning, and Public Policy," based on FEMA's Best Available Flood Hazard Data, the development site falls within Floodplain Area AE, which is defined as the area subject to storm surge flooding from the one percent annual chance coastal flood (i.e., 100-year flood). AE zones are not subject to high velocity wave action but are still considered high risk flooding areas. Since the development site is on the waterfront, the potential effects of global climate change on the proposed project are considered and measures that could be implemented as part of the project to improve its resilience to climate change are discussed.

Currently, standards and a framework for analysis of the effects of climate change on a proposed project are not included in CEQR. However, the recently proposed revisions to the Waterfront Revitalization

Program (WRP) address climate change and sea level rise. If finalized, the WRP would require consideration of climate change and sea level rise in planning and design of waterfront development. As set forth in more detail in the *CEQR Technical Manual*, the provisions of the WRP are applied by the New York City Department of City Planning (DCP) and other city agencies when conducting environmental review.

The proposed WRP revisions, among other provisions, would require waterfront developments to:

- Consider potential risks related to coastal flooding to features specific to the project, including but not limited to critical electrical and mechanical systems, residential living areas, and public access areas;
- Minimize losses from flooding and erosion by employing non-structural and structural management measures appropriate to the site, the use of the property to be protected, and the surrounding area;
- Integrate consideration of the latest New York City projections of climate change and sea level rise (as published by the New York City Panel on Climate Change (NPCC), or any successor thereof) into the planning and design of projects in the city's Coastal Zone;
- Incorporate design techniques in projects that address the potential risks identified and/or which enhance the capacity to incorporate adaptive techniques in the future. Climate resilience techniques should aim to protect lives, minimize damage to systems and natural resources, prevent loss of property, and, if practicable, promote economic growth and provide additional benefits such as provision of public space and intertidal habitat;
- The project should also provide a qualitative analysis of potential adverse impacts on existing resources (including ecological systems, public access, visual quality, water-dependent uses, infrastructure, and adjacent properties) as a result of the anticipated effects of climate change;
- Projects that involve construction of new structures directly in the water or at the water line should be designed to protect inland structures and uses from flooding and storm surge when appropriate and practicable;
- As appropriate and to the extent practicable:
    - Promote the greening of the waterfront with a variety of plant material for aesthetic and ecological benefit;
    - Use water- and salt-tolerant plantings in areas subject to flooding and salt spray;
    - Maximize water-absorption functions of planted areas;
    - Preserve and enhance natural shoreline edges;
    - Design shoreline edges that foster a rich marine habitat; and
    - Design sites that anticipate the effects of climate change, such as sea level rise and storm surges.

Climate change considerations may be incorporated into state and/or local laws prior to the development of the proposed project, and any development would be constructed to meet or exceed the codes in effect at the time of construction. Nonetheless, since the proposed project is located within the current 1-in-100 flood zone, climate change considerations and measures that could be implemented to increase climate resilience are discussed, addressing the above proposed WRP measures as applicable.

Resilience of the Proposed Project to Climate Change

In reviewing the potential climate related impacts and resilience measures discussed above, the only issue for which the project can prepare, within its context and location, is potential future flooding, i.e., designing the project to withstand and recover from flooding and to ensure that hazardous materials and other potentially dangerous items would not end up in floodwaters. This section discusses the project's approach to these items.

As discussed above, the development site falls within Floodplain Area AE, which is defined as the area subject to storm surge flooding from the one percent annual chance coastal flood (i.e., 100-year flood). The advisory base (one percent annual chance/100-year) flood elevation for the project area and most of the study area is 11 feet NAVD88 (or 9.553 Brooklyn Borough Highway Datum). The ABFE for the adjacent Coney Island Beach ranges from 12 to 17 feet NAVD88 (or 10.553 to 15.553 Brooklyn Borough Highway Datum).

Based on the above data, any subgrade areas within the renovated Childs Restaurant building would be lower than current severe flooding event levels, and in future conditions, severe flood levels could reach the ground floor levels of the building. However, the proposed project is being designed to meet all current building code requirements regarding potential flooding elevations. Moreover, the proposed project is taking a proactive approach to planning infrastructure resilience to flooding in general, including future sea level rise. All mechanical equipment for the Childs Restaurant building will be stored at the roof level, while electrical switchgear is planned at the first floor level, raised to two feet above the established floodplain elevation.

The remainder of the development site would be comprised of a 2.41-acres open space, with a 5,100 seat seasonal amphitheater, and would not include any habitable spaces that would be affected by flooding. Moreover, much of the open space area would be comprised of permeable surfaces (sloped lawn area, plantings, etc.).