2.O GREENHOUSE GAS EMISSIONS

INTRODUCTION

Increased greenhouse gas (GHG) emissions are changing the global climate, which is predicted to lead to 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. In New York City, increased temperatures may lead to an increase in summertime electricity demand due to greater usage of air conditioning, which in turn may result in more frequent power outages. Increases in precipitation levels may lead to more street and sewer flooding, while extended droughts and increased water demand may strain the City's water supply system. Rising sea levels may lead to increased risks of coastal flooding, as well as damage to infrastructure not designed to withstand saltwater exposure.

Through PlaNYC, the City has established sustainability initiatives and goals for both greatly reducing greenhouse gas emissions and adapting to climate change in the City. In addition, the City is engaged in several initiatives related to assessing potential local impacts of global climate change and developing strategies to make existing and proposed infrastructure and development more resilient to the effects of climate change. These include: 1) establishing a task force that is charged to develop strategies to secure the City's critical infrastructure against potential threats from rising seas, higher temperatures, and changing precipitation patterns; 2) conveying a expert panel to develop climate change projections for the City; 3) at the request of the City, the Urban Green Council convened a task force, consisting of over 150 building and design professionals, to strengthen the City's energy and building codes; 4) establishing an interagency group to work with the Federal Emergency Management Agency (FEMA) to revise the Flood Insurance Rate Maps for the City; and, 5) tasking the City's Department of Environmental Protection (DEP) to evaluate and implement adaptive strategies for the City's drinking water systems and drainage and wastewater management systems.

The City has determined that consideration of GHG emissions is appropriate under CEQR for at least certain projects for several reasons: 1) greenhouse gas emission levels may be directly affected by a project's effect on energy use; 2) 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, 3) Local Law 22 of 2008 codified PlaNYC's citywide GHG emissions reduction goal of 30 percent below 2005 levels by 2030 (the "GHG reduction goal").

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, larger projects' contribution of GHG emissions, especially, 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. This goal was developed as part of PlaNYC for the purpose of planning for an increase in population of almost one million residents while achieving significant greenhouse gas reductions, and was codified by the New York City Climate Protection Act (Local Law 22 of 2008[1]).

PRINCIPAL CONCLUSIONS

Construction for the Proposed Action would result in an estimated 128,128 metric tons of net embodied carbon dioxide equivalent over the entire construction period. Annually, the Proposed Action would result in approximately 19,472 metric tons of GHG emissions from its operations and 9,621 metric tons of GHG emissions from mobile sources, for an annual total of 29,094 metric tons of GHG emissions, or

[1] §24-803 of the Administrative Code of the City of New York

about 0.06 percent of the City's annual total of 49.3 million metric tons. This does not represent a net increment in GHG emissions, since similar GHG emissions would occur if residential units and associated uses were to be constructed elsewhere, and could be higher if constructed with less energy efficiency (the energy efficiency measures proposed on the applicant-controlled development sites are discussed in further detail below), as lower density residential, further from employment and commercial uses, and/or with less immediate access to transit service.

Construction on the applicant-controlled Development Sites would result in an estimated 60,116 metric tons of net embodied carbon dioxide equivalent over the entire construction period (with 39,817 metric tons attributed to the LSGD sites and 20,299 metric tons attributed to the applicant's non-LSGD sites). Annually, the applicant-controlled Development Sites would result in approximately 9,109 metric tons of GHG emissions from its operations (6,020 metric tons from the LSGD sites and 3,088 metric tons from the applicant's non-LSGD sites) and 18,633 metric tons of GHG emissions from mobile sources (11,879 metric tons from the applicant's LSGD sites and 6,755 from the applicant's non-LSGD sites), for an annual total of 27,742 metric tons of GHG emissions, or about 0.05 percent of the City's annual total of 49.3 million metric tons. For applicant-controlled development sites, research will be conducted into the use of low carbon and carbon neutral concrete.

Construction on the Development Sites not controlled by the project applicant would result in an estimated 68,012 metric tons of net embodied carbon dioxide equivalent over the entire construction period. Annually, the Development Sites not controlled by the applicant would result in approximately 10,363 metric tons of GHG emissions annually from its operations and 22,489 metric tons of GHG emissions annually from mobile sources, for an annual total of 32,852 metric tons of GHG emissions, or about 0.06 percent of the City's annual total of 49.3 million metric tons.

The site selection for the applicant-controlled Development Sites and other development sites within the rezoning area, the dense and mixed-use development projected to result from the Proposed Action, and the GHG reduction measures that the applicant will or may incorporate into its LSGD site, as well as on the other applicant-controlled development sites within the rezoning area, would advance New York City's GHG reduction goals as stated in PlaNYC. Where applicable, implementation of GHG reduction measures will be required through the project's Restrictive Declaration. The applicant will also consider participation in the Enterprise Green Communities Initiative and /or the NYS Energy Research and Development Authority's Multifamily Performance Program, depending on the availability of these or similar programs at the time of development. In addition, the development associated with the Proposed Action 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. Therefore, the Proposed Action is consistent with the City's citywide GHG and climate change goals.

METHODOLOGY

This chapter has been prepared following the guidance of the *CEQR Technical Manual*, which requires a disclosure of the projected quantities of greenhouse gas emissions that would be generated by the Proposed Action and a qualitative discussion of potential impacts on climate change. With the exception of city capital projects and projects proposing power generation or a fundamental change to the City's solid waste management system, a GHG emissions assessment is typically conducted only for larger projects undergoing an EIS, since these projects have a greater potential to be inconsistent with the City's GHG reduction goal to a degree considered significant. As such and in accordance to the *Manual*, the GHG consistency assessment focuses on projects that would result in development of 350,000 square feet or greater. The Proposed Action, as detailed in Chapter 1, "Project Description," is projected to result in an overall total of 2.89 million gross square feet (gsf) of mixed residential development on 26

development sites. Of this total projected development, the applicant controls six development sites that would contain 1.35 million gsf of development including one, Site 2N (part of the applicant's proposed LSGD site, see Figure 1-11 in Chapter 1, "Project Description"), with approximately 363,500 gsf of projected development.

A project's GHG emissions may generally be assessed in two steps: estimate the GHG emissions of the proposed project and examine the project in terms of the qualitative goals for reducing GHG emissions. The *Manual* recommends that the project's emissions be estimated with respect to the following main emissions sources: operations emissions (direct and indirect); mobile source emissions (direct and indirect); and, when applicable, construction emissions and emissions from solid waste management. The project would not be expected to fundamentally change the City's solid waste management system; therefore no estimate has been made of emissions from solid waste management.

There are six internationally-recognized greenhouse gases regulated under the Kyoto Protocol: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. All calculations of emissions in this chapter are presented in units of metric tons of carbon dioxide equivalent, a common measure that allows gases with different global warming potentials to be added together and compared.

ESTIMATED ANNUAL GREENHOUSE GAS EMISSIONS

Operations Emissions

According to the *CEQR Technical Manual*, for projects such as a rezoning, where the proposed action would result in construction on sites that are not under the control of the applicant and where details such as specific fuel type to be used may be unknown, annual GHG emissions are estimated based on a project's built floor area. Table 18-3 in the *CEQR Technical Manual* provides the carbon intensity of New York City building types, which is used to calculate annual operations emissions of development resulting from the Proposed Action. (It should be noted that the stationary source air quality analyses in Chapter 2.N (Air Quality) assume natural gas as a fuel for LSGD development sites (1, 2S and 2N). This analysis, however, to be more conservative, uses Table 18-3 in the *CEQR Technical Manual*, which contains GHG emission rates by building type. These emission rates are based on a City-wide average energy consumption by building type, regardless of fuel used for HVAC purposes.) Table O-1 displays the estimated GHG emissions for both the Proposed Action overall and the applicant's Proposed Project.

Table O-1: Annual Operational GHG Emissions and Carbon Intensity

Building Type	kg Carbon Dioxide Equivalent / sq. ft	Floor Area (sq. ft)	GHG emissions (kg)
Applicant Development Sites: LSGD			
Commercial	9.43	18,493	174,389
Institutional	11.42	11,888	135,761
Large Residential	6.59	866,514	5,710,327
LSGD Operational GHG Emissions			6,020,477
Applicant Development Sites: Non-LSGD			
Commercial	9.43	27,540	259,702
Institutional	11.42	0	0
Large Residential	6.59	429,300	2,829,087
Applicant Non-LSGD Operational GHG Emissions			3,088,789
All Applicant Sites Operational GHG Emissions			**9,109,266**
Non-Applicant Sites			
Commercial	9.43	85,836	809,433
Institutional	11.42	0	0
Large Residential	6.59	1,449,713	9,553,609
Non-Applicant Operational GHG Emissions			10,363,042
RWCDS Total Operational GHG Emissions			**19,472,309**

As shown in Table O-1, GHG emissions are estimated to be approximately 6 million kilograms for the LSGD sites, approximately 9.1 million kilograms for the other applicant-controlled development sites, and 10.3 million kilograms for the development sites not controlled by the applicant. Overall, the Proposed Action's annual GHG emissions are estimated to be approximately 19.4 million kilograms, or approximately 19,472 metric tons. This represents less than 0.04 percent of the City's overall GHG emissions in 2009 – which, according to the PlaNYC document *Inventory of New York City Greenhouse Gas Emissions* (September 2010), is approximately 49.3 million metric tons.

Mobile Source Emissions

Mobile source emissions resulting from the Proposed Action are estimated by using the trip generation numbers from the Transportation chapter of this EIS and using these to calculate the Vehicle Miles Traveled (VMT) for each vehicle mode (trucks, cars, and other trips). The *CEQR Technical Manual* provides guidance criteria on how to calculate VMT for trucks, cars, and taxis, which have been followed for this analysis. Then the VMTs are assigned to arterials, local roads, or interstates/expressways using percentages given in the *Manual* (unless more specific data regarding VMT assignment is known). Table O-2 shows estimated VMTs by vehicle type and roadway type for the applicant's development sites and for the reasonable worst case development scenario (RWCDS), as discussed in detail in Chapter 1 of this EIS, of the entire rezoning area.

Table O-2: Estimated Annual VMTs for the Proposed Action

	Cars			Taxis			Trucks		
	Local VMTs	Arterial VMTs	Highway VMTs	Local VMTs	Arterial VMTs	Highway VMTs	Local VMTs	Arterial VMTs	Highway VMTs
Applicant Development Sites: LSGD									
Weekday residential	623,047	1,277,246	1,214,942	27,994	57,388	54,588	106,403	218,126	207,485
Weekend residential	148,142	303,692	288,878	6,656	13,645	12,980	14,187	29,083	27,665
Retail weekday	14,826	30,393	28,910	13,178	27,016	25,698	12,825	26,291	25,009
Retail weekend	35,293	72,350	68,821	31,371	64,311	61,174	1,466	3,005	2,858
Childcare	15,553	31,884	30,329	6,110	12,526	11,915	1,649	3,380	3,215
Applicant LSGD Subtotal	**836,861**	**1,715,565**	**1,631,879**	**85,310**	**174,886**	**166,355**	**136,529**	**279,885**	**266,232**
Applicant Development Sites: Non-LSGD									
Weekday residential	299,341	613,649	583,715	13,450	27,572	26,227	51,121	104,798	99,686
Weekend residential	71,175	145,908	138,790	3,198	6,556	6,236	6,816	13,973	13,291
Retail weekday	22,079	45,261	43,054	19,626	40,232	38,270	19,099	39,153	37,243
Retail weekend	46,718	95,773	91,101	46,718	95,773	91,101	2,183	4,475	4,256
Childcare	0	0	0	0	0	0	0	0	0
Applicant Non-LSGD Subtotal	**439,313**	**900,591**	**856,660**	**82,991**	**170,132**	**161,833**	**79,219**	**162,398**	**154,476**
All Non-Applicant Subtotal	**1,276,174**	**2,616,156**	**2,488,539**	**168,301**	**345,018**	**328,188**	**215,748**	**442,283**	**420,708**
Non-Applicant Development Sites									
Weekday residential	1,009,406	2,069,282	1,968,341	45,353	92,975	88,439	172,384	353,388	336,149
Weekend residential	240,007	492,015	468,014	10,784	22,107	21,028	22,985	47,118	44,820
Retail weekday	68,814	141,070	134,188	61,168	125,395	119,278	59,527	122,031	116,078
Retail weekend	163,812	335,814	319,433	145,611	298,502	283,941	6,803	13,946	13,266
Childcare	0	0	0	0	0	0	0	0	0
Non-Applicant Subtotal	**1,482,039**	**3,038,181**	**2,889,977**	**262,916**	**538,978**	**512,686**	**261,699**	**536,483**	**510,314**
RWCDS Grand Total	**2,758,213**	**5,654,337**	**5,378,515**	**431,218**	**883,996**	**840,874**	**477,447**	**978,767**	**931,022**

Then a mobile GHG emissions calculator (included with the *CEQR Technical Manual*) is used to obtain the total estimated source GHG emissions attributable to the project[2]. The results of this calculation are presented below in Table O-3, which shows separately the GHG emissions generated by the LSGD Sites, Applicant-Controlled Non-LSGD Sites, and all other Development Sites.

[2] Mobile source GHG emissions were recalculated between the Draft and Final EIS, as the *CEQR Technical Manual*'s calculator was revised to reflect corrections to EPA's MOVES2010 model, which forms the basis of the calculator.

Table O-3: Estimated Annual Mobile Source GHG Emissions (in metric tons)

	Car	Taxi	Truck	Total
Applicant Development Sites: LSGD				
Local	408.52	37.40	275.62	721.54
Arterial	707.22	64.53	465.53	1,237.28
Int/Exp	475.10	42.60	301.87	819.58
Applicant LSGD Subtotal	1,590.85	144.53	1,043.02	2,778.40
Applicant Development Sites: Non-LSGD				
Local	214.45	36.38	159.92	410.76
Arterial	371.26	62.77	270.12	704.14
Int/Exp	249.41	41.45	175.16	466.01
Applicant Non-LSGD Subtotal	835.12	140.60	605.20	1,580.92
All Non-Applicant Subtotal	**2,425.97**	**285.13**	**1,648.22**	**4,359.32**
Non-Applicant Development Sites				
Local	723.47	115.26	528.31	1,367.04
Arterial	1,252.45	198.86	892.33	2,343.64
Int/Exp	841.39	131.30	578.63	1,551.32
Subtotal	2,817.31	445.42	1,999.27	5,262.00
RWCDS Grand Total	**5,243.28**	**730.56**	**3,647.48**	**9,621.32**

As shown in the above tables, annual mobile source emissions of carbon dioxide equivalent would be approximately 2,778 metric tons for the LSGD sites, 1,581 metric tons for the other applicant-controlled development sites, and 5,262 metric tons for the non-applicant-controlled development sites. In total, annual mobile source emissions related to development on the applicant's development sites would result in 9,621 metric tons of carbon dioxide equivalent.

Construction Emissions

According to the *2010 CEQR Technical Manual*, for projects subject to a GHG assessment, the lead agency should discuss construction, extraction or production of materials or fuels qualitatively by considering the types of construction materials and equipment proposed for use on the project and the opportunities for alternative approaches (*e.g.*, different forms of concrete production) that may serve to reduce GHG emissions associated with construction. For those projects where the construction phase or the extraction or production of materials or fuels is likely to be a significant part of total project emissions, the lead agency, in its discretion, may quantify the emissions resulting from construction activity and construction materials. It should be noted that by far, the most prevalent material that will be used in the construction of the projected dwelling units is concrete. Ninety percent of the embedded carbon dioxide equivalent in concrete comes from the cement portion of the mixture.

Because of the magnitude of the Proposed Action, a rough estimate was prepared of the greenhouse gases which would be released during the construction process. This estimate was made using the Construction Carbon Calculator, Version 0.03.5, as developed by BuildCarbonNeutral.Org.

The Construction Carbon Calculator estimates embodied carbon. Embodied carbon is the carbon released when a product is manufactured, shipped to a project site and installed. This calculator looks at an entire project, and takes into account the site disturbance, landscape and ecosystem installation or restoration, building size and base materials of construction. It does this simply, requiring only basic information that is available to a project team very early in the design process.

The calculator provides an estimate that establishes a base number to clarify the carbon implications of the construction process - to be used as tool to address the reduction of that footprint. The results obtained are an estimation and approximate - accurate within 25 percent, plus or minus.

Below are the main features, characteristics and assumptions behind the model:

1. "The calculator is accurate to about 25%, plus or minus. (This is similar to most operational carbon calculators.)
2. Landscape data are for soil organic carbon (SOC) only and do not include above ground biomass (trees, shrubs and grasses).
3. Disturbed soil retains an amount of residual carbon. This carbon factor has been accounted for in both the disturbed soil and the installed landscape accounting.
4. The land use categories are very broad and refer largely to mature natural landscapes - 5 years for grasslands, 10 years for shrublands and 30 years for forests.
5. The data are taken from a number of published references. Where there is a range for any vegetation type/ecoregion cell, the mid point is taken.
6. This takes no account of the variation of soil characteristics within each ecoregion.
7. This does not include data for conventional landscaped systems, which can vary considerably depending on inputs - the nearest vegetation type should be used (e.g. for a urban park use savanna/parkland; lawns use shortgrass/lawn).
8. Numbers have been built from a combination of project cost estimates including quantities and available web-based resources of embodied carbon intensity ratios of different building materials.
9. The building data takes into account site excavation, shell and core (structural systems, building envelope and building systems). Tenant improvements, interiors or furniture, fixtures or equipment have not been included in version 0.01.
10. These carbon cost estimates are based primarily on commercial or multi-family projects. Residential projects may vary from these results.
11. The building data is based on Life Cycle Balancing: Building Shell, Interiors, & Furnishings Sub-Systems: Nursing and Biomedical Sciences Building, the University of Texas at Houston Health Sciences Center from the Center for Maximum Potential Building Systems. They had the following factors for different building elements: Shell - 24%, Service Systems - 22%, Service Sector - 14%, Substructure - 5%, Other/ Miscellaneous - 17%. This is 70% of the total for a complete building including interiors, but covers the materials being quantified in our analysis. Our breakdown was slightly different, taking into account the specific building elements for which we were able to accumulate data, and extrapolating the unknown factors. Our factors were as follows: Shell Known - 12%, Shell Unknown - 12%, Service Systems - 22%, Service Sector - 14%, Substructure Known - 2%, Substructure Unknown - 3%, Other/ Miscellaneous - 5%.
12. Building square footage intensity values have been generated from cost estimate data for excavation, steel, concrete and wood and material carbon intensity ratios.
13. Wood values assume non-certified wood sources. The values for the wood represent the carbon released converting the wood from a natural forested state to an installed condition. Certified wood will compensate for the carbon released and allow the wood in a building to count as a carbon sink.
14. Some data sets used in developing version 0.01 were smaller than others. Averaged values were available for certain building structural types, but for others it was based on one or two actual buildings. "[3]

Following, in Table O-4, are the inputs that were used for the Construction Carbon Calculator.

[3] From http://www.buildcarbon neutral.com , "assumptions" page.

Table O-4: Construction Carbon Calculator Inputs and Results

	Applicant Sites: LSGD	Applicant Sites: Non-LSGD	Non-Applicant Development Sites	Subtotal: Applicant Sites	Total
Total Square Feet[1]	896,895	456,840	1,535,549	1,353,735	2,889,284
Stories Above Grade[2]	9	10	7	N/A	N/A
Stories Below Grade	1	1	1	N/A	N/A
System Type	concrete	concrete	concrete	N/A	N/A
Ecoregion	Eastern Temperate Forests	Eastern Temperate Forests	Eastern Temperate Forests	N/A	N/A
Existing Vegetation Type	Previously Developed	Previously Developed	Previously Developed	N/A	N/A
Installed Vegetation Type	Shrubland	Shrubland	Shrubland	N/A	N/A
Landscape Disturbed[3] (sf)	0	0	0	0	0
Landscape Installed[4] (sf)	44,254	19,650	97,039	63,904	160,943
Approximate net embodied CO2 (metric tons)	39,817	20,299	68,012	60,116	128,128

Source: buildcarbonneutral.com Construction Carbon Calculator formula version 0.03.5

Notes: 1: From RWCDS, total building floor area

2: Derived assuming average of 70 percent lot coverage as footprint

3: Lot area from RWCDS

2: Equals 30 percent of lot area

As shown in Table O-4, the inputs in the Construction Carbon Calculator resulted in 39,817 metric tons of carbon dioxide equivalent for the applicant-controlled LSGD sites, 20,299 metric tons of carbon dioxide equivalent for the applicant-controlled non-LSGD sites, and 68,012 metric tons of carbon dioxide equivalent for the Development Sites not controlled by the applicant. Thus, the construction process would result in about 128,094 metric tons of carbon dioxide equivalent over the full, 10-year construction period.

CONSISTENCY WITH THE GHG REDUCTION GOAL

According to the *CEQR Technical Manual*, the assessment of consistency with the 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:

1. Pursue transit-oriented development;

2. 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);

3. 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 this Proposed Action);

4. Encourage sustainable transportation through improving public transit, improving the efficiency of private vehicles, and decreasing the carbon intensity of fuels.

The design of the buildings on the applicant controlled development sites will incorporate sustainable elements to conserve energy, promote the health of residents and enhance the environmental quality of the community, while providing durable, low maintenance building systems and materials. The applicant will consider participation in the Enterprise Green Communities Initiative and /or the NYS Energy Research and Development Authority's Multifamily Performance Program, depending on the availability of these or similar programs at the time of development.

Strategies may include: site planning to optimize open space with native and drought resistant plantings; well insulated and sealed building envelope; insulated windows with low-e glazing; efficient heating system; EnergyStar appliances and light fixtures; lighting controls in offices, etc.; low-flow plumbing fixtures; low-VOC materials; use of recycled and regional materials.

The location of the project is convenient to public transit and neighborhood services. The project utilizes the exiting urban infrastructure. By revitalizing an underutilized industrial area, the project will provide affordable housing opportunities for New Yorkers and will enhance the quality of life for residents and the community. The *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.

Building Design and Operation Measures Applicable Only to Applicant-Controlled Development Sites

For the applicant-controlled development sites, the applicant proposes to include or consider the following specific sustainability and efficiency measures.

- *Design an energy efficient building envelope to reduce cooling/heating requirements*. The exterior envelope of the buildings is anticipated to be primarily masonry cavity wall, with insulation within the cavity to optimize performance. The cavity wall construction, with the air gap between inner and outer wythes of masonry also limits possibilities for air and moisture infiltration. It is anticipated that the building envelope, as well as apartment demising walls, will be well sealed to further limit air infiltration.

- *Install high-efficiency HVAC systems*. It is anticipated that boilers for space heating and domestic hot water will be natural gas fired hot water semi-condensing or condensing type.

- *Construct green roofs*. Subject to further study, portions of roof areas may be planted as green roofs.

- *Maximize interior daylighting*. It is anticipated that windows will be provided adjacent to elevator cores to provide natural lighting in core areas and corridors.

- *Incorporate window glazing to optimize daylighting, heat loss and solar heat gain*. Windows will be double glazed with low-e glazing and argon filled cavity. Aluminum window frames will be thermally broken.

- *Incorporate motion sensors and lighting and climate control*. Motion sensors will be used for lighting in Refuse Rooms, Custodial and utility rooms and other common spaces. Bi-level lighting will be used in fire stairs, so that a low level of code compliant lighting is always on and additional lighting is activated by a motion sensor. Consideration will be given to bi-level lighting in corridors. Exterior lighting will be controlled by timer or photocell. Light fixtures will be EnergyStar labeled or energy efficient type. Thermostats or control valves will be provided in apartments for heating control.

- *Use efficient, directed exterior lighting*. It is anticipated that exterior lighting will be designed to balance security and safety with energy efficiency and to minimize light trespass impacts.

- *Use water conserving fixtures that exceed building code requirements*. It is anticipated that plumbing fixtures and fittings will meet or exceed building code flow requirements, including toilets, faucets/aerators and shower heads.

- *Provide for storage and collection of recyclables in building design*. Refuse rooms and trash storage areas will be designed to accommodate recyclables.

- *Use building materials with recycled content*. It is anticipated that the project will include materials with recycled content. These may include: concrete, steel elements (structural steel, steel studs, doors and frames, etc.), gypsum wall board, etc.

- *Use building materials that are extracted and/or manufactured within the region*. It is anticipated that the project will include materials that are extracted and/or manufactured in the region. These may include: concrete, concrete masonry units, brick, steel doors and frames, windows, gypsum wall board, etc.

- *Provide permanent protection for open space on the project site*. Three publicly accessible open spaces will be provided on Development Sites 1, 2S, and 2N within the applicant's LSGD . Two 60 foot wide landscaped open spaces, designated as mid-block open areas, extend from Boone Avenue to West Farms Road. These areas provide access to building entries and pedestrian connections between Boone Avenue to West Farms Road. The other proposed open space is a tot lot, which is to be located on the east side of Boone Avenue adjacent to one of the mid-block open areas.

- *Minimize building footprint.* The design of the buildings for the applicant controlled development sites balances an appropriate urban density with preservation of open space both for public use, as described above and for use by residents.

- *Develop or support multi-use paths to and through site*. As described above, the Proposed Action is integrated into the urban fabric to provide pedestrian / bike access to transit, shopping and neighborhood services. The mid-block open areas within the LSGD would provide access towards the Bronx River Greenway and Starlight Park areas. These will provide new pedestrian connections to the east for project and community residents. In addition, these mid-block open areas would be located near the bikeways along Longfellow and Bryant Avenues, and East 174th street, which runs east-west and cuts through the Proposed Action area.

- For the applicant controlled development sites, research will be conducted into both low carbon and carbon neutral concrete. Decisions on the concrete specifications will be made depending on cost effectiveness and whether or not the low carbon and carbon neutral concrete has been technologically proven for strength and durability characteristics.

Building Design and Operation Measures Applicable to the Proposed Action (All Development Sites)

- *Provide access to public transportation.* The location of the Proposed Action affords convenient access to public transportation including multiple bus routes and three subway lines (Numbers 2, 5, and 6).

- *Select brownfields or greyfields for redevelopment to minimize vegetation/forest loss.* Although the 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. Consideration will be given to providing a community facility on the applicant controlled development sites to provide day care or similar community service.

- *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 buildings.

- *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. Many roads in the area have bike lanes, including Longfellow and Bryant Avenue, which run north-south and are located one block west of the Proposed Action area, and East 174th street, which runs east-west and cuts through the Proposed Action area.

- *Design water efficient landscaping*. It is anticipated that on-site plantings will be native species and drought resistant.

- *Use energy efficient boilers*. As described above, it is anticipated that 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*. As described above, 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).

CONCLUSIONS

Applicant-Controlled Development Sites

Construction on the applicant-controlled Development Sites would result in an estimated 60,116 metric tons of net embodied carbon dioxide equivalent over the entire construction period (with 39,817 metric tons attributed to the LSGD sites and 20,299 metric tons attributed to the applicant's non-LSGD sites).

For applicant-controlled development sites, research will be conducted into the use of low carbon and carbon neutral concrete.

Annually, the applicant-controlled Development Sites would result in approximately 9,109 metric tons of GHG emissions from its operations (6,020 metric tons from the LSGD sites and 3,088 metric tons from the applicant's non-LSGD sites) and 4,359 metric tons of GHG emissions from mobile sources (2,778 metric tons from the applicant's LSGD sites and 1,581 from the applicant's non-LSGD sites), for an annual total of 13,469 metric tons of GHG emissions, or about 0.03 percent of the City's annual total of 49.3 million metric tons.

Non-Applicant Development Sites

Construction on the Development Sites not controlled by the project applicant would result in an estimated 68,012 metric tons of net embodied carbon dioxide equivalent over the entire construction period.

Annually, the Development Sites not controlled by the applicant would result in approximately 10,363 metric tons of GHG emissions annually from its operations and 5,262 metric tons of GHG emissions annually from mobile sources, for an annual total of 15,625 metric tons of GHG emissions, or about 0.03 percent of the City's annual total of 49.3 million metric tons.

Proposed Action (All Development Sites)

Construction for the Proposed Action would result in an estimated 128,128 metric tons of net embodied carbon dioxide equivalent over the entire construction period. As noted above, the most prevalent material that will be used in the construction of the projected development is concrete. Ninety percent of the embedded carbon dioxide equivalent in concrete comes from the cement portion of the mixture.

The Proposed Action would result in approximately 19,472 metric tons of GHG emissions annually from its operations and 9,621 metric tons of GHG emissions annually from mobile sources, for an annual total of 29,094 metric tons of GHG emissions, or about 0.06 percent of the City's annual total of 49.3 million metric tons.

According to the PlaNYC document *Inventory of New York City Greenhouse Gas Emissions* (September 2010), which covers calendar year 2009, New York City was responsible for 49.3 million metric tons of carbon dioxide equivalent emissions (i.e., the city's carbon footprint). According to Figure 2 in the *Inventory of New York City Greenhouse Gas Emissions*, residential buildings accounted for 35%, other buildings 43%, on-road transportation 17%, transit 3%, and fugitive and process gases 2% (the last category includes fugitive gases released from landfills and sewage treatment plants, the operation of sewage treatment plants, and the production and distribution of electricity.)

According to Table 8 of the *of New York City Greenhouse Gas Emissions*, the total was actually 49,301,948 metric tons. The total for buildings (the table does not provide a breakdown by type of building) was 38,286,226 metric tons. The figure for on-road transportation was 8,440,445 metric tons, of which passenger cars contributed 6,820,843 and trucks 1,619,602. It should be noted that bus emissions are not classified as on-road but are combined with subway, commuter rail, and freight rail as transit. The city's carbon footprint has been dropping since the initial inventory was made for 2005. For 2008 the figure was 53.3 million metric tons.

As compared to this, the contribution of the Proposed Action's greenhouse gas (GHG) emissions to GHG emissions citywide is insignificant; in fact it is approximately 0.06 percent of this total. Further, the site

selection for the Proposed Project and other development sites within the rezoning area, the dense and mixed-use development projected to result from the Proposed Action, and the GHG reduction measures described above that the applicant will or may incorporate into the Proposed Project, would advance New York City's GHG reduction goals as stated in PlaNYC. Where applicable, implementation of the measures described above will be required through the Proposed Project's Restrictive Declaration. In addition, the development associated with the Proposed Actions 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. In conclusion, there would be no significant adverse GHG emission or climate change impacts.