Chapter 15: Greenhouse Gas Emissions and Climate Change

15.1 Introduction

As noted 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*, New York City's long-term sustainability program, the City advances sustainability initiatives and goals to both greatly reduce GHG emissions and increase the City's resilience to climate change. 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. Subsequently, the City committed to an 80 percent reduction in greenhouse gases in by the year 2050 ("80 by 50"). On November 13, 2014, the City Council passed a bill to reduce citywide greenhouse gas emissions by 80 percent by 2050 (INT. 378) and it was adopted on December 14, 2014.

As described in Chapter 1, "Project Description," the Jerome Avenue Rezoning consists of a series of land use actions (collectively, the "Proposed Actions") intended to facilitate the implementation of the objectives of the Jerome Avenue Neighborhood Plan (the "Plan"). The affected area comprises an approximately 92-block area primarily along Jerome Avenue and its east west commercial corridors in Bronx Community Districts (CDs) 4, 5, and 7 (the "rezoning area"). The rezoning area is generally bounded by 184th Street to the north and East 165th Street to the south, and also includes portions of 183rd Street, Burnside Avenue, Tremont Avenue, Mount Eden Avenue, 170th Street, Edward L. Grant Highway, and East 167th Street.

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, certain projects' contribution of GHG emissions still should be analyzed to determine their consistency with the City's GHG reduction goal, which is currently the most appropriate standard by which to analyze a project under CEQR. The GHG consistency assessment focuses on those projects that have the greatest potential to produce GHG emissions that may result in inconsistencies with the GHG reduction goal to a degree considered significant. The *CEQR Technical Manual* recommends that a GHG

consistency assessment be conducted for any project resulting in 350,000 square feet (sf) or more of development, and other energy-intense projects.

The Proposed Actions are expected to facilitate the construction of new multi-unit residential buildings, commercial, community facility, and mixed-use buildings, as well as the conversion and/or enlargement of several existing buildings, which are expected to result in the development of approximately 4.8 million square feet on 45 projected development sites.[1] Therefore, a GHG consistency assessment is warranted. GHG emissions that would be generated as a result of the Proposed Actions are presented in this chapter, along with an assessment of the Proposed Actions' consistency with the citywide GHG reduction goal.

15.2 Principal Conclusions

The Proposed Actions would not result in a significant adverse impact on greenhouse gas emissions or climate change. It is estimated that the Reasonable Worst-Case Development Scenario (RWCDS) associated with the Proposed Actions would result in approximately 21,680 metric tons of carbon dioxide equivalent (CO2e) emissions from building operations annually and 9,177 metric tons of CO2e emissions from mobile sources annually, for an annual total of approximately 30,857 metric tons of CO2e emissions. This represents less than 0.06 percent of the City's overall 2014 GHG emissions of approximately 49.09 million metric tons. It should also be noted that the estimated GHG emissions for the Proposed Actions conservatively do not account for any energy efficiency measures that may be implemented by individual developments on projected development sites.

The Proposed Actions would advance New York City's GHG reduction goals by virtue of their nature and location. By revitalizing and reinforcing the rezoning area, which is served by 13 New York City Transit (NYCT) subway stations, ten local bus routes, and one commuter rail station, the Proposed Actions support transit-oriented development in New York City. Further, the new buildings facilitated by the Proposed Actions, which would replace existing structures or vacant lots, would be subject to the New York City Energy Conservation Code (NYCECC), which governs performance requirements of heating, ventilation, and air conditioning systems, as well as the exterior building envelope of new buildings. In compliance with this code, new development resulting from the Proposed Actions must meet standards for energy efficiency. Therefore, the Proposed Actions would be consistent with the applicable City's emissions reduction goals of transit-oriented development and construction of new resource - and energy-efficient buildings.

[1] Pursuant to CEQR, the GHG assessment is based on the total GHG emissions associated with a project, rather than the relative increment of a project's GHG emissions as compared to a No-Action scenario.

The rezoning area is located beyond the 100- and 500-year flood zones, and therefore is not susceptible to storm surge and coastal flooding. It is also located beyond the 100- and 500-year projections developed by the New York City Panel on Climate Change (NPCC) for the 2020s and 2050s. Accordingly, an assessment of the effects of climate change on the Proposed Actions is not warranted.

15.3 Recognized Greenhouse Gases

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 the Earth's surface, the atmosphere, and clouds. This property causes the general warming of the Earth's atmosphere, or the "greenhouse effect." Some GHGs, such as carbon dioxide, 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)

Carbon dioxide (CO2) 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). CO2 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, CO2 is the most abundant and, therefore, the most influential GHG.

METHANE (CH4)

Methane (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 by the decay of organic waste in municipal solid waste landfills. Methane, in addition to nitrous oxide (noted below), play an important role because 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 CO2.

NITROUS OXIDE (N2O)

Nitrous oxide (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, 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 Actions.

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 one 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 15-1, "Global Warming Potential for Primary Greenhouse Gases."

Table 15-1: Global Warming Potential for Primary Greenhouse Gases

Greenhouse Gas	Global Warming Potential
CO_2 - Carbon Dioxide	1
CH_4 - Methane	21
N_2O - Nitrous Oxide	310
HFCs - Hydrofluorocarbons	140-11,700*
PFCs - Perfluorocarbons	6,500-9,200*
SF_6 - Sulfur Hexafluoride	23,900

Note:

Subsequent to the *Second Assessment Report* ("SAR"), which was published in 1995, the Intergovernmental 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.

Source: *CEQR Technical Manual,* Table 18-1, 2014; STV Incorporated, 2017.

15.4 Methodology

GREENHOUSE GAS EMISSIONS

New York City determined that consideration of GHG emissions is appropriate under CEQR for at least certain projects for several reasons: (a) greenhouse gas emission levels may be directly affected by a project's effect on energy use; (b) the U.S. Supreme Court has upheld the determination that carbon dioxide, one of the main greenhouse gases, is an air pollutant, subject to regulation as defined by the Clean Air Act; and (c) Local Law 22 of 2008 codified *PlaNYC*'s citywide GHG emissions reduction goal of 30 percent below 2005 levels by 2030; moreover, the City has also adopted a longer-term goal of reducing emissions to 80 percent below 2005 levels by 2050, and has published a study evaluating the potential for achieving that goal. In accordance with the *CEQR Technical Manual*, the GHG consistency assessment focuses on proposed actions that would result in development of 350,000 sf or greater and other energy-intense projects. As previously stated, the Proposed Actions are projected to result in approximately 4.8 million sf of residential, commercial, industrial, community facility and mixed use development at 45 projected development sites spread throughout the approximately 92-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 resulting from the Proposed Actions and the second would be to examine the Proposed Actions in terms of the qualitative goals for reducing GHG emissions, as defined in the *CEQR Technical Manual*. A project's emissions are 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. After the emissions are estimated, the source of GHG emissions are examined in terms of goals for reducing GHG emissions using qualitative considerations. As defined in the *CEQR Technical Manual*, the qualitative goals that should be assessed, as relevant to the Proposed Actions are: (1) pursuing transit-oriented development; (2) generating clean, renewable power; (3) constructing new resource- and energy-efficient buildings and/or improving the efficiency of existing buildings; and (4) encouraging sustainable transportation.

Operational emissions and mobile source emissions were considered for this analysis. Per the guidance of the *CEQR Technical Manual* methodology, the assessment is based on the total GHG emissions associated with the Proposed Actions, rather than the relative increment of the Proposed Actions' GHG emissions as compared to the No-Action condition. Given the lack of specific construction sequences and data for the projected development sites, and as the construction phase is not likely to be a significant part of total emissions resulting from the Proposed Actions, emissions associated with construction of the Proposed Actions have been described qualitatively based on other similar analyses for large building construction. Similarly, because the Proposed Actions are not expected to fundamentally change the City's solid waste management system, an estimate of emissions from solid waste management is not warranted.

Building 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 anticipated future 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 Actions' RWCDS projected developments.

Mobile Source Emissions

The number of annual weekday 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 13, "Transportation." The assumptions used in the calculation include average daily weekday and Saturday person trips and delivery trips by use, the percentage of vehicle trips by mode, and the average vehicle occupancy. To calculate annual totals, the number of trips on Sundays was assumed to be the same as on Saturdays. Average one-way trip distances as shown in Tables 18-6 and 18-7 of the *CEQR Technical Manual* were used in the calculations of annual vehicle miles traveled by cars and taxis. Table 18-8 of the *CEQR Technical Manual* was used to determine the percentage of vehicle miles traveled by road type. The mobile GHG emissions calculator was used to obtain an estimate of car, taxi, and truck GHG emissions attributable to the Proposed Actions.

Construction Emissions

Consistent with common CEQR practice, emissions associated with construction in the RWCDS have not been estimated explicitly for the Proposed Actions, but analyses prepared for development projects in New York City[2] 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 operational emissions from the operation of the buildings over approximately five to ten years. Annualized emissions associated with construction were found to represent approximately three to 7.6 percent of the overall annual emissions for such projects.

[2] Examples include GHG analyses prepared for the EISs for Riverside Center, the Domino Sugar Rezoning, and Western Rail Yard.

Emissions from Solid Waste Management

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

CLIMATE CHANGE

According to the *CEQR Technical Manual*, depending on a project's sensitivity, location, and useful life, it may be appropriate to provide a qualitative discussion of the potential effects of climate change on a proposed project in environmental review. Rising sea levels and increases in storm surge and coastal flooding are the most immediate threats in New York City for which site-specific conditions can be assessed, and an analysis of climate change may be deemed warranted for projects at sites located within the 100- or 500-year flood zone. Based on the Federal Emergency Management Agency (FEMA) Preliminary Flood Insurance Rate Maps (FIRMs) issued in December 2013, the rezoning area is located beyond the 100- and 500-year flood zones, and is also located beyond the NPCC 100- and 500-year projections for the 2020s and 2050s. Therefore, the rezoning area is not susceptible to storm surge and coastal flooding, and an assessment of climate change is not warranted.

15.5 Projected GHG Emissions from the Proposed Actions

OPERATIONAL EMISSIONS

Table 15-2, "Annual Operational Emissions – RWCDS," displays the estimated GHG emissions associated with the operation emissions of the projected development sites resulting from the Proposed Actions in the RWCDS. As shown in the table, operational GHG emissions are estimated to be approximately 21,680 metric tons of CO2e emissions. This represents less than 0.06 percent of the City's overall 2014 GHG emissions of approximately 49.09 million metric tons.[3] It should be noted that the estimated GHG emissions for the Proposed Actions conservatively do not account for any energy efficiency measures that may be implemented by individual developments on projected development sites.

[3] City of New York, *Inventory of New York City Greenhouse Gas Emissions, November 2014,* by Cathy Pasion, Mikael Amar and Michael Delaney. Mayor's Office of Long-Term Planning and Sustainability, New York, 2014.

Table 15-2: Annual Operational Emissions – RWCDS

Building Type	Carbon Intensity Rates (kg CO_2e/ft^2)	Proposed Action Floor Area (ft^2)	GHG Emissions (kg CO_2e)	GHG Emissions (metric tons CO_2e)
Commercial	9.43	35,575.00	335,472.25	335.47
Industrial	21.18	(47,795.00)	(1,012,298.10)	(1,012.30)
Institutional	11.42	72,273.00	825,357.66	825.36
Large Residential (> 4family)	6.59	3,267,287.00	21,531,421.33	21,531.42
Small Residential (1-4 family)	4.52	-	-	-
Total		**3,327,340.00**	**21,679,953.14**	**21,679.95**

Notes:
Commercial = Office, Retail, Restaurant, Supermarket
Institutional = Medical Office, House of Worship, Community Center, Pre-K, PS/IS School
1 metric ton = 1,000 kg

Source: STV Incorporated, 2017

MOBILE SOURCE EMISSIONS

The number of annual weekday motorized vehicle trips by mode (cars, taxis and trucks) that would be generated by the projected developments in the Proposed Actions was calculated using the transportation planning assumptions developed for the traffic analysis and presented in Chapter 13, "Transportation." The assumptions used in the calculation include average daily weekday and Saturday person trips and delivery trips by proposed use, the percentage of vehicle trips by mode, and the average vehicle occupancy. To calculate annual totals, the number of trips on Sundays was assumed to be the same as on Saturdays. As stated in Section 15-4, "Methodology," above, annual vehicle miles traveled by cars, taxis, and trucks were calculated in accordance with *CEQR Technical Manual* guidelines. The projected annual VMT with the Proposed Actions, which forms the basis for the mobile-source GHG emissions calculations, are summarized in Table 15-3, "Proposed Actions Annual VMT (miles/year)."

Table 15-3: Proposed Actions Annual VMT (miles/year)

Mode	Land Use							Total Project Related VMT by Mode
	Residential	Local Retail	Restaurant	Medical Office	Office	Day Care Center	Commercial	
Auto	10,797,491	221,068	-	-	525,217	-	746,285	11,543,776
Taxi	1,015,030	2,926,127	-	-	22,571	-	2,948,698	3,963,728
Truck	2,143,284	-320,250	-	-	126,240	-	-194,010	1,949,274
Total Project Related VMT by Land Use	**13,955,805**	**2,826,945**	**-**	**-**	**674,028**	**-**	**3,500,973**	**17,456,778**

Source: STV Incorporated, 2017

The mobile GHG emissions calculator was used to obtain an estimate of car, taxi, and truck GHG emissions attributable to the Proposed Actions. As shown in Table 15-4, "Annual Mobile Source Emissions for 2026 – RWCDS Carbon Dioxide Equivalent (CO2e) Emissions (Metric tons/year)," annual

mobile source emissions related to the Proposed Actions would result in approximately 9,177 metric tons of CO2e emissions.

Table 15-4: Annual Mobile Source Emissions for 2026 – RWCDS Carbon Dioxide Equivalent (CO2e) Emissions (metric tons/year)

Road Type	Mode			Total GHG Emissions by Road Type
	Passenger Vehicle	Taxi	Truck	
Local	1,286	347	922	2,555
Arterial	2,096	599	1,449	4,144
Freeways	1,248	375	855	2,479
Total	**4,629**	**1,322**	**3,226**	**9,177**

Source: STV Incorporated, 2017

SUMMARY

The total projected GHG emissions from the projected developments in the Proposed Actions are shown in Table 15-5 below. The estimated total of 30,857 metric tons of CO2e emissions is approximately 0.06 percent of New York City's 2013 annual total of 49.09 million metric tons of CO2e emissions. As noted above, the estimated operational GHG emissions for the Proposed Actions conservatively do not include any additional energy efficiency measures that may be implemented by individual developments on projected development sites. As described in Section 15-4, "Methodology," above, construction emissions were not modeled explicitly, but are estimated to be equivalent to approximately five to ten years of operational emissions, including both direct energy and emissions embedded in materials (extraction, production, and transport). The Proposed Actions are not expected to change the City's solid waste management system, and therefore emissions associated with solid waste are not presented.

Table 15-5: Summary of Total Annual GHG Emissions from Projected Developments With the Proposed Actions

Emissions Source	Total GHG Emissions (metric tons CO2e)
Operational	21,680
Mobile	9,177
Total	**30,857**

Source: STV Incorporated, 2017

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." To determine consistency with the City's overall GHG reduction goal, one is to assess consistency with the four major goals as cited in the *CEQR Technical Manual*, as relevant to the project:

- 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 Actions);
- 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 Actions show consistency with these goals in that:

- The proposed rezoning area is well served by public transportation. A total of 13 NYCT subway stations, ten local bus routes, and one commuter rail station are located within, or in close proximity to, the rezoning area. The Proposed Actions would allow increases in density along selected corridors to expand opportunities for affordable housing, as well as directing higher densities to areas that can accommodate future growth, such as those close to subway lines. The Proposed Actions would also map new commercial overlays and new mixed-use (MX) districts to incentivize mixed-use development, permit industrial uses to expand in select areas, facilitate active streetscapes, and encourage new retail development to support the anticipated residential development in the area. By revitalizing and reinforcing the rezoning area, which is well-served by transit facilities and services, the Proposed Actions support transit-oriented development in New York City.
- The Proposed Actions utilize the existing urban infrastructure and would facilitate the development of vacant and underutilized sites.
- By applying a new Mandatory Inclusionary Housing (MIH) Program to portions of the rezoning area, the Proposed Actions would provide affordable housing opportunities for New Yorkers and enhance the quality of life for residents and the community.
- The new buildings facilitated by the Proposed Actions, which would replace existing structures or vacant lots, would be subject to the NYCECC, which comprises the 2010 Energy Conservation Construction Codes of New York State (ECCCNYS) in addition to a series of local laws. The NYCECC governs performance requirements of heating, ventilation, and air conditioning systems, as well as

the exterior building envelope of new buildings. In compliance with this code, new development resulting from the Proposed Actions must meet standards for energy efficiency.

The Proposed Actions would not substantially involve energy-intensive uses such as data centers or web hosting facilities, nor would they remove a source of energy generation. For these reasons, the Proposed Actions would not result in a significant adverse impact on energy systems. As the Proposed Actions are not expected to change the City's solid waste management system and are consistent with the GHG reduction goal, the Proposed Actions would not result in a significant adverse impact on greenhouse gas emissions or climate change.