14

Greenhouse Gas Emissions and Climate Change

This chapter describes the potential impact of the Proposed Actions on greenhouse gas (GHG) emissions and considers whether the Proposed Actions are consistent with the State and Citywide GHG emissions reduction goals. This chapter also evaluates the resilience of the development facilitated by the Proposed Actions to climate conditions throughout the lifetime of the Proposed Project.

Introduction

As discussed in the ~~2021~~2025 *City Environmental Quality Review (CEQR) Technical Manual*, increased concentrations of greenhouse gases change the global climate and result 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 regional and local level. Although the contribution of a proposed project's GHG emissions to global GHG emissions is small when compared to the scale and magnitude of global climate change, certain projects' contribution of GHG emissions still should be analyzed to determine their consistency with the State and City's citywide GHG reduction goal, which is currently the most appropriate standard by which to analyze a project under CEQR.

New York State has enacted the Climate Leadership and Community Protection Act (CLCPA) and the New York Scoping Plan—recommending statewide policy changes and requiring State agencies to consider a decision's impact in achieving the State's sustainability goals. New York City's sustainable development policy, starting with PlaNYC and continued and enhanced in OneNYC, established sustainability initiatives and goals for greatly reducing GHG emissions and for adapting to climate change in the City. In 2014, the City Council passed a bill to reduce citywide greenhouse gas

emissions by 80 percent by 2050 (Local Law 66 of 2014). The New York Climate Mobilization Act, Local Law 97 of 2019, the most recent legislation, is the most aggressive climate legislation to date. It requires buildings larger than 25,000 square feet (sf) to meet strict GHG emission limits starting in 2024. Buildings are the largest source of greenhouse gas emissions, representing nearly 70 percent of New York City's total emissions. Focusing on the city's largest buildings will promote energy efficiency and renewable energy and discourage reliance on fossil fuels. The GHG emission reduction goal for NYC buildings is 40 percent by 2030 and 80 percent by 2050, compared to 2005.

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. However, according to the *CEQR Technical Manual*, a GHG emissions assessment is typically conducted for larger projects undergoing an environmental impact statement, especially projects that would result in development of 350,000 sf or greater. As development under the With-Action condition would exceed this threshold, a GHG emissions assessment is appropriate. The GHG consistency assessment focuses on those projects that have the greatest potential to produce GHG emissions and evaluates their potential to result in significant inconsistencies with the GHG reduction goal.

Principal Conclusions

The Proposed Actions would be consistent with the applicable City GHG emissions reduction and climate change goals, and there would be no significant adverse GHG emission or climate change impacts as a result of the Proposed Actions.

Following the methodology provided in the *CEQR Technical Manual*, it is estimated that the Proposed Development would result in approximately 5,588 metric tons of carbon dioxide equivalent (CO_2e) emissions from its annual operations and 440 metric tons a year of CO_2e emissions from mobile sources. This estimate of vehicle emissions by the Proposed Actions' analysis year is conversative, as it does not account for the future increase in use of electric vehicles, which are expected to be powered by a cleaner grid and thus decrease in mobile source GHG emissions. The overall emissions represent less than 0.02 percent of the city's overall 2022 GHG emissions of 53.7 million metric tons. The NYCTA Relocation Site would result in approximately 381 metric tons of CO_2e emissions from its annual operations. The GHG emissions resulting from the Proposed Development would not hinder the project's consistency with City or State GHG goals due to its compliance with local laws, policies and building codes established for reducing GHG emissions.

The Proposed Actions would comply with the ~~2020~~2025 Energy Conservation Construction Code of New York State and ~~2020~~2025 New York City Energy Conservation Code, which govern performance requirements of heating, ventilation, and air conditioning (HVAC) systems, as well as the exterior building envelope of new buildings. The Proposed Actions would comply with the Local Law 97 requirements and implement energy efficient measures in addition to being situated in a transit-rich location. Thus, the Proposed Actions would contribute towards the NYC GHG reduction goals, would not interfere with the attainment of statewide GHG limits and would not result in a disproportionate burden on disadvantaged communities.

Since the Development Site and NYCTA Relocation Site are located within the AE Flood Zone, which is the "Special Flood Hazard Area," also known as the 1.0 percent annual chance floodplain, the potential effects of global climate change have been considered and are presented in **Appendix B: Waterfront Revitalization Program Consistency Assessment**. The assessment considers the effects of climate change on rising sea levels, storm surge, and coastal flooding resulting from the Proposed

Actions. As detailed in **Appendix B**, it was determined that the Proposed Actions would be supportive of Policy 6.2 of the New York City Waterfront Revitalization Program (WRP). Therefore, adverse climate change impacts are not anticipated as a result of the Proposed Actions.

Pollutants of Concern

GHGs are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by Earth's surface, the atmosphere, and clouds. This property causes the general warming of Earth's atmosphere, or the "greenhouse effect." Some GHGs, such as carbon dioxide (CO_2), occur both naturally and are emitted into the atmosphere through human activities. The *CEQR Technical Manual* lists six GHGs that could potentially be included in the scope of an environmental impact assessment: CO_2, nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

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) of CO_2 is taken as the standard, and emissions are expressed in terms of CO_2 equivalents (CO_2e) but can also be expressed in terms of carbon equivalents. The GHGs that are emitted as a result of human activities and their GWPs are presented in **Table 14-1**.

Table 14-1 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:
The GWPs above are based on the Intergovernmental Panel for Climate Change (IPCC) Second Assessment Report (SAR). The IPCC has since published updated GWP values that reflect new information. However, GWP values from the SAR are still used, in accordance with the *CEQR Technical Manual* to maintain consistency in GHG reporting. It should be noted that New York State, per the Climate Act (CLCPA) calculates GHG emissions using the 20-year global warming potentials (GWPs).
*The GWPs of HFCs and PFCs vary depending on the specific compound emitted.

› **Carbon Dioxide (CO_2).** CO_2 enters the atmosphere via the combustion of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and also as a result of other chemical reactions (e.g., manufacture of cement). CO_2 is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle. Although not

the GHG with the strongest effect per molecule, CO_2 is by far the most abundant and, therefore, the most influential GHG.

- **Methane (CH_4).** CH_4 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 by the decay of organic waste in municipal solid waste landfills. Methane, in addition to nitrous oxide (noted below), plays an important role in GHG emissions since the removal processes for these compounds are limited and they have a relatively high impact on global climate change as compared to an equal quantity of CO_2 as reflected in their high global warming potential.
- **Nitrous Oxide (N_2O).** N_2O 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).

This analysis focuses on CO_2, N_2O, and CH_4 (collectively as CO_2e) as there are no significant direct or indirect sources of HFCs, PFCs, or SF_6 associated with the Proposed Actions.

Policy and Regulations on GHG Emissions and Climate Resilience

The following provides the climate requirements and policies at the federal, state, and local levels to provide context of the information provided herein.

Federal

The U.S. Environmental Protection Agency (USEPA) enforces the Clean Air Act, which regulates air emissions, including GHG emissions. The USEPA issued an endangerment finding in 2009 under Section 202(a) of the Clean Air Act, which stated that GHGs threaten public health and welfare, providing the basis for regulating these emissions.

The U.S. Department of Energy (USDOE) is responsible for the country's energy policy and research, including efforts to reduce GHG emissions through energy efficiency and renewable energy technologies. The USDOE also regulates energy production and consumption, including the standards for energy efficiency in buildings.

In addition to these agencies, the Federal Government also has planning and policy tools to address energy use and GHG emissions. The Council on Environmental Quality's (CEQ's) *National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change* serves as guidance for addressing GHG emissions and climate change in federal environmental review documents.[1]

[1] Council on Environmental Quality, National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions and Climate Change, January 9, 2023, https://www.regulations.gov/document/CEQ-2022-0005-0023

Recent federal policy and investment have been established to support energy modernization, reduce dependency on fossil fuels, and reduce GHG emissions. This includes the Inflation Reduction Act, which expands tax credits for initiatives such as clean energy, electric vehicles (EVs), and energy efficiency; and the Infrastructure Investment and Jobs Act (2021), which provides investments in energy modernization, transportation, and building decarbonization. Executive Orders 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis,[2] and 14008, Tackling the Climate Crisis at Home and Abroad,[3] seek to lower GHG emissions and strengthen the climate resilience of infrastructure against the impacts of climate change.

State

In 2019, New York State enacted the CLCPA in which the New York State Department of Environmental Conservation (NYSDEC) adopted 6 NYCRR Part 496, Statewide Greenhouse Gas Emission Limits,[4] which contains limits on the emission of GHGs in 2030 and 2050 as a percentage of 1990 emissions. The rule established 410 million metric tons of carbon dioxide equivalent emissions (million metric tons CO_2e) as the 1990 baseline and, per the CLCPA, the State committed to the following requirements:

- 40 percent GHG emissions reduction from 1990 baseline level by 2030 (60 percent of 1990 emission levels, which equates to 246 million metric tons CO_2e);
- 85 percent GHG emissions reduction from 1990 baseline level by 2050 (15 percent of 1990 emission levels, which equates to 61 million metric tons CO_2e); and
- net-zero GHG emissions by 2050 (the remaining 15 percent achieved through GHG emissions offset projects).

Part 496 applies to all emission sources in the State, although it does not itself impose compliance obligations. The CLCPA requires State agencies to determine if their decisions are consistent with the statewide GHG emission limits established by the CLCPA in the Environmental Conservation Law (ECL) Article 75 and to ensure that decisions shall not disproportionately burden disadvantaged communities.

Other relevant State policies and guidelines include the following:

- Guide for Assessing Energy Use and Greenhouse Gas Emissions in Environmental Impact Statements
- Energy Conservation Construction Code
- Climate Action Council Scoping Plan. The Scoping Plan is the framework for how New York will reduce GHG emissions and achieve net-zero emissions, increase renewable energy use, and ensure all communities equitably benefit in the clean energy transition.[5]
- Part 490 Projected Sea-Level Rise

[2] Executive Order 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, 86 Fed. Reg. 7,037, January 20, 2021.

[3] Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, 86 Fed. Reg. 7,619, January 27, 2021.

[4] Title 6 of the New York Codes, Rules and Regulations, Chapter IV: Quality Services, Subchapter I: Climate Change, Part 486, Statewide Greenhouse Gas Emissions Limits, as established in the Climate Leadership and Community Protection Act, Chapter 106 of the Laws of 2019 (Environmental Conservation Law Article 75-0107).

[5] New York State, Climate Act, New York's Scoping Plan, https://climate.ny.gov/resources/scoping-plan/

New York State is also developing an economywide Cap-and-Invest Program to meet the requirements set forth in the CLCPA. It is anticipated that large-scale GHG emissions sources and distributors of heating and transportation fuels will be required to purchase or obtain allowances for the emissions associated with their activities. Proceeds from the Cap-and-Invest auctions will be invested to bolster carbon reductions and help ensure the Cap-and-Invest Program is affordable for all New Yorkers and delivers benefits to disadvantaged communities. Proceeds will support critical investments in climate mitigation, energy efficiency, clean transportation, and other projects, in addition to funding an annual Consumer Climate Action Account that will be distributed to New Yorkers to mitigate any potential consumer costs associated with the program.[6]

Local

New York City's long-term comprehensive plan for a sustainable and resilient New York City, which began as PlaNYC 2030 in 2007 and continues to evolve today as OneNYC, includes GHG emissions reduction goals, many specific initiatives that can result in emission reductions, and initiatives aimed at adapting to future climate change impacts. The goal to reduce citywide GHG emissions to 30 percent below 2005 levels by 2030 (30 by 30) was codified by Local Law 22 of 2008, known as the New York City Climate Protection Act (the GHG reduction goal). The City also has announced a longer-term goal of reducing emissions to 80 percent below 2005 levels by 2050 (80 by 50), which was codified by Local Law 66 of 2014, and has published a study evaluating the potential for achieving that goal. More recently, as part of OneNYC, the City has announced a more aggressive goal for reducing emissions from building energy down to 30 percent below 2005 levels by 2025.

In May 2019, the New York City Council enacted Local Law 97 of 2019—the Climate Mobilization Act. For most buildings that exceed 25,000 gsf (excluding electricity/steam generation facilities, rent-regulated accommodations, places of public worship, and city-owned properties), the City has established annual building emission limits beginning in 2024 and would require the owner of a covered building to submit annual reports demonstrating the building is in compliance with the current GHG emission limits. For buildings not covered under the GHG emissions limits, owners may either demonstrate compliance with the current limits or implement specified energy conservation measures where applicable. Additionally, New York City's Local Law 154 of 2021 prohibits the on-site combustion of fuels that emit more than 25 kg CO_2/ MMBTU.

Executive Order 23 of 2022, Clean Construction, is aimed at using lower embodied carbon construction materials and reducing construction waste, recognizing that the embodied carbon from cement manufacturing is responsible for an estimated 8 percent of global GHG emissions and the embodied carbon from iron and steel production accounts for approximately 7 percent of global GHG emissions.

There are also local initiatives related to assessing the potential local impacts of global climate change and development strategies to make existing and proposed infrastructure and development more resilient to the effects of climate change. The initiatives include the work of the Climate Change Adaptation Task Force that the City launched in 2008 and the work of the New York City Panel on Climate Change (NPCC), composed of academic, policy advisers, and agencies to develop climate change projections of New York City. The 2009 *Climate Risk Information* report was prepared by the NPCC as part of PlaNYC to advise the mayor and the task force on issues related to potential impacts on infrastructure due to climate change including, temperature, precipitation, rising sea levels, and

[6] New York State, Cap-and-Invest, https://capandinvest.ny.gov/

extreme weather events. The NPCC developed projections using the Intergovernmental Panel on Climate Change (IPCC)-based methods to generate model-based probabilities for temperature, precipitation, sea level rise, and extreme events including coastal flooding in the 1 percent annual chance floodplain for the 2020s to the 2080s. These projections were developed using 16 global climate model (GCM) simulations and three GHGH emission scenarios. The NPCC released *Climate Change Adaptation in New York City: Building a Risk Management Response* in 2010 to serve as a basis for climate change adaptation in the city. In June 2013, the NPCC published *Climate Risk Information 2013: Observations, Climate Change Projections, and Maps,* which outlines the most recent NPCC future climate projections. The NPCC regularly assesses climate change projections and updates those projections regularly. The resulting reports serve as a guide in the City's policymaking process.

The City has also established an interagency group to work with the Federal Emergency Management Agency (FEMA) to revise the Flood Insurance Rate Maps (FIRMs) for the city, which set the base flood elevations for development on the floodplain and triggers the City's building code flood protection requirements. Currently, the FIRMs are undergoing revision to reflect changes in coastal shorelines and elevation, but the city's building code requirements will continue to reflect the 2015 Preliminary FIRMs.

The New York City Department of Housing Preservation and Development (HPD) has established specific requirements to ensure that new construction projects comply with the 2080 floodplain management guidelines. These guidelines are part of the Climate Resiliency Design Guidelines and are based on the work of the New York City Panel on Climate Change (NPCC). The guidelines utilize climate projections and associated useful life estimates to determine the Sea Level Rise-adjusted Design Flood Elevation (DFE) for the 2080s. For the proposed buildings, the DFE for the residential ground floors would be designed in compliance with HPD's requirements (see **Appendix B: Waterfront Revitalization Program Consistency Assessment** for more details).

The City has started preparing for extreme climate events, as outlined in the Natural Hazard Mitigation Plan, Coastal Storm Plan, Heat Emergency Plan, Debris Management Plan, Power Disruption Plan, Winter Weather Emergency Plan, and Flash Flood Emergency Plan. Additionally, the New York City Department of Environmental Protection (DEP) issued several plans aimed at evaluating and implementing adaptive strategies for infrastructure, and the Department of City Planning (DCP) developed the Waterfront Revitalization Program (WRP), which serves as the City's principal coastal management tool and established the City's policies for development and use on the waterfront. DCP also published the Zoning for Coastal Flood Resiliency (ZCFR), a series of zoning changes for developments on the floodplain.

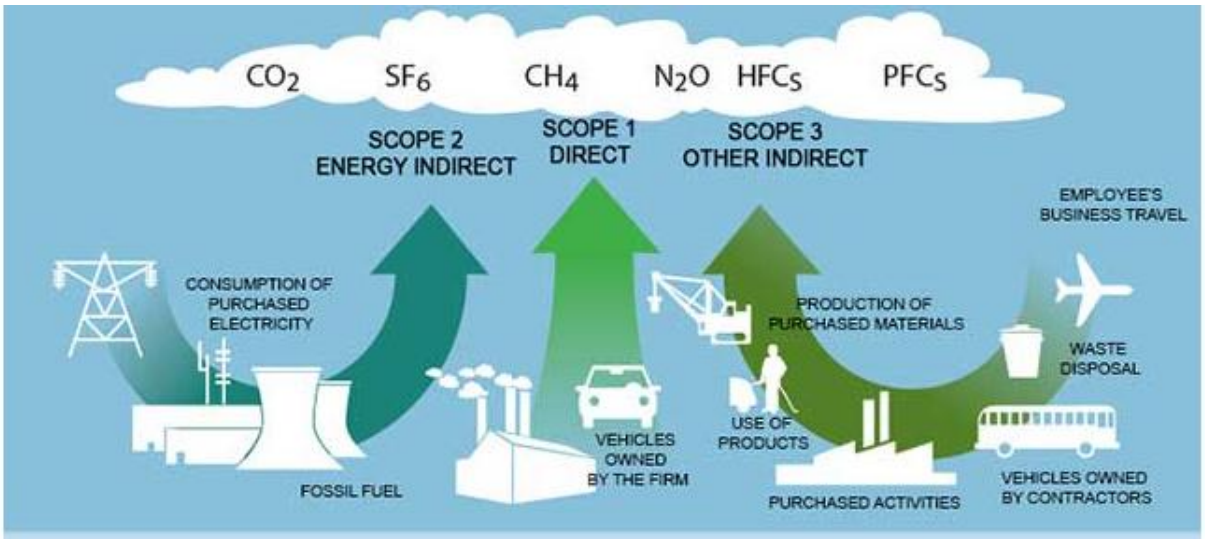
Methodology

GHG Emissions Assessment

According to the *CEQR Technical Manual*, a GHG emissions assessment is typically conducted for larger projects undergoing an environmental impact statement, especially projects that would result in development of 350,000 sf or greater. The Proposed Actions would result in the total development of approximately 1,215,000 gsf on the Development Site, of which approximately 1,178,000 gsf would include residential, commercial, and community facility uses. This latter amount is used in the GHG emissions assessment.

GHG emissions are generally divided into three types, three scopes, as illustrated in **Figure 14-1**.

Figure 14-1 Three Scopes of GHG Emissions



Source: http://synergyfiles.com/2017/04/scope-ghg-emissions/

Scope 1, or direct emissions, are emissions resulting from the fossil-fuel combustion by the proposed buildings or by vehicles owned or operated by the proposed building management. Emissions from HVAC systems are the most typical source of GHG emissions for new building projects in New York City. Scope 2, or indirect emissions, are emissions from the generation of purchased electricity used by the buildings. Scope 3 are all other GHG emissions, including emissions from the vehicular trips generated by the proposed buildings, like employees' commute.

A project's GHG emissions under CEQR are assessed in two steps: first, GHG emissions of the proposed action are estimated, and second, the proposed action is assessed in comparison with the City 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. Pursuant to *CEQR Technical Manual* methodology, the assessment is based on the GHG emissions associated with the Proposed Actions.

Operational and mobile source emissions were quantified for this analysis. Emissions associated with construction are described qualitatively. The Proposed Actions are not expected to fundamentally change the City's solid waste management system, therefore, no estimate of emissions from solid waste management is warranted.

Climate Change Assessment

According to the *CEQR Technical Manual*, an analysis of consistency with Policy 6.2 of the WRP may provide sufficient information to assess the potential effects of sea-level rise, storm surge, and coastal flooding.

Assessment

Direct GHG Emissions

The Proposed Development would use electricity for its heating, hot water, and ventilation needs. As such, no substantial direct GHG emissions are associated with the Proposed Development.

The NYCTA Relocation Site may use natural gas for its heating, hot water, and ventilation needs. As such, potential direct GHG emissions were estimated for the facility. Natural gas consumption was estimated using average energy use intensities (EUIs) from industry surveys based on the Energy Star Portfolio Manager. EUIs for commercial and retail uses were based on average natural gas consumption data in the 2018 Commercial Buildings Energy Consumption Survey (CBECS) from the U.S. Energy Information Administration. Since the majority of the building would be used for storage of NYCTA vehicles, wash trucks, box trucks, and vans, the analysis uses the CBECS EUI for Vehicle Storage and Maintenance. Estimates of the GHG emissions from the natural gas consumption at the NYCTA Relocation Site are presented in **Table 14-2**. This table uses energy use estimates from existing building stock for site energy consumption. The NYCTA Relocation Site would result in a total of 293 metric tons of CO_2e per year to satisfy the facility's annual natural gas consumption.

Table 14-2 NYCTA Relocation Site – GHG Emissions from Natural Gas Consumption

	Amount	Unit
Vehicle Storage/Maintenance Gas Use Intensity	37.7	cf/sf
***~~2021~~2025 CEQR TM* CO_2e Carbon Conversion Factor**	53.196	kg CO_2e/MMBtu
Max Commercial Gas CO_2e	292,954	kg CO_2e
	293	MT CO_2e

Indirect GHG Emissions

Indirect GHG emissions would be generated as a result of purchased and consumed electricity for the buildings associated with the Proposed Actions. Electricity consumption was estimated using values in the *CEQR Technical Manual* Table 15-1 for commercial and large residential uses. This table uses energy use estimates from existing building stock for source energy consumption. Both the Proposed Development's retail and community facility uses were considered commercial for the purposes of this analysis. Estimates of the GHG emissions from the electricity are presented in **Table 14-3**. A total of 5,588 metric tons of CO_2e per year would be generated to satisfy the Proposed Development's annual consumption. 5,033 metric tons would result from the residential buildings and 555 metric tons would result from the retail and community facility. This results in a total carbon emissions intensity of 4.7 kilograms CO_2e per square foot.

Table 14-3 Development Site - GHG Emissions from Purchased Electricity Consumption

	Amount	Unit
Residential Electricity Use Intensity	126.7	kBtu/sf
Commercial Electricity Use Intensity	216.3	kBtu/sf
~~2021~~2025 *CEQR TM* CO_2e Carbon Conversion Factor	35.902	kg CO_2e/MMBtu
Electricity CO_2e	5,588,469	kg CO_2e
	5,588	MT CO_2e

Indirect GHG emissions would also occur due to electricity consumption at the NYCTA Relocation Site. Electricity consumption was estimated using average energy use intensities (EUIs) from industry surveys based on the Energy Star Portfolio Manager. EUIs for commercial and retail uses were based on average electricity consumption data in the 2018 Commercial Buildings Energy Consumption Survey (CBECS) from the U.S. Energy Information Administration. Estimates of the GHG emissions from the electricity use at the NYCTA Relocation Site are presented in **Table 14-4**. This table uses energy use estimates from existing building stock for site energy consumption. The NYCTA Relocation Site would result in a total of 88 metric tons of CO_2e per year to satisfy the facility's annual electricity consumption.

Table 14-4 NYCTA Relocation Site - GHG Emissions from Purchased Electricity Consumption

	Amount	Unit
Vehicle Storage/Maintenance Electricity Use Intensity	5.1	kWh/sf
~~2021~~2025 *CEQR TM* CO_2e Carbon Conversion Factor	35.902	kg CO_2e/MMBtu
Electricity CO_2e	88,092	kg CO_2e
	88	MT CO_2e

Mobile Source Emissions

The number of annual vehicle trips by mode (cars, taxis, and trucks) that would be generated by the Proposed Actions was calculated using the transportation planning assumptions developed for the traffic analysis and presented in **Chapter 12, Transportation**. The number of project-generated trips by autos, taxis and trucks was obtained from the transportation analysis. Annual vehicle mile travel (VMT) was estimated based on the weekday trips and the average one-way distances as shown in Table 18-6 and Table 18-7 of the *CEQR Technical Manual*. The average truck trip was assumed to be 38 miles as per the *CEQR Technical Manual*. Tables 18-6 and 18-7 of the *CEQR Technical Manual* (presented below as **Table 14-5** and **Table 14-6**) were used to determine the one-way trip distances for personal and taxi trips in Brooklyn and the mobile GHG emissions calculator provided in the *CEQR Technical Manual* was used to obtain an estimate of auto, taxi, and truck CO_2e emissions attributable to the Proposed Actions. The overall assumptions made to estimate emissions are conservative, as they do not account for the increased use of electric vehicles in the future due to an anticipated increase in a cleaner power grid (i.e., a grid that uses more renewable energy sources).

The resultant GHG emissions for the Proposed Development are presented in **Table 14-7**. The total CO_2e emissions from the mobile sources attributable to the Proposed Action would be 440 metric tons annually.

Table 14-5 Average One-Way Trip Distances (Miles)

Personal Vehicles				Taxi
Other NYC	Residential	Office	Retail	Other NYC
Weekday	8	8	4	7.88
Weekend	4	8	4	

Source: ~~2021~~2025 *CEQR TM* Tables 18-5 and 18-6

Table 14-6 Percentages of Daily VMT by Facility Type

Facility	Other NYC
Freeways	39%
Arterials	41%
Locals	20%

Source: ~~2021~~2025 *CEQR TM* Table 18-7

Table 14-7 Development Site – GHG Emissions from Mobile Sources

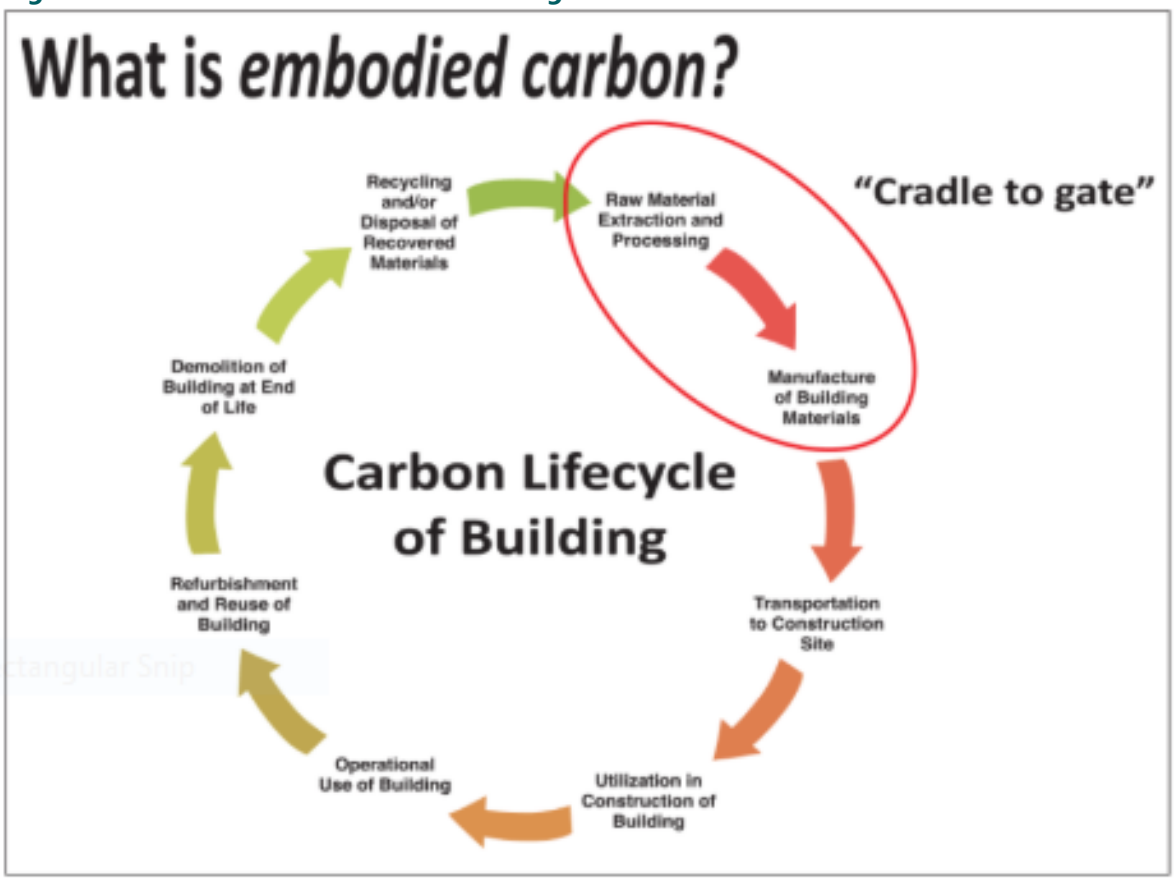
Vehicle Type	Annual VMT generated	Annual CO_2e [MT]
Auto	651,988	227
Taxi	57,485	18
Truck	132,126	196
Total	841,599	440

Mobile source GHG emissions from the NYCTA Relocation Site are expected to be unchanged from the No-Action condition. Since the NYCTA Relocation Site is a relocation and consolidation of existing facilities, vehicles associated with the NYCTA Relocation Site are already in operation and would not incrementally increase between the No-Action and With-Action conditions. While the location of the mobile source GHG emissions may be different due to the new facility location, the amount of mobile source GHG emissions is expected to be similar to the No-Action condition.

Construction Emissions

Construction associated with the Proposed Actions would comply with the New York City Air Pollution Control Code, the latest version of which was adopted on May 12, 2020. As per *CEQR Technical Manual* guidance, emissions associated with the construction of the Proposed Development and NYCTA Relocation Site have been assessed qualitatively. Construction would follow New York City regulations and codes for construction that require the use of recycled materials, reduced diesel emissions, limited idle time for vehicles and equipment on-site, and other measures to reduce carbon emissions. In addition, following these practices would contribute to the overall goal of reducing GHG emissions from construction. Thus, construction of the Proposed Development and NYCTA Relocation Site would adhere to the City's goals to reduce GHG.

Figure 14-2 Embodied Carbon of a Building



Source: Sustainable Energy Association

Consistency with GHG Reduction Goals

The overall GHG emissions from the Proposed Actions, which are presented in **Table 14-3** and **Table 14-7** constitute less than 0.02 percent of the 2022 NYC annual GHG emissions of 53.6 million metric tons (MMT) of CO_2e. The NYS CLCPA has adopted emissions targets to reduce GHG emissions by 40 percent by 2030 and 85 percent in 2050 from a 1990 baseline. The Scoping Plan for the CLCPA recognizes buildings as a major contributor to GHG emissions and recommends policy be implemented that requires efficient electrification of heating equipment and building performance standards that encourage high-performance building envelopes.

In addition, the *CEQR Technical Manual* outlines major goals toward GHG reduction:

- 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.

The Proposed Development is consistent with the State CLCPA and *CEQR Technical Manual* goals as it plans to employ the following GHG mitigation measures:

- The Proposed Development would comply with Local Law 97's requirements for buildings.

- The Proposed Development would comply with the Enterprise Green Communities and Energy Star programs.
- The Proposed Development would allow increases in residential and commercial density on the Development Site and would expand community amenities through the construction of a new museum. The inclusion of local retail would likely result in internal capture that would reduce mobile source emissions.
- The Proposed Development would be built in accordance with the latest NYS and NYC codes, including the ~~2020~~2025 Energy Conservation Construction Codes of New York State (ECCNYS) and ~~2020~~2025 New York City Energy Conservation Code (NYCECC)—both of which govern building efficiency in the choice of HVAC system and the exterior building envelope.
- The Development Site would include the efficient electrification of the heating and cooling equipment, which would result in a complete (100 percent) reduction in local fossil fuel usage and allow the buildings' carbon footprint to be reduced as the grid gets greener. The Proposed Development's all-electric design fully aligns with the Scoping Plan for the CLCPA and could take full advantage of the grid sourcing increasing renewable energy, resulting in less GHG emissions.
- The Proposed Development would construct new residential units in close proximity to bus, subway transit stations, and the ferry. Development in a transit-rich location facilitates a lower automobile mode share and ensures that GHG emissions per person would be less than that of development for the same number of people on a site not well-served by transit.

Accordingly, the Proposed Actions would be in compliance with the City and State GHG reduction goals and would contribute toward meeting the State GHG emissions targets.

Resilience to Climate Change

As discussed in **Appendix B: Waterfront Revitalization Program Consistency Assessment**, both the Development Site and the NYCTA Relocation Site are located within the City's Coastal Zone, specifically the AE Flood Zone, which is the "Special Flood Hazard Area," also known as the 100-year flood zone (2015 PFIRMs) with 1.0 percent annual chance or greater of flooding. As such, the Proposed Development would be built to Appendix G Building Code standards.

Because the Proposed Development and the NYCTA Replacement Facility would be constructed in the 1.0 percent annual floodplain, the potential effects of climate change as it relates to current and future sea-level rise scenarios are considered in this assessment. According to the *CEQR Technical Manual*, an analysis of consistency with Policy 6.2 of the WRP may provide sufficient information to access the potential effects of sea-level rise, storm surge, and coastal flooding. Policy 6.2 identifies three basic steps to determine the consistency of a project with this policy: (1) identify vulnerabilities and consequences; (2) identify adaptive strategies; and (3) assess policy consistency.

Building features are defined in one of four categories: (1) vulnerable: project features that have the potential to incur significant damage if flooded; (2) critical: project features that if damaged would have severe impacts on the project and its ability to function as designed; (3) potentially hazardous: project features that if damaged or made unsecure by flooding could potentially adversely affect the health and safety of the public and the environment; and (4) other: project features that are entirely open and unenclosed spaces, except the open storage of potentially hazardous materials, which may be damaged by flooding, but are not likely to present significant consequences and are more easily repaired. These features are assessed against sea level rise and mean higher high water (MHHW) projections ranging from low to high estimates produced by the NPCC. Adaptive strategies to

mitigate the impacts of sea-level rise and flooding on vulnerable and critical features and additional measures taken to protect the project from additional coastal hazards such as waves, high winds, or debris are discussed.

As detailed in **Appendix B**, the Proposed Actions would promote Policy 6.2. Critical features would face minimal flood risk beginning in 2100, at which point adaptive strategies could be undertaken in order to extend their lifespan. Vulnerable project features below the projected elevation of the future high estimate of MHHW or 1.0 percent chance annual flood and sea-level rise would be made resilient through the implementation of site-specific adaptive strategies. As the Development Site and NYCTA Relocation Site are located within the 100-year flood zone, the developments on both sites would be required to incorporate floodproofing measures to protect from current and future flood risk that would comply with Appendix G of the NYC Building Code.

Additionally, the Applicant would undertake a combination of wet floodproofing measures to protect vulnerable features and dry floodproofing for critical features and egress points. Vulnerable features such as the cellar parking garage, critical residential back-of-house spaces, and the ground-floor retail use would be dry floodproofed. All critical features, including points of egress and all critical infrastructure, would be dry floodproofed, i.e., floodwater would be prevented from entering these features entirely through measures such as sealing all openings in the building envelope (windows, doors, etc.), installing temporary barriers at entrances to block floodwater, and constructing walls to keep floodwater out. The design flood elevation (DFE) for residential uses would be +17 feet (NAVD88). The residential ground floor and lobby for both buildings would be located at this elevation with non-critical residential back-of-house uses including storage and mail room. The Proposed Development would also include resiliency and flood protection measures on the Development Site including installation of a new bulkhead to defend against future erosion and flooding due to sea-level rise.

Measures to adapt and protect the site would rely on the implementation of best practices and technology available at that time. These may include, but are not limited to, structural changes such as dry flood-proofing the ground floor areas, considering the implementation of a passive barrier strategy to protect vulnerable features, and incorporating marine glass into the lower-level facades. Floodproofing techniques would most likely need to be updated throughout the lifespan of the building depending on the actual sea-level-rise scenario. As building designs do no limit or bind floodproofing techniques, there are several potential strategies for floodproofing upgrades that could feasibly be carried out throughout the lifespan of the building. For example, dry flood shield sizes could be increased, and additional wet flood vents could be added. Operational changes may include moving vulnerable uses to a higher elevation.

As such, significant climate change impacts would not occur before 2031 for the Proposed Development.