Chapter 16: Greenhouse Gas Emissions and Climate Change

A. INTRODUCTION

This chapter evaluates the greenhouse gas (GHG) emissions that would be generated by the construction and operation of the proposed project and also evaluates the proposed actions' consistency with the citywide GHG reduction goals. As described in Chapter 1, "Project Description," the applicants, the New York City Department of City Planning (DCP) and SJC 33 Owner 2015 LLC, are proposing a series of discretionary actions (the proposed actions) that would facilitate the redevelopment of St. John's Terminal Building at 550 Washington Street (Block 596, Lot 1) (the development site) with a mix of residential and commercial uses, and public open space (the proposed project) in Manhattan Community District 2.

As discussed in the 2014 *City Environmental Quality Review* (*CEQR) Technical Manual*, climate change is projected to have 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. New York City's sustainable development policy, starting with PlaNYC, and continued and enhanced in OneNYC, established sustainability initiatives and goals for greatly reducing GHG emissions and for adapting to climate change in the City.

Per the *CEQR Technical Manual*, the citywide GHG reduction goal is currently the most appropriate standard by which to analyze a project under CEQR. The *CEQR Technical Manual* recommends that a GHG consistency assessment be conducted when an Environmental Impact Statement (EIS) is being prepared for any project resulting in 350,000 square feet (sf) or more of development and other energy-intense projects. Therefore, since the proposed actions would result in the development of roughly two million gross square feet (gsf) of floor area, a GHG consistency assessment is provided. This assessment conservatively considers the scenario under which the development site is built with the proposed project with big box retail, since that scenario has a greater potential to result in GHG emissions.

PRINCIPAL CONCLUSIONS

The proposed actions would be consistent with the City's emissions reduction goals, as defined in the *CEQR Technical Manual*, and would be consistent with New York City policies regarding adaptation to climate change.

The building energy use and vehicle use associated with the proposed project would result in up to approximately 23,600 metric tons of carbon dioxide equivalent (CO_2e) emissions per year, including approximately 14,200 metric tons from building operations and 9,400 from on-road emissions. This is a conservative estimate, and does not include specific building design for energy efficiency expected to result in lower emissions. The project may include cogeneration, providing electricity and heat and hot water as a byproduct; this would reduce offsite emissions from electricity generation and increase on-site emissions from natural gas combustion. Based

on preliminary, simplified estimates, the cogeneration would reduce net GHG emissions only very slightly (reducing building energy emissions by 0.8 percent.)

The *CEQR Technical Manual* defines five goals through which a project's consistency with the City's emission reduction goal is evaluated: (1) efficient buildings; (2) clean power; (3) sustainable transportation; (4) construction operation emissions; and (5) building materials carbon intensity.

The applicant is currently evaluating the specific energy efficiency measures and design elements that may be implemented. The applicant is committed at a minimum to achieve the energy efficiency consistent with the prerequisite requirements for certification under the Leadership in Energy and Environmental Design (LEED) New Construction rating system, version 4 and would likely exceed them. The buildings would exceed the energy requirements of the New York City building code (currently the same as ASHRAE 90.1-2010), resulting in energy expenditure lower than a baseline building designed to meet but not exceed the minimum building code requirements by five percent or more. Furthermore, additional energy savings would likely be achieved via guidance for tenant build-out, which would control much of the building's energy use and efficiency, but those are unknown at this time. The project's commitment to building energy efficiency, exceeding the building code energy requirements, ensures consistency with the efficient buildings goal defined in the *CEQR Technical Manual* as part of the City's GHG reduction goal, and would be specified and required under the conditions of the special permit.

The proposed project would also support the other GHG goals by virtue of its nature and location: its proximity to public transportation, reliance on natural gas, commitment to construction air quality controls, and the fact that as a matter of course, construction in New York City uses recycled steel and includes cement replacements. All of these factors demonstrate that the proposed development supports the GHG reduction goal.

Therefore, based on the commitment to energy efficiency and by virtue of location and nature, the proposed project would be consistent with the City's emissions reduction goals, as defined in the *CEQR Technical Manual*.

The proposed project would be designed to accommodate flood levels projected for the year 2100 for all critical infrastructure and residential uses, and for the 2050s or higher for commercial uses (applying the higher 2100 levels where practicable). The proposed project would be consistent with New York City policies regarding adaptation to climate change.

B. ANALYSIS APPROACH

As described in Chapter 2, "Analytical Framework," in the future with the proposed actions (the With Action condition), the development site is assumed to be redeveloped with one of two development programs: the proposed project or the proposed project with big box retail. In addition, under both of these scenarios, the South Site could contain either hotel or office use. For the purposes of this analysis, the development option that includes big box retail and hotel has been considered, since retail and hotel uses are more energy intense than parking and office use, respectively.

C. GREENHOUSE GAS EMISSIONS

POLLUTANTS OF CONCERN

GHGs are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds. This phenomenon causes the general warming of the Earth's atmosphere, or the "greenhouse effect." Water vapor, carbon dioxide (CO_2), nitrous oxide (N_2O), methane, and ozone are the primary greenhouse gases in the Earth's atmosphere.

There are also a number of entirely anthropogenic greenhouse gases in the atmosphere, such as halocarbons and other chlorine- and bromine-containing substances, which also damage the stratospheric ozone layer (and contribute to the "ozone hole"). Since these compounds are being replaced and phased out due to the 1987 Montreal Protocol, there is no need to address them in GHG assessments for most projects. Although ozone itself is also a major greenhouse gas, it does not need to be assessed as such at the project level since it is a rapidly reacting chemical[1] and efforts are ongoing to reduce ozone concentrations as a criteria pollutant (see Chapter 15, "Air Quality"). Similarly, water vapor is of great importance to global climate change, but is not directly of concern as an emitted pollutant since the negligible quantities emitted from anthropogenic sources are inconsequential.

CO_2 is the primary pollutant of concern from anthropogenic sources. Although not the GHG with the strongest effect per molecule, CO_2 is by far the most abundant and, therefore, the most influential GHG. CO_2 is emitted from any combustion process (both natural and anthropogenic); from some industrial processes such as the manufacture of cement, mineral production, metal production, and the use of petroleum-based products; from volcanic eruptions; and from the decay of organic matter. CO_2 is removed ("sequestered") from the lower atmosphere by natural processes such as photosynthesis and uptake by the oceans. CO_2 is included in any analysis of GHG emissions.

Methane and N_2O also play an important role since the removal processes for these compounds are limited and because they have a relatively high impact on global climate change as compared with an equal quantity of CO_2. Emissions of these compounds, therefore, are included in GHG emissions analyses when the potential for substantial emission of these gases exists.

The *CEQR Technical Manual* lists six GHGs that could potentially be included in the scope of a GHG analysis: CO_2, N_2O, methane, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). This analysis focuses mostly on CO_2, N_2O, and methane. There are no significant direct or indirect sources of HFCs, PFCs, or SF_6 associated with the proposed development.

To present a complete inventory of all GHGs, component emissions are added together and presented as CO_2e emissions—a unit representing the quantity of each GHG weighted by its effectiveness using CO_2 as a reference. This is achieved by multiplying the quantity of each GHG emitted by a factor called global warming potential (GWP). GWPs account for the lifetime

[1] Unlike the six GHGs normally evaluated, ozone in the troposphere does not accumulate over the long term because it reacts chemically as part of the photochemical process, and therefore is not included in GHG inventories.

and the radiative forcing of each chemical over a period of 100 years (e.g., CO_2 has a much shorter atmospheric lifetime than SF_6, and therefore has a much lower GWP). The GWPs for the main GHGs discussed here are presented in **Table 16-1**.

Table 16-1
Global Warming Potential (GWP) for Major GHGs

Greenhouse Gas	100-year Horizon GWP
Carbon Dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous Oxide (N_2O)	310
Hydrofluorocarbons (HFCs)	140 to 11,700
Perfluorocarbons (PFCs)	6,500 to 9,200
Sulfur Hexafluoride (SF_6)	23,900

Note: The GWPs presented above are based on the Intergovernmental Panel on Climate Change's (IPCC) Second Assessment Report (SAR) to maintain consistency in GHG reporting. The IPCC has since published updated GWP values that reflect new information on atmospheric lifetimes of GHGs and an improved calculation of the radiative forcing of CO_2. In some instances, if combined emission factors were used from updated modeling tools, some slightly different GWP may have been used for this study. Since the emissions of GHGs other than CO_2 represent a very minor component of the emissions, these differences are negligible.
Source: 2014 *CEQR Technical Manual.*

POLICY, REGULATIONS, STANDARDS, AND BENCHMARKS FOR REDUCING GHG EMISSIONS

As a result of the growing consensus that human activity resulting in GHG emissions has the potential to profoundly impact Earth's climate, countries around the world have undertaken efforts to reduce emissions by implementing both global and local measures addressing energy consumption and production, land use, and other sectors. Although the U.S. has not ratified international agreements which set emissions targets for GHGs, in December 2015, the U.S. signed the international Paris agreement[2] that pledges deep cuts in emissions, with a stated goal of reducing emissions to between 26 and 28 percent lower than 2005 levels by 2025[3] to be implemented via existing laws and regulations with executive authority of the President.

The U.S. Environmental Protection Agency (EPA) is required to regulate greenhouse gases under the Clean Air Act (CAA), and has begun preparing and implementing regulations. In coordination with the National Highway Traffic Safety Administration (NHTSA), EPA currently regulates GHG emissions from newly manufactured on-road vehicles. In addition, EPA regulates transportation fuels via the Renewable Fuel Standard program, which will phase in a requirement for the inclusion of renewable fuels increasing annually up to 36 billion gallons in 2022. In ~~2014~~2015, EPA also ~~proposed~~ finalized rules to address GHG emissions from both new and existing power plants that would, for the first time, set national limits on the amount of carbon pollution that power plants can emit. The Clean Power Plan sets carbon pollution emission guidelines and performance standards for existing, new, and modified and

[2] Conference of the Parties, 21st Session. *Adoption of The Paris Agreement, decision -/CP.21*. Paris, December 12, 2015.

[3] United States of America. *Intended Nationally Determined Contributions (INDCs)* as submitted March 31, 2015.

reconstructed electric utility generating units. On February 9, 2016, the Supreme Court stayed implementation of the Clean Power Plan pending judicial review. EPA expects to expand this program in the future to limit emissions from additional stationary sources.

There are also regional and local efforts to reduce GHG emissions. In 2009, Governor Paterson issued Executive Order No. 24, establishing a goal of reducing GHG emissions in New York State by 80 percent, compared with 1990 levels, by 2050, and creating a Climate Action Council tasked with preparing a climate action plan outlining the policies required to attain the GHG reduction goal; an interim draft plan has been published.[4] The State is now seeking to achieve some of the emission reduction goals via local and regional planning and projects through its Cleaner Greener Communities and Climate Smart Communities programs. The State has also adopted California's GHG vehicle standards (which are at least as strict as the federal standards).

The New York State Energy Plan outlines the State's energy goals and provides strategies and recommendations for meeting those goals. The latest version of the plan was published in June 2015. The plan outlines a vision for transforming the state's energy sector which would result in increased energy efficiency (both demand and supply), increased carbon-free power production and cleaner transportation, in addition to achieving other goals not related to GHG emissions. The 2015 plan also establishes a new target of reducing GHG emissions in New York State by 40 percent, compared with 1990 levels, by 2030. The plan also establishes a new target of providing 50 percent of electricity generation in the state from renewable sources by 2030, and increasing building energy efficiency gains by 600 trillion British thermal units (Btu) by 2030.

New York State has also developed regulations to cap and reduce CO_2 emissions from power plants to meet its commitment to the Regional Greenhouse Gas Initiative (RGGI). Under the RGGI agreement, the governors of nine northeastern and Mid-Atlantic states have committed to regulate the amount of CO_2 that power plants are allowed to emit, gradually reducing annual emissions to half the 2009 levels by 2020. The RGGI states and Pennsylvania have also announced plans to reduce GHG emissions from transportation, through the use of biofuel, alternative fuel, and efficient vehicles.

Many local governments worldwide, including New York City, are participating in the Cities for Climate Protection™ (CCP) campaign and have committed to adopting policies and implementing quantifiable measures to reduce local GHG emissions, improve air quality, and enhance urban livability and sustainability. New York City's long-term comprehensive plan for a sustainable and resilient New York City, which began as PlaNYC 2030 in 2007, and continues to evolve today as OneNYC, includes GHG emissions reduction goals, many specific initiatives that can result in emission reductions, and initiatives aimed at adapting to future climate change impacts. The goal to reduce citywide GHG emissions to 30 percent below 2005 levels by 2030 ("30 by 30") was codified by Local Law 22 of 2008, known as the New York City Climate Protection Act (the "GHG reduction goal").[5] The City has also announced a longer-term goal of reducing emissions to 80 percent below 2005 levels by 2050 ("80 by 50"), which was codified by Local Law 66 of 2014, and has published a study evaluating the potential for achieving that goal. More recently, as part of OneNYC, the City has announced a more aggressive goal for reducing emissions from building energy down to 30 percent below 2005 levels by 2025.

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[4] New York State Climate Action Council. *New York State Climate Action Plan Interim Report*. November 2010.

[5] Administrative Code of the City of New York, §24-803.

In December 2009, the New York City Council enacted four laws addressing energy efficiency in large new and existing buildings, in accordance with PlaNYC. The laws require owners of existing buildings larger than 50,000 sf to conduct energy efficiency audits and retro-commissioning every 10 years, to optimize building energy efficiency, and to "benchmark" the building energy and water consumption annually, using an EPA online tool. By 2025, commercial buildings over 50,000 sf will also require lighting upgrades, including the installation of sensors and controls, more efficient light fixtures, and the installation of submeters, so that tenants can be provided with information on their electricity consumption. The legislation also creates a local New York City Energy Conservation Code, which along with the Energy Conservation Construction Code of New York State (as updated in 2010), requires equipment installed during a renovation to meet current efficiency standards.

To achieve the 80 by 50 goal~~s~~, the City is convening Technical Working Groups to analyze the GHG reduction pathways from the building sector, power, transportation, and solid waste sectors to develop action plans for these sectors. ~~The building sector work is currently in progress.~~ The members of the Technical Working Groups will develop and recommend the data analysis, interim metrics and indicators, voluntary actions, and potential mandates to effectively achieve the City's emissions reduction goal. In 2016, the City published the building sector Technical Working Group report, which included commitments by the City to change to building energy code and take other measures aimed at substantially reducing GHG emissions.

For certain projects subject to CEQR (e.g., projects with 350,000 gsf or more of development or other energy intense projects), an analysis of the project's contributions to GHG emissions is required to determine consistency with the City's reduction goal, which is currently the most appropriate standard by which to analyze a project under CEQR, and is therefore applied in this chapter.

A number of benchmarks for energy efficiency and green building design have also been developed. For example, the LEED system is a benchmark for the design, construction, and operation of high-performance green buildings that includes energy efficiency components. EPA's Energy Star is a voluntary labeling program designed to identify and promote the construction of new energy efficient buildings, facilities, and homes and the purchase of energy efficient appliances, heating and cooling systems, office equipment, lighting, home electronics, and building envelopes. The applicant is currently evaluating the specific energy efficiency measures and design elements which would be implemented, and would, at a minimum, achieve energy efficiency consistent with the prerequisite requirements for certification under the LEED rating system.

METHODOLOGY

Although the contribution of any single project's emissions to climate change is infinitesimal, the combined GHG emissions from all human activity have been found to be significantly impacting global climate. While the increments of criteria pollutants and toxic air emissions are assessed in the context of health-based standards and local impacts, there are no established thresholds for assessing the significance of a project's contribution to climate change. Nonetheless, prudent planning dictates that all sectors address GHG emissions by identifying GHG sources and practicable means to reduce them. Therefore, this chapter presents the total GHG emissions potentially associated with the proposed project and identifies measures that would be implemented and measures that are still under consideration to limit emissions.

The analysis of GHG emissions that would be associated with the proposed project is based on the methodology presented in the *CEQR Technical Manual*. Estimates of emissions of GHGs from the development have been quantified, including off-site emissions from electricity generation associated with the proposed project's use of electricity, on-site emissions from heat and hot water systems, and emissions from vehicle use associated with the proposed development. GHG emissions that would result from construction are discussed as well. As per the guidance, analysis of building energy accounts for current carbon intensity of electricity, which will likely be lower in the 2024 build year and lower still in future years. Since the methodology does not account for future years and other changes described above, it also does not explicitly address potential changes in future consumption associated with climate change, such as increased electricity for cooling, or decreased on-site fuel for heating. Overall, this analysis results in conservatively high potential GHG emissions.

CO_2 is the primary pollutant of concern from anthropogenic emission sources and is accounted for in the analysis of emissions from all development projects. GHG emissions for gases other than CO_2 are included where practicable or in cases where they comprise a substantial portion of overall emissions. The various GHG emissions are added together and presented as metric tons of CO_2e emissions per year (see "Pollutants of Concern," above).

BUILDING OPERATIONAL EMISSIONS

Estimates of emissions due to electricity and natural gas use were prepared using the emissions intensity (emissions per floor area) provided in the *CEQR Technical Manual* and the floor area for each proposed use type. For the emissions intensity of hotel use, which was not provided in the *CEQR Technical Manual*, a factor was developed based on analysis of the 2013 hotel benchmark data.[6]

Per *CEQR Technical Manual* guidance, the carbon intensity applied here represents recent average data (2012) and not future target year (2024). Future emissions are expected to be lower as efficiency and renewable energy use continue to increase with the objective of meeting State and City future GHG reduction goals. Furthermore, the analysis does not account for specific fuel choices or additional energy efficiency, which could be included in the proposed project design since those details are not yet available.

The project may include cogeneration, providing electricity and heat and hot water as a byproduct; this would reduce offsite emissions from electricity generation and increase on-site emissions from natural gas combustion. To estimate the difference in emissions with and without the cogeneration system, emissions were calculated based on the size of the system, assuming—

Total system capacity: 1,850 kilowatt (kW), operating 24 hours/day, 365 days/year =

= 16,206,000 kW-hours per year

Cogeneration engine efficiency: 9,380 Btu/kW-hour (natural gas)

Winter Heating Offset Potential: 16,973 million Btu/hour for winter (91.25 days)

[6] *NYC. LL84 2013 Benchmarking Data Disclosure Data. www.nyc.gov/html/gbee/html/plan/ll84_scores.shtml. Accessed 4/28/15.*

Calculations were based on a natural gas emissions rate of 35.902 kilogram (kg) CO_2e per million Btu from the *CEQR Technical Manual* guidance, and 85.08503 kg CO_2e/Gigajoul for off-site electricity generation from the New York City GHG Inventory (2014) data for 2013.

MOBILE SOURCE EMISSIONS

The number of annual weekday and Saturday vehicle trips by mode (cars, taxis, and trucks) that would be generated by the proposed project was calculated using the transportation planning assumptions developed for the analysis presented in Chapter 14, "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 Saturday. Travel distances shown in Table 18-6 and 18-7 and associated text of the *CEQR Technical Manual* were used in the calculations of annual vehicle miles traveled by cars, taxis, and trucks. Table 18-8 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 project.

EPA estimates that the well-to-pump GHG emissions of gasoline and diesel are more than 20 percent of the tailpipe emissions.[7] Although upstream emissions (emissions associated with production, processing, and transportation) of all fuels can be substantial and are important to consider when comparing the emissions associated with the consumption of different fuels, fuel alternatives are not being considered for the proposed development, and as per the *CEQR Technical Manual* guidance, the well-to-pump emissions are not considered in the analysis. The assessment of tailpipe emissions only is in accordance with the *CEQR Technical Manual* guidance on assessing GHG emissions and the methodology used in developing the New York City GHG inventory, which is the basis of the GHG reduction goal.

The projected annual vehicle miles traveled, forming the basis for the GHG emissions calculations from mobile sources, are summarized in **Table 16-2**.

Table 16-2
Vehicle Miles Traveled per Year

Roadway Type	Passenger	Taxi	Truck
Local	1,134,499	795,271	476,100
Arterial	2,475,271	1,735,137	1,038,763
Interstate/Expressway	1,547,044	1,084,461	649,227
Total	**5,156,814**	**3,614,868**	**2,164,090**

CONSTRUCTION EMISSIONS

A description of construction activities is provided in Chapter 20, "Construction." Consistent with CEQR practice, emissions associated with construction have not been estimated explicitly for the proposed project, but analyses of similar projects 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,

[7] EPA. *MOVES2004 Energy and Emission Inputs*. Draft Report, EPA420-P-05-003. March 2005.

rebar, aluminum, and cement used for construction) are equivalent to the total operational emissions over approximately 5 to 10 years.

EMISSIONS FROM SOLID WASTE MANAGEMENT

The proposed project would not fundamentally change the City's solid waste management system. Therefore, as per the *CEQR Technical Manual*, the GHG emissions from solid waste generation, transportation, treatment, and disposal are not quantified.

PROJECTED GHG EMISSIONS

BUILDING OPERATIONAL EMISSIONS

The floor areas, emissions intensity factors, and resulting GHG emissions from each of the uses are presented in detail in **Table 16-3**. Most of the emissions would be associated with the residential use, as the largest use in the proposed development, although emission associated with the other uses would be higher than their respective fraction of the project space since retail and hotel uses are more energy intense (event space emissions may be overstated since they are conservatively based on commercial energy intensity). Note that these estimates do not include project-specific energy efficiency measures (see more below regarding emissions reduction measures).

Regarding the optional cogeneration system, we estimate the change in emissions to be as follows:

- Emissions from cogeneration engines: 2,360 metric tons CO_2e/year
- Electricity emissions reduced: 2,147 metric tons CO_2e/year
- Winter heating emissions reduced: 315 metric tons CO_2e/year
  - **Total reduction: 101 metric tons CO_2e/year**, equivalent to a reduction of 0.7 percent of total building energy emissions

Table 16-3
Annual Building Operational Emissions

Use	Building Area (gsf)	GHG Intensity (kg CO_2e / gsf / year)	Annual GHG Emissions (metric tons CO_2e)
Retail (all)	255,000	9.43	2,405
Residential	1,334,100	6.59	8,792
Hotel	229,700	10.9 (1)	2,504
Event Space	41,400	9.43	390
Parking	101,000	0.98 (2)	99
		TOTAL:	**14,190**

Notes: GHG intensity from *CEQR Technical Manual* other than as noted.
Totals may not sum due to rounding.
Per *CEQR Technical Manual* guidance, electricity emissions are representative of existing conditions in 2012 and not the future target year (2024). Future emissions are expected to be lower.
Representative emission intensity for existing buildings are higher than new and future construction, and do not include the expected energy efficiency measures.
1. AKRF, analysis of 2013 LL84 benchmark data, 2015.
2. Based on electricity rate of 27,400 Btu/sq.ft./year. 2001 *CEQR Technical Manual*.

MOBILE SOURCE EMISSIONS

The mobile-source-related GHG emissions from the proposed project are presented in detail in **Table 16-4**.

Table 16-4
Annual Mobile Source Emissions
(metric tons CO_2e, 2024)

Use	Passenger Vehicle	Taxi	Truck	Total
Residential	716	282	1,865	2,862
Destination Retail	263	275	843	1,381
Big Box Retail	1,419	478	781	2,677
Local Retail	45	189	276	510
Hotel	222	488	461	1,171
Event Space	274	136	365	775
Total	**2,939**	**1,848**	**4,590**	**9,376**

SUMMARY

A summary of GHG emissions by source type is presented in **Table 16-5**. Note that if new buildings were to be constructed elsewhere to accommodate the same number of units and space for other uses, the emissions from the use of electricity, energy for heating and hot water, and vehicle use could equal or exceed those estimated for the proposed project, depending on their location, access to transit, building type, and energy efficiency measures. As described in the "Methodology" section above, construction emissions were not modeled explicitly, but are estimated to be equivalent to approximately 5 to 10 years of operational emissions, including both direct energy and emissions embedded in materials (extraction, production, and transport). The proposed project is not expected to fundamentally change the City's solid waste management system, and therefore emissions associated with solid waste are not presented.

Table 16-5
Summary of Annual GHG Emissions, 2021
(metric tons CO_2e)

Use	Building Operations	Mobile	Total
Retail (all)	2,405	4,568	6,973
Residential	8,792	2,862	11,654
Hotel	2,504	1,171	3,674
Event Space	390	775	1,166
Parking	99	NA	99
Total	**14,190**	**9,376**	**23,566**

The operational emissions from building energy use include on-site emissions from fuel consumption as well as emissions associated with the production and delivery of the electricity to be used on-site. The applicant is currently evaluating the specific energy efficiency measures and design elements that would be implemented (see below), and would, at a minimum, achieve energy efficiency consistent with the prerequisite requirements for certification under the LEED rating system. The buildings would exceed the energy requirements of ASHRAE 90.1-2010 (which are the same as New York City building energy code) so as to reduce energy expenditure by at least five percent as compared with a baseline building designed to meet the minimum

building code requirements—those measures are not included in this estimate. The optional cogeneration system may slightly change emissions; based on preliminary simplified estimates, cogeneration may result in a slight reduction of 101 metric tons CO_2e/year, equivalent to a reduction of 0.7 percent of total building energy emissions.

ELEMENTS THAT WOULD REDUCE GHG EMISSIONS

The proposed project would include a number of sustainable design features which would, among other benefits, result in lower GHG emissions. To achieve energy efficiency consistent with the requirements for LEED certification, the proposed development would use less energy than it would if built only to meet the building code. In general, dense, mixed-use development with access to transit and existing roadways is consistent with sustainable land use planning and smart growth strategies to reduce the carbon footprint of new development. These features and other measures currently under consideration are discussed in this section, addressing the PlaNYC/OneNYC goals as outlined in the *CEQR Technical Manual*. The implementation of the various design measures and features described would result in development that is consistent with the City's emissions reduction goal, as defined in the *CEQR Technical Manual*.

BUILD EFFICIENT BUILDINGS

While the specific efficiency measures to be included are still being evaluated, the proposed project's buildings would likely include the following components that would result in efficient energy consumption and reduced emissions:

- energy-efficient glazing designed to reduce heat loss and facilitate daylight harvesting;
- high-efficiency heating, ventilation, and air conditioning (HVAC) systems;
- some green roof areas, including the overpass, and high-albedo roofs to reduce energy consumption and reduce the buildings contribution to the urban heat-island effect;
- efficient lighting and motion sensors for lighting incorporated in common areas;
- maximized interior daylighting;
- energy efficient and directed exterior lighting;
- energy efficient elevators and Energy Star appliances if applicable;
- third-party fundamental and enhanced building energy systems commissioning undertaken upon completion of construction to ensure energy performance;
- sustainable design guidelines provided by the applicant for tenant build-out;
- storage and collection of recyclables incorporated in building design;
- water-efficient landscaping selected to reduce water consumption, indirectly reducing energy consumption associated with potable water production and delivery; and
- low impact stormwater design, exceeding requirements.

The applicant may also consider:

- submeters for electricity, water, and/or gas, allowing tenants to track and optimize their electricity use;
- insulation exceeding building code requirements; and
- reusing storm water or grey water.

USE CLEAN POWER

The proposed project would use natural gas, a lower carbon fuel, for the operation of the heat and hot water system, and for cogeneration if included.

TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

The development site is located in an area supported by several transit options including the M21 Bus immediately adjacent to the development site, and the Seventh Avenue and Eighth Avenue subway lines and the M20 bus within walking distance to the site. In addition, the proposed project is adjacent to a central bike route, the Hudson River Greenway, and a Citi Bike station at West Houston and Greenwich Streets, and bicycle storage would likely be provided for the residential uses.

REDUCE CONSTRUCTION OPERATION EMISSIONS

Construction specifications would include an extensive diesel emissions reduction program, as described in detail in Chapter 20, "Construction," including diesel particle filters for large construction engines and other measures. These measures would reduce particulate matter emissions; while particulate matter is not included in the list of standard GHGs ("Kyoto gases"), recent studies have shown that black carbon—a constituent of particulate matter—may play an important role in climate change.

USE BUILDING MATERIALS WITH LOW CARBON INTENSITY

Recycled steel would most likely be used for most structural steel since the steel available in the region is mostly recycled. Some cement replacements such as fly ash and/or slag may also be used.

In addition, the following components would likely be included:

- the use of building materials with recycled content;
- the use of regionally extracted/manufactured building products;
- the use of wood that is locally produced and/or certified in accordance with the Sustainable Forestry Initiative or the Forestry Stewardship Council's Principles and Criteria;

In addition, the applicant may consider re-use of building materials and/or products from the existing buildings, and the use of rapidly renewable building materials. Furthermore, tenant build-out may also use sustainable materials per the sustainable guidelines likely to be provided by the applicant, depending on the specific uses and tenants.

Construction waste would be diverted from landfills to the extent practicable by separating out materials for reuse and recycling, with a diversion target of minimum 75 percent.

D. ADAPTATION TO CLIMATE CHANGE

Since the proposed project will be constructed and operated within a coastal floodplain, the potential effects of global climate change on the proposed project have been considered.

Standards for analysis of the effects of climate change on a proposed project are still being developed and have not yet been defined in CEQR. However, the Waterfront Revitalization

Program (WRP)[8] addresses climate change and sea level rise. The WRP requires consideration of climate change and sea level rise in planning and design of waterfront development. As set forth in more detail in the *CEQR Technical Manual*, the provisions of the revised WRP are applied by the New York City Department of City Planning (DCP) and other city agencies when conducting environmental review. Since the proposed project site is on the waterfront and on the water, the potential effects of global climate change on the proposed project are considered and measures that would be implemented as part of the project to improve its resilience to climate change are identified.

DEVELOPMENT OF POLICY TO IMPROVE CLIMATE CHANGE RESILIENCE

In recognition of the important role that the federal government has to play to address adaptation to climate change, a federal executive order signed October 5, 2009 charged the Interagency Climate Change Adaptation Task Force, composed of representative from more than 20 federal agencies, with recommending policies and practices that can reinforce a national climate change adaptation strategy. The 2011 progress report by the Task Force included recommendations to build resilience to climate change in communities by integrating adaptation considerations into national programs that affect communities, facilitating the incorporation of climate change risks into insurance mechanisms, and addressing additional cross-cutting issues, such as strengthening resilience of coastal, ocean, and Great Lakes communities.[9] In February 2013, federal agencies released Climate Change Adaptation Plans for the first time. The President's Climate Action Plan[10] outlines a plan for resiliency that includes building stronger and safer infrastructure through agency support in investment, developing standards, and other measures, and was followed by an executive order[11] directing agencies to implement the plan. In January 2015, a Presidential executive order was issued[12] requiring that federal actions use natural systems and approaches where possible when developing adaptation alternatives for consideration, and redefining the floodplain elevation as either future projected levels; the level that results from adding two feet (or three feet for critical actions) to the current base flood elevation; the "500-year" elevation (elevation of the flood with 0.2 percent probability in any given year); or the level obtained via other methods yet to be developed.

The New York State Sea Level Rise Task Force was created to assess potential impacts on the state's coastlines from rising seas and increased storm surge. The Task Force prepared a report of its findings and recommendations including protective and adaptive measures.[13] The recommendations are to provide more protective standards for coastal development, wetlands protection, shoreline armoring, and post-storm recovery; to implement adaptive measures for

[8] City of New York Department of City Planning. *The New York City Waterfront Revitalization Program*. October 30, 2013. Approved by NY State Department of State, February 3, 2016.

[9] The White House Council on Environmental Quality. Progress Report of the Interagency Climate Change Adaptation Task Force: Federal Actions for a Climate Resilient Nation. October, 2011.

[10] Executive Office of the President. *The President's Climate Action Plan*. June 2013.

[11] The White House. Executive Order [13653]—Preparing the United States for the Impacts of Climate Change. November 1, 2013.

[12] The White House. Executive Order [13690]—Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input. January 30, 2015.

[13] New York State Sea Level Rise Task Force. *Report to the Legislature*. December 2010.

habitats; integrate climate change adaptation strategies into state environmental plans; and amend local and state regulations or statutes to respond to climate change. The Task Force also recommended the formal adoption of projections of sea level rise.

The New York State Climate Action Plan Interim Report identified a number of policy options and actions that could increase the climate change resilience of natural systems, the built environment, and key economic sectors—focusing on agriculture, vulnerable coastal zones, ecosystems, water resources, energy infrastructure, public health, telecommunications and information infrastructure, and transportation.[14] New York State's Community Risk and Resiliency Act (CRRA)[15] requires that applicants to certain State programs demonstrate that they have taken into account future physical climate risks from storm surges, sea-level rise and flooding, and required the New York State Department of Environmental Conservation (DEC) to establish official State sea-level rise projections by January 1, 2016. These projections provide the basis for State adaptation decisions and are available for use by all decision makers. DEC published a draft on November 2, 2015, proposing to adopt existing projections for use (see discussion of NPCC below). CRRA applies to specific State permitting, funding and regulatory decisions, including smart growth assessments; funding for wastewater treatment plants; siting of hazardous waste facilities; design and construction of petroleum and chemical bulk storage facilities; oil and gas drilling, and State acquisition of open space.

In New York City, the Climate Change Adaptation Task Force is tasked with securing the city's critical infrastructure against rising seas, higher temperatures, and fluctuating water supplies projected to result from climate change. The Task Force is composed of over 35 New York City and State agencies, public authorities, and companies that operate, regulate, or maintain critical infrastructure in New York City. The approaches suggested for the City to create a city-wide adaptation program include ways to assess risks, prioritize strategies, and examine how standards and regulations may need to be adjusted in response to a changing climate.

To assist the task force, the New York City Panel on Climate Change (NPCC), has prepared a set of climate change projections for the New York City region[16] which was subsequently updated,[17] and has suggested approaches to create an effective adaptation program for critical infrastructure. The NPCC includes leading climatologists, sea-level rise specialists, adaptation experts, and engineers, as well as representatives from the insurance and legal sectors. The climate change projections include a summary of previously published baseline and projected climate conditions throughout the 21st century including heat waves and cold events, intense precipitation and droughts, sea level rise, and coastal storm levels and frequency. NPCC projected that sea levels are likely to increase in the range of 11 to 21 inches, with a higher end estimate of up to 30 inches by the 2050s; and in the range of 22 to 50 inches, with a higher end estimate of up to 75 inches by the end of the century (2100). In general, the probability of higher sea levels is characterized as "extremely likely," but there is uncertainty regarding the

[14] NYSERDA. New York State Climate Action Plan Interim Report. November, 2010.

[15] *Community Risk and Resiliency Act.* Chapter 355, NY Laws of 2014. April 9, 2013. Signed September 22, 2014.

[16] New York City Panel on Climate Change. *Climate Change Adaptation in New York City: Building a Risk Management Response*. Annals of the New York Academy of Sciences, May 2010.

[17] New York City Panel on Climate Change. Climate Risk Information 2013: Observations, Climate Change Projections, and Maps. June 2013.

probability the various levels projected and timescale. Intense hurricanes are characterized as "more likely than not" to increase in intensity and/or frequency, and the likelihood of changes in other large storms ("Nor'easters") are characterized as unknown. Therefore, the projections for future 1-in-100 coastal storm surge levels for New York City include only sea level rise at this time, and do not account for changes in storm frequency.

The New York City Green Code Task Force has also recommended strategies for addressing climate change resilience in buildings and for improving storm water management.[18] Some of the recommendations call for further study, while others could serve as the basis for revisions to building code requirements. Notably, one recommendation was to require new developments within the projected future 100-year floodplain to meet the same standards as buildings in the current 100-year flood zone.

The City is currently working with the Federal Emergency Management Agency (FEMA) to revise the Flood Insurance Rate Maps (FIRMs) using the recently acquired detailed Light Detection and Ranging (LiDAR) data.

The New York City Department of Environmental Protection (DEP) is evaluating adaptive strategies for City water and wastewater infrastructure. The City has already developed a *New York City Green Infrastructure Plan,*[19] and a *Sustainable Stormwater Management Plan.*[20] Many of the strategies discussed in these plans would improve the City's resilience to climate change.

While strategies and guidelines for addressing the effects of climate change are rapidly being developed on all levels of government, there are currently no specific requirements or accepted recommendations for development projects in New York City. However, the recently approved revisions to the WRP require consideration of climate change and sea level rise in planning and design of waterfront development. As set forth in more detail in the City's *CEQR Technical Manual*, the provisions of the WRP are applied by city agencies when conducting environmental review, and are described in detail in Chapter 3, "Land Use."

The WRP Policy 6.2 requires waterfront developments reviewed under CEQR to:

- Consider potential risks related to coastal flooding to features specific to the project, including but not limited to critical electrical and mechanical systems, residential living areas, and public access areas;
- Minimize losses from flooding and erosion by employing non-structural and structural management measures appropriate to the condition and site, the use of the property to be protected, and the surrounding area;
- Integrate consideration of the latest New York City projections of climate change and sea level rise (as published by the NPCC, or any successor thereof) into the planning and design of projects in the city's Coastal Zone;
- Incorporate design techniques in projects that address the potential risks identified and/or which enhance the capacity to incorporate adaptive techniques in the future. Climate resilience techniques should aim to protect lives, minimize damage to systems and natural

[18] New York City Green Codes Task Force. *Recommendations to New York City Building Code*. February 2010.

[19] New York City. New York City Green Infrastructure Plan. September 2010.

[20] New York City. Sustainable Stormwater Management Plan. December 2008.

resources, prevent loss of property, and, if practicable, promote economic growth and provide additional benefits such as provision of public space and intertidal habitat;

- The project should also provide a qualitative analysis of potential adverse impacts on existing resources (including ecological systems, public access, visual quality, water-dependent uses, infrastructure, and adjacent properties) as a result of the anticipated effects of climate change;
- Projects that involve construction of new structures directly in the water or at the water line should be designed to protect inland structures and uses from flooding and storm surge when appropriate and practicable;
- As appropriate and to the extent practicable:
  - Promote the greening of the waterfront with a variety of plant material for aesthetic and ecological benefit;
  - Use water- and salt-tolerant plantings in areas subject to flooding and salt spray;
  - Maximize water-absorption functions of planted areas;
  - Preserve and enhance natural shoreline edges;
  - Design shoreline edges that foster a rich marine habitat; and
  - Design sites that anticipate the effects of climate change, such as sea level rise and storm surges.

Climate change considerations and measures that would be implemented to increase climate resilience are discussed below, addressing the above WRP measures as applicable. If additional climate change considerations are incorporated into state and/or local laws prior to the development of the proposed project, any development would be constructed to meet or exceed the codes in effect at the time of construction.

RESILIENCE OF THE PROPOSED PROJECT TO CLIMATE CHANGE

The proposed project would be designed to accommodate flood levels projected for the year 2100 for all critical infrastructure and residential uses, and for the 2050s or higher for commercial uses (applying the higher 2100 levels where practicable). This would account for the NPCC's "High Estimate" level of +30 inches for the 2050s and +75 inches for the end of the century (2100). In terms of absolute elevations, the design will account for potential future "100-year" levels (flood levels with a one percent probability of occurring in any given year); for the proposed project site, this would be 18 feet and 19 feet NAVD88 for critical infrastructure and residential uses in the South and North/Center Sites, respectively, and at least 14.5 and 15.5 feet NAVD88 for commercial spaces in the South and North/Center Sites, respectively.[21]

The proposed project would have substantial below grade commercial space at elevations below current and future potential flood elevations. These areas would be dry-flood proofed to accommodate flooding up to the above 2050-projected flood levels (14.5 and 15.5 feet NAVD88) such that the subgrade levels would be fully protected from flooding to that level.

All critical infrastructure, including but not limited to electricity connections, generators and fuel, communications, and elevators would be designed to withstand flooding up to the above

[21] Based on preliminary flood insurance rate map (FIRM) "100-year" level of 11 feet NAVD88 and one foot freeboard, added to the projected sea level rise.

levels. Connections and systems would be either located above this elevation or sealed. The lowest residential locations would well above these elevations (the lowest residential unit would be at approximately 38 feet NAVD88, 25 feet above current design flood elevations). If entrances and other aperture need to be lower than this elevation, they would be protected using temporary deployable barriers.

Any plantings in at-grade open spaces (excluding the elevated open spaces which would be above flood levels) would be water- and salt-tolerant species to the extent practicable.

The proposed project is not on the waterfront (the site is east of Route 9A/West Street) and therefore would not include any coastal protection measures that would affect other sites or open space areas. Since there are buildings on the site in the existing condition, and there would be new buildings in the No Action condition, the proposed project would not substantially affect flood levels in the surrounding area (regardless of the selection of dry- or wet-flood proofing for cellar spaces).

Based on the above review and design commitments, the proposed project would be consistent with New York City policies regarding adaptation to climate change. A review of the proposed project's consistency with WRP Policy 6.2 can be found in in Chapter 3, "Land Use." ✷