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 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"). 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* recommends that any project resulting in 350,000 square feet of development, or more and other energy-intense projects, quantify project-related GHG emissions and assess the project's consistency with the citywide GHG reduction goal.

The Proposed Action, which is expected to facilitate the construction of new multi-unit mixed-use buildings, would result in the increased development of 1,189,969 gross square feet (gsf)[1], a GHG consistency assessment has been conducted. As such, GHG emissions that would be generated as a result of the Proposed Action—and measures that would be implemented to limit those emissions—are presented in this chapter, along with an assessment of the Proposed Action'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 Action would annually result in approximately 8,074 metric tons of GHG emissions from its operations and 3,113 metric tons of GHG emissions from mobile sources—for an annual total of approximately 12,000 metric tons of GHG emissions as compared to New York City's 2011 annual total of 54.3 million metric tons. In addition, according to the PlaNYC document *Inventory of New York City Greenhouse Gas*

[1] Incremental gsf (compared to No-Action) resulting from the Proposed Action. To calculate residential gross square footage, approximately 3% was added to zoning floor area (1,076,074 zsf). To calculate commercial gross square footage, approximately 10% was added to the zoning floor area (74,194 zsf). This results in a total gross square footage of 1,189,969 sf.

Emissions (September 2011), the total for supplying energy to buildings (residential, commercial, industrial, and institutional) was 40.6 million metric tons.

As compared to these values, the contribution of the Proposed Action's GHG emissions to GHG emissions citywide is insignificant; it is approximately 0.02 percent of the total (and 0.03 percent of building-related emissions). Further, the buildings associated with the Proposed Action, as dense and mixed-use developments, advance New York City's GHG reduction goals as stated in *PlaNYC*. In addition, the developments could be subject to changes in the New York City Building Code that are currently being considered to require greater energy efficiency and to further the goals of *PlaNYC*. These could include energy efficiency requirements, specifications regarding cement, and other issues influencing GHG emissions.

The Proposed Action is, therefore, consistent with the City's citywide GHG and climate change goals, and there would be no significant adverse GHG emission or climate change impacts as a result of the Proposed Action.

C. POLLUTANTS OF CONCERN

Some GHGs, such as carbon dioxide (CO_2), 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 (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). This analysis focused on CO_2, N_2O, and methane as there are no significant direct or indirect sources of HFCs, PFCs, or SF_6 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) 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 12-1.

TABLE 12-1
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.

D. METHODOLOGY

In accordance with the *CEQR Technical Manual*, the GHG consistency assessment focuses on projects that would result in development of 350,000 square feet or greater. The Proposed Action is projected to result in an increase of 1,189,969 gross square feet (gsf) of residential, commercial and mixed used development at 8 projected development sites spread throughout the approximately 6-block proposed rezoning area.

A project's GHG emissions can generally be assessed in two steps: the first would be to estimate the GHG emissions of the Proposed Action 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 most of the affected buildings is not expected to take longer than two years, 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.

E. GHG EMISSIONS

Operational Emissions

According to the *CEQR Technical Manual*, for projects such as a proposed rezoning action, where the action would result in construction on sites that are not under the control of an applicant and where details such as the specific fuel type to be used are unknown, annual GHG emissions should be estimated based on a project's built floor area. Table 18-3 of the *CEQR Technical Manual* provides the carbon intensities of New York City building types, which were used to calculate annual operations emissions of the Proposed Action's RWCDS projected developments.

Table 12-2 displays the estimated GHG emissions associated with the operation emissions of the Proposed Action. As shown, operational GHG emissions are estimated to be approximately 8,074 metric tons of carbon dioxide equivalents. This represents less than 0.015 percent of the City's overall GHG emissions in 2011, which, according to the PlaNYC document Inventory of New York City Greenhouse Gas Emissions (September 2011), is approximately 54.3 million metric tons.

TABLE 12-2
Operational Emissions

Building Type	Carbon Dioxide Equivalent (CO_2e) kilogram (kg) / square foot / year	Floor Area (square ft)	CO_2e (metric tons/year)
Commercial	9.43	81,613	770
Industrial	23.18	0	0
Institutional	11.42	0	0
Large Residential	6.59	1,108,356	7,304
Small Residential	4.52	0	0
TOTAL			**8,074**

Mobile Source Emissions

The number of annual weekday motorized vehicle trips by mode (cars, taxis, trucks) that would be generated by the Proposed Action was calculated using the transportation planning assumptions developed for the analysis. 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* were used in the calculations of annual vehicle miles traveled by cars 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 was used to obtain an estimate of car, taxi, and truck GHG emissions attributable to the Proposed Action.

As shown Table 12-3, annual mobile source emissions related to the Proposed Action would result in approximately 3,113 metric tons of carbon dioxide equivalents.

TABLE 12-3
Mobile Source Emissions

Carbon Dioxide Equivalent (CO_2e) Emissions (metric tons/year)				
Road type	**Passenger Vehicles**	**Taxis**	**Trucks**	**TOTAL**
Local	371	52	449	872
Arterial	554	77	720	1,351
Interstate/Expressway	372	51	467	890
TOTAL	**1,297**	**180**	**1636**	**3,113**

Construction Phase Emissions

As per *CEQR Technical Manual* guidance, emissions associated with construction of the Proposed Action have not been estimated explicitly, but other similar 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 1 to 4 years.

Emissions from Solid Waste Management

The Proposed Action 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.

F. PROJECTED GHG EMISSIONS FROM THE PROPOSED ACTION

The detailed operational and mobile source emissions estimates are presented in Table 12-2 and Table 12-3, respectively. The total projected GHG emissions from the Proposed Action are shown in Table 12-4 below. The estimated total of 11,187 metric tons of GHG emissions is about 0.02% of New York City's 2011 annual total of 54.3 million metric tons.

TABLE 12-4
Total Emissions

Emissions Source	CO2e Emissions (metric tons)
Operations	8,074
Mobile Sources	3,113
TOTAL	**11,187**

G. 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 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 Action);
- 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 Action shows consistency with these goals in that:

- The rezoning area is located in an area supported by several public transit options. Thus, the Proposed Action supports an important PlaNYC goal of continuing transit-oriented development. The Proposed Action is expected to result in increased density in an already developed area, and would facilitate mixed-use development including new residential and retail uses, thereby promoting walkable destinations for retail and other services. The applicant would also encourage sustainable transportation on the applicant's development sites and include provisions for bicycle parking.
- The project utilizes exiting urban infrastructure; and
- By revitalizing creating increased densities through use of the Inclusionary Housing Program (IHP) in appropriate locations to expand and enhance future affordable housing development opportunities, the Proposed Action will provide affordable housing opportunities for New Yorkers and enhance the quality of life for residents and the community.

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. This assessment is summarized below.

- *Provide access to public transportation.* The location of the Proposed Action affords convenient access to public transportation including multiple bus routes and subway lines.

- *Select brownfields or greyfields for redevelopment to minimize vegetation/forest loss.* Although the projected development sites are not brownfields, all are developed lots in an urban setting, and their development does not involve vegetation or forest loss.
- *Incorporate mixed-use design to promote short commutes for employment and shopping.* The Proposed Action includes local retail districts to serve needs of the residents and the community.
- *Provide permanent protection for open space on the project site.* All zoning districts that are proposed as a part of the Proposed Action are contextual districts in which the Quality Housing Program is required. Per the regulations of the Quality Housing Program, adequate open space will be provided for every new multifamily residential building.
- *Design project to support alternative transportation (walking and bicycling).* The Proposed Action area is located within convenient walking or biking distance of public transit; shopping and other neighborhood services; and many roads in the area have bike lanes.
- *Design water efficient landscaping.* It is anticipated that on-site plantings will be native species and drought resistant.
- *Use energy efficient boilers*. It is anticipated that many of the boilers for space heating and domestic hot water will be natural gas fired hot water semi-condensing or condensing type.
- *Develop or support multi-use paths to and through site*. The Proposed Action area is integrated into the urban fabric to provide pedestrian / bike access to transit, shopping and neighborhood services.
- *Size parking capacity to meet, but not exceed, parking required by zoning.* Parking is sized to meet zoning requirements.
- *Provide bicycle storage*. Bicycle storage is provided in accordance with zoning requirements.
- During construction, the Proposed Action will comply with the NYC Air Pollution Control Code, which includes use of ultra-low sulfur diesel (ULSD) fuel and best available technology (BAT).