# 2.15 GREENHOUSE GAS EMISSIONS

## 2.15.1 INTRODUCTION

As discussed in the *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 *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 percent 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"). Given this goal, plans are needed that will allow for a projected one million additional residents by 2030 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 percent by 2050.

The contribution of a proposed project's GHG emissions to global GHG emissions will be insignificant when measured against the scale and magnitude of global climate change. However, 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* recommends that for any project of 350,000 square feet or more of development and other energy-intensive projects, a GHG analysis should quantify project-related GHG emissions and assess the project's consistency with the citywide GHG reduction goal.

The Proposed Project would result in the construction of new buildings (in addition to the development of a new park) over the 350,000 square feet threshold, as follows:

- Approximately up to 285,000 square feet of retail space (consisting of up to approximately 195,000 square feet on Retail Site "A", and approximately 90,000 square feet on Retail Site "B");
- Approximately up to 259,500 square feet of senior housing floor area;
- Approximately up to 100,000 square feet of school floor area; and
- Approximately up to 15,000 (maximum) square feet of library floor area.

This new development, totaling approximately up to approximately 659,500 square feet, would generate new demands for energy consumption and increased emission of GHG. Since the total development scale exceeds the threshold subject to a quantification of project-related GHG emissions, GHG emissions related to project energy consumptions were estimated. The annual GHG emissions analysis was performed for both the 2015 and 2020 analysis years. The results of that analysis, along with an assessment of the Proposed Project's consistency with the citywide GHG reduction goal, are presented in this chapter.

## 2.15.2 POLLUTANTS OF CONCERN

Some GHGs occur naturally and are emitted into the atmosphere through natural processes and human activities, such as carbon dioxide ($CO_2$). The principal GHGs emitted as a result of human activities are described below.

- 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.

- 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.
- 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).

The CEQR Technical Manual lists six GHGs that could potentially be included in the scope of an EIS: $CO_2$, nitrous oxide ($N_2O$), methane, 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 GWPs for the main GHGs are presented in **Table 2.15-1**.

**Table 2.15-1**

**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 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.

## 2.15.3 METHODOLOGY

A project's GHG emissions can generally be assessed in two steps:

- Estimate the GHG emissions of the Proposed Project; and
- Examine the Proposed Project in terms of the qualitative goals for reducing GHG emissions consistent with PlaNYC goals.

The *CEQR Technical Manual* recommends that the project's emissions be estimated with respect to the following main emissions sources:

- On-site stationary operational GHG emissions (direct and indirect);
- Mobile source GHG emissions (direct and indirect); and
- Construction GHG emissions and GHG emissions from solid waste management (when applicable).

Stationary and mobile source operational emissions were considered for this analysis. It was assumed that the types of construction materials, methods and equipment used in the development of the ~~Project~~Development Area would be similar to other mixed use projects in the city with relatively simple earth-moving and equipment requirements. In addition, because construction would be spread out over an approximately seven-year period, as described in **Chapter 2.19**, "Construction", the elements to be constructed each year and the equipment to be used would be further limited. Therefore, the emissions from construction activity and associated equipment operations are unlikely to be a significant part of total project emissions. As such, a quantitative construction emissions analysis, according to the *CEQR Technical Manual*, is not warranted. Similarly, because the ~~project~~Proposed Project is not expected to change the City's solid waste management system, no estimate of emissions from solid waste management is required.

## 2.15.4 EXISTING CONDITIONS

As discussed in **Chapter 2.1**, "Land Use, Zoning and Public Policy," the entire Development Area is vacant, undeveloped and covered with vegetation. As a result, no GHG emissions are emitted in the area.

## 2.15.5 FUTURE NO-ACTION CONDITIONS

Under the Future No-Action conditions, the entire Development Area would remain vacant, undeveloped and covered with vegetation. The level of GHG emissions in the area would remain at zero, the same as under existing conditions

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## 2.15.6 FUTURE WITH-ACTION CONDITIONS

### 2.15.6.1 Year 2015 Analysis

By the year 2015, the City would construct a new 23-acre park, the 11-acre site of Retail Site "A" with approximately 195,000 square feet of commercial space, and an approximately 15,000-square-foot branch of the New York Public Library, which will share parking with the retail uses.

***Stationary Source Operational Emissions***

According to the *CEQR Technical Manual*, a project's annual GHG emissions should be estimated based on projected energy usage. Since the specific fuel types to be used are unknown, the *CEQR Technical*

*Manual* recommends that annual GHG emissions be calculated based on the project's built floor area and the carbon intensities of New York City building types, as provided in Table 18-3 of the manual.

The predicted GHG emissions, expressed in terms of $CO_2$ from emissions ($CO_2e$), are summarized in **Table 2.15-2**. As shown, operational GHG emissions are estimated to be approximately 5,173.8 metric tons on an annual basis. This level represents less than 0.0001 percent of the City's overall GHG emissions in 2011 of 54.3 million metric tons (per the City's inventory amount of September 2011).

**Table 2.15-2**

**Stationary Source Operational GHG Emissions (Year 2015)**

| Building Type | Building Size (square feet) | $CO_{2e}$ Emission Factor (Kg/sf/year) | GHG Annual Emissions (Kg/Year) | GHG Annual Emissions (Metric Tons per Year) |
|---|---|---|---|---|
| Commercial | 195,000 | 9.43 | 1,838,850 | 1,838.9 |
| Institutional | 15,000 | 11.42 | 171,300 | 171.3 |
| **Total Stationary Source GHG Annual Emissions** | | | | 2,010.2 |

***Mobile Source Operational Emissions***

The numbers of annual weekday and weekend vehicle trips by mode (auto, taxi, and truck) that would be generated from the Proposed Project were calculated based on the transportation planning assumptions as described in the **Chapter 2.13**. The assumptions used in the calculation include average daily weekday person trips and delivery trips by proposed use, the percentage of vehicle trips by mode, and the average vehicle occupancy. Travel distances shown in Table 18-4 of the *CEQR Technical Manual* for areas outside of Manhattan were used in the calculations of annual vehicle miles traveled by cars, taxies, and trucks. An average one-way truck trip was assumed to be 38 miles, as per the *CEQR Technical Manual*. 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 were used to obtain an estimate of auto and truck GHG emissions attributable to the Proposed Project. As shown in **Table 2.15-3**, mobile source operational GHG emissions are estimated to be approximately 19,579 metric tons on an annual basis.

**Table 2.15-3**

**Mobile Source Operational GHG Emissions (Year 2015)**

| Road Type | Passenger Vehicle | Taxi | Truck | GHG Annual Emissions (Metric Tons per Year) |
|---|---|---|---|---|
| Local | 4,806 | 107 | 737 | 5,650 |
| Arterial | 7,024 | 156 | 1,169 | 8,349 |
| Expressway | 4,719 | 103 | 758 | 5,580 |
| **Total Mobile Source GHG Annual Emissions** | | | | 19,579 |

***Construction Phase Emissions***

As previously noted, construction activity and material production emissions are not considered significant sources as compared to long-term operational activities discussed above. Some analyses have shown that construction emissions (both direct 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 be equivalent to the total emissions from the operation of the buildings over approximately ~~3~~three to ~~10~~ten years per West Harlem Rezoning Final Environmental Impact Statement (City Planning Commission, August 24, 2012). During construction, equipment on site would comply in the NYC Air Pollution Control Code and utilize ultra-low sulfur diesel fuel (ULSDF) and best available technologies where applicable.

***Emissions from Solid Waste Management***

The Proposed Project would not change the City's solid waste management system. Therefore, as per *CEQR Technical Manual* guidance, GHG emissions from solid waste generation, transportation, treatment, and disposal were not quantified.

### 2.15.6.2 Year 2020 Analysis

***Stationary Source Operational Emissions***

The predicted GHG emissions, expressed in terms of $CO_2$ from emissions ($CO_2e$) with potential to be emitted from Year 2020 were predicted using the same methodologies as described in Chapter 2.15.5.1 for Year 2015 and are summarized in **Table 2.15-4**. As shown, operational GHG emissions are estimated to be approximately 5,173.8 metric tons on an annual basis starting from Year 2020. This level represents less than 0.0001 percent of the City's overall GHG emissions in 2011 of 54.3 million metric tons (per the City's inventory amount of September 2011).

**Table 2.15-4**

**Stationary Source Operational GHG Emissions (Year 2020)**

| Building Type | Building Size (square feet) | $CO_{2e}$ Emission Factor (Kg/sf/year) | GHG Annual Emissions (Kg/Year) | GHG Annual Emissions (Metric Tons per Year) |
|---|---|---|---|---|
| Commercial | 285,000 | 9.43 | 2,687,550 | 2,687.6 |
| Residential | 259,500 | 4.52 | 1,172,940 | 1,172.9 |
| Institutional | 115,000 | 11.42 | 1,313,300 | 1,313.3 |
| **Total Stationary Source GHG Annual Emissions** | | | | 5,173.8 |

***Mobile Source Operational Emissions***

The numbers of annual weekday and weekend vehicle trips by mode (auto, taxi, and truck) that would be generated from the Proposed Project from Year 2020 were calculated using the same methodologies as described previously under Year 2015 condition, Operational GHG emissions from vehicle trips are estimated to be approximately 25,568 metric tons on an annual basis from 2020 and summarized in **Table 2.15-5**.

**Table 2.15-5**

**Mobile Source Operational GHG Emissions (Year 2020)**

| Road Type | Passenger Vehicle | Taxi | Truck | GHG Annual Emissions (Metric Tons per Year) |
|---|---|---|---|---|
| Local | 5,686 | 124 | 1,018 | 6,828 |
| Arterial | 9,337 | 203 | 1,695 | 11,235 |
| Expressway | 6,272 | 134 | 1,099 | 7,505 |
| **Total Mobile Source GHG Annual Emissions** | | | | 25,568 |

***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 percent below 2005 levels by 2030?*"

Four major goals are cited for projects in the *CEQR Technical 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 (applies only to new construction for the Proposed Project); and
- Encourage sustainable transportation through improving public transit, improving the efficiency of private vehicles, and decreasing the carbon intensity of fuels.

The Proposed Project is in an area served by the nearby bus routes of the S74, S84, and S78 lines, which would help encourage sustainable transportation. Additionally, the mixed-use design promotes walking between the proposed residences, parkland, school, library, and retail shopping centers.

The Proposed Project includes a number of commitments that would ensure that energy efficient buildings are constructed. If the Proposed Project requires city capital funding to construct the library, the approximately 15,000 square foot library building would comply with the requirements of Local Law 86 of 2005, as applicable. The proposed school would be built according to the New York City Green Schools Guide, which addresses the sustainable design, construction, and operation of new schools. The Green Schools Guide and Rating System include strategies that substantially reduce energy costs and water use as compared with buildings constructed to meet code, and require the use of recycled content, and regional materials, if feasible, in construction. For ~~retail site~~Retail Site "A", the Contract of Sale will require the developer to: (i) design and construct to achieve a 10% reduction in energy performance, calculated in accordance with LEED Core and Shell, Energy and Atmosphere, Prerequisite 2, Option 1 (see http://www.usgbc.org/sites/default/files/LEED%202009%20RS_CS_04.01.13_current.pdf), or design and construct in accordance with the Prescriptive Compliance Path set forth in LEED Core and Shell, Energy and Atmosphere Credit 1, Option 3; and (ii) employ low flow fixtures, fittings and appliances, which are

described in LEED Core and Shell, Water Efficiency, Prerequisite 1. For Retail Site "B" and senior housing components of the development, through the request for proposals process the City would look favorably upon proposals that enhance the energy-efficiency of buildings. This may include designing and constructing to achieve Leadership in Energy and Environmental Design ("LEED") Silver certification, using fewer raw materials, making the best of natural light where appropriate, improving indoor air quality, and decreasing the total impact on the natural and human environment. These designs may also include features aimed at reducing energy consumption and greenhouse GHG emissions, such as:

- Energy efficient building envelopes to reduce cooling and heating;
- High-efficiency HVAC systems, incinerators and/or generators;
- Window glazing to optimize energy performance by allowing for day-lighting while managing both heat loss and solar heat gain; and
- Fuel from renewable sources or less GHG-intense fuels, such as natural gas, co-firing of biomass or use of biofuels or bioheat for heating fuel or in vehicles/equipment.

If the senior housing or retail development on Retail Site "B" would not be certified as LEED Silver or certified under the Enterprise Green Communities Program, consultation with the Mayor's Office of Environmental Coordination would be required to ensure that energy efficiency measures equivalent to those that would be necessary to achieve LEED Silver certification are implemented. The commitments set forth in this chapter and would be incorporated into the contract of sale and/or development agreements. The provisions of the contract of sale and/or development agreements relating to the substance and enforceability of these commitments would be subject to approval by the Mayor's Office of Environmental Coordination.

The *CEQR Technical Manual* also includes a specific listing of sustainability and efficiency measures to consider in the assessment of consistency with the GHG Reduction Goals. The Proposed Project would include a number of measures aimed at reducing energy consumption and GHG emissions including:

- Providing access to public transportation. The S74, S84, and S78 bus lines serve this section of Staten Island. The S74 and S84 provide service to the north via Arthur Kill Road, while the S78 provides service to the south, also via Arthur Kill Road. Each of the routes terminates on Bricktown Way, in front of Retail Site "A". As such, the routes are ideally located for easy transit access from the Development Area.
- Incorporating mixed-use design to promote short commutes for employment and shopping. The Proposed Project's mixed-use development and dense design that includes new residences, a new park, a new school and a new library in addition to the retail shopping centers would promote an enhancement to the community that would be less automobile dependent.
- Providing permanent protection for open space in the Project Area. The Proposed Project includes the mapping of an existing Conservation Area and the mapping and development of a new Fairview Park with active and passive recreation facilities and natural areas with walking trails. The mapping provides extensive protection to these areas of the Development Area and overall Project Area.
- Design measures that support alternative transportation (walking and bicycling). The Proposed Project area is located within convenient walking or biking distance of public bus stops; shopping and other neighborhood services. In addition, the proposed mapping and construction of Englewood Avenue and the development of Retail Site "A" would include bicycle paths and link to existing bicycle path networks.
- Design measures with water efficient landscaping. It is anticipated that on-site plantings would be native species and drought resistant.
- Using energy efficient boilers. It is anticipated that many of the boilers for space heating and domestic hot water would be natural gas-fired hot water semi-condensing or condensing type.
- Developing or support multi-use paths to and through the Development Area. The uses in the Development Area are proposed to be fully connected through a series of paths, so that residents

of the senior housing and school, and others in the surrounding community will have easy pedestrian access to the park, library and retail areas.

- Providing bicycle storage. Bicycle storage is projected to be provided in accordance with zoning requirements.
- Using ultra-low sulfur diesel ~~(~~("ULSD~~)~~") fuel. During construction, the Proposed Projects would comply with the NYC Air Pollution Control Code, which includes use ULSD fuel.

***Conclusion***

The potential GHG emissions associated with the Proposed Project have been projected and are presented above. Measures for reducing GHG emissions included in the Proposed Project as well as any additional relevant measures under consideration have been identified. Overall, the location of the area, the mixed-use design, the measures to achieve energy efficiency, and other measures incorporated in the Proposed Project would result in lower GHG emissions than would otherwise be achieved by similar residential and commercial use projects, and thus would advance New York City's GHG reduction goals as stated in *PlaNYC*.

The annual GHG emissions from the Proposed Project are predicted to be approximately 30,742 metric tons of $CO_{2e}$. This does not represent a net incremental increase in GHG emissions, since similar GHG emissions would occur if the residential units, school, library, retail development and associated uses were to be constructed elsewhere. However, the Proposed Project would include measures aimed at reducing energy consumption and GHG emission and therefore, is generally consistent with the City's citywide GHG and climate change goals.

The Proposed Project includes a number of commitments that would ensure that energy efficient buildings are constructed. If city capital funding is used to construct the library, the library would be built in accordance with the requirements of Local Law 86 of 2005, as applicable. The proposed school would be built according to the New York City Green Schools Guide, which addresses the sustainable design, construction, and operation of new schools. The Green Schools Guide and Rating System include strategies that substantially reduce energy costs and water use as compared with buildings constructed to meet code, and require the use of recycled content, and regional materials, if feasible, in construction. The Contract of Sale for Retail Site "A" will require the developer to: (i) design and construct to achieve a 10% reduction in energy performance, calculated in accordance with LEED Core and Shell, Energy and Atmosphere, Prerequisite 2, Option 1, or design and construct in accordance with the Prescriptive Compliance Path set forth in LEED Core and Shell, Energy and Atmosphere Credit 1, Option 3; and (ii) employ low flow fixtures, fittings and appliances, which are described in LEED Core and Shell, Water Efficiency, Prerequisite 1. For the remaining retail (Retail Site "B") and senior housing components of the development, through the request for proposals process the City would look favorably upon proposals that enhance the energy-efficiency of buildings. This may include designing and constructing to achieve LEED Silver certification, using fewer raw materials, making the best of natural light where appropriate, improving indoor air quality, and decreasing the total impact on the natural and human environment.