A. INTRODUCTION

This chapter evaluates the greenhouse gas (GHG) emissions that would be generated by the construction and operation of the proposed project and its consistency with the citywide GHG reduction goals (see Section B). Per the 2014 *City Environmental Quality Review (CEQR) Technical Manual,* evaluation of GHG emissions serves as a proxy for evaluating the proposed project's impact on climate change.

As discussed in the New York State Department of Environmental Conservation (NYSDEC) policy[1] and the *CEQR Technical Manual,*[2] 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 State and New York City have each established sustainability initiatives and goals for greatly reducing GHG emissions and for adapting to climate change.

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 undertaken for any project preparing an environmental impact statement expected to result in 350,000 square feet or more of development and other energy-intense projects. The proposed project would result in over 2.8 million gross square feet (gsf) of developed floor area (including approximately 1.0 million gsf of garage parking space). Accordingly, a GHG consistency assessment is provided. The approach outlined would also be consistent with the above-referenced NYSDEC policy.

Since portions of the proposed project will be constructed and operated within the current and/or future floodplain, the potential effects of global climate change on the proposed project have been considered (see Section C).

PRINCIPAL CONCLUSIONS

The building energy use and vehicle use associated with the proposed project would result in up to approximately 39 thousand metric tons of carbon dioxide equivalent (CO_2e) emissions per year with the full build out of Phase II in 2028. Annual emissions would be less with the completion of Phase I in 2023.

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[1] NYSDEC. NYSDEC Policy: Assessing Energy Use and Climate Change in Environmental Impact Statements. July 15, 2009.

[2] New York City Mayor's Office of Environmental Coordination. *CEQR Technical Manual*. March 2014.

The *CEQR Technical Manual* defines five goals by 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.

In accordance with the existing agreement between ESD and the developer, the developer is committed to achieving Leadership in Energy and Environmental Design (LEED) certification at the LEED certified level and U.S. Environmental Protection Agency (USEPA) Energy Star rating (for all buildings with the exception of parking garages and the small retail building). The conditions of the General Project Plan (GPP) would specifically require that all buildings (except the parking garages and the small retail building) be designed and constructed to achieve at least a 5 percent reduction in energy expenditure relative to the ASHRAE 90.1-2013 standard (equivalent to the current building code requirement), be designed to earn the USEPA Energy Star, and achieve LEED and Energy Star certification. These commitments would result in energy expenditure lower than baseline buildings designed to meet but not exceed the minimum building code requirements by approximately 5 percent. Furthermore, additional energy savings would likely be achieved via guidance for tenant build-out, including a requirement for tenants to use Energy Star-rated appliances. The proposed project's commitment to building energy efficiency that exceeds the building code energy requirements would ensure consistency with the efficient buildings goal defined in the *CEQR Technical Manual* as part of the City's GHG reduction goal.

The proposed project would also support other GHG goals by virtue of its proximity to public transportation, commitment to construction air quality controls and recycling construction materials, 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 project supports the GHG reduction goal.

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

Regarding resilience to the impacts of potential climate change on the proposed project, the conditions of the GPP would require the proposed project be designed to be resilient to flood elevations of up to the base flood elevation defined by the Federal Emergency Management Agency (FEMA) at the time (currently 13 feet NAVD88) with 1 foot of freeboard[3] plus sea-level rise projected by the New York City Panel on Climate Change (NPCC) for at least 50 years beyond the construction date for the high end of the "Middle Range" scenario (currently 39 inches). Until FEMA floodplains and/or NPCC projections are updated, the applicable elevation for design purposes would be 17 feet NAVD88, including 1 foot of freeboard. In the event that elevation and other solutions prove to be impracticable, the flood design may also include deployable flood protection for building openings (e.g., entrances). All critical infrastructure would be either elevated or sealed up to the above-defined design elevation.

[3] Freeboard refers to elevating a building's lowest floor above predicted flood elevations by a small additional height (e.g., one foot). Freeboard accounts for rounding and uncertainty in future flood elevation projections.

B. 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 GHGs in the Earth's atmosphere.

There are also a number of entirely anthropogenic GHGs 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 GHG, it does not need to be assessed as such at the project level since it is a rapidly reacting chemical 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 project.

To present a complete inventory of all GHGs, component emissions are added together and presented as carbon dioxide equivalent (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 and the radiative forcing[4] of each chemical over a period

[4] *Radiative forcing* is a measure of the influence a gas has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the gas as a GHG.

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

Because of the growing consensus that human activity resulting in GHG emissions has the potential to profoundly impact the 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 the international agreements that set emissions targets for GHGs, in December 2015, the U.S. signed the international Paris agreement[5] that pledges deep cuts in emissions, with a stated goal of reducing annual emissions to levels that would be between 26 and 28 percent lower than 2005 levels by 2025.[6] On June 1, 2017, the President of the U.S. announced that "the United States will withdraw from the Paris Climate Accord."[7]

Regardless of the Paris Agreement, USEPA is required to regulate GHGs under the Clean Air Act and has begun preparing and implementing regulations. In coordination with the National Highway Traffic Safety Administration (NHTSA), USEPA currently regulates GHG emissions from newly manufactured on-road vehicles. In addition, USEPA 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 36.0 billion gallons in 2022. In 2015, USEPA also

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

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

[7] Under the Agreement, countries are allowed to withdraw four years from the date the agreement entered into force—meaning the United States can officially withdraw on November 4, 2020. However, given the voluntary nature of the agreement, any action in the U.S. may or may not occur regardless of this status.

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 reconstructed electric utility generating units. On February 9, 2016, the Supreme Court stayed implementation of the Clean Power Plan pending judicial review. In October 2017, USEPA proposed to repeal the Clean Power Plan and issued the Affordable Clean Energy rule June 19, 2019, replacing the Clean Power Plan. The Affordable Clean Energy rule establishes revised emissions reduction measures accepted as best technology and focusing on energy efficiency improvements in place of direct emissions reduction measures.

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.[8] 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 new plan outlines a vision for transforming the state's energy sector that 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 new targets: (1) reducing GHG emissions in New York State by 40 percent, compared with 1990 levels, by 2030; (2) providing 50 percent of electricity generation in the state from renewable sources by 2030; and (3) 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, and reducing an additional 30 percent from 2020 to 2030. 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.

In 2019, New York State enacted the Climate Leadership and Community Protection Act to achieve the GHG reductions goals established in the New York State Energy Plan as well as establishing a new long-term goal to reduce statewide GHG by 100 percent, compared with 1990 levels by 2050. The legislation charges New York State Climate Action Council with establishing statewide GHG emission limits and agency regulations to reduce emissions, increase investments in renewable energy sources, and ensure that significant portions of investments are made in disadvantaged communities. Pursuant to these requirements, the Climate Action Council will prepare and approve a scoping plan outlining recommendations for

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

attaining the GHG emission limits and reduction goals. A final scoping plan is anticipated to be approved by 2022.

Many local governments worldwide, including New York City, are participating in the Cities for Climate Protection™ 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")[9] 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 and achieving net-zero citywide GHG emissions by 2050.

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 square feet 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 USEPA online tool. By 2025, commercial buildings over 50,000 square feet 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 2016), requires equipment installed during a renovation to meet current efficiency standards.

To achieve the GHG reduction goals, 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 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.

In 2019, the New York City Council enacted Local Law 97 of 2019—the Climate Mobilization Act. For most buildings that exceed 25,000 gsf (excluding electricity/steam generation facilities, rent-regulated accommodations, places of public worship, and city-owned properties), the City has established annual building emission limits beginning in 2024 and would require the owner of a covered building to submit annual reports demonstrating the building is in compliance with the current GHG emission limits. For buildings not covered under the GHG emissions limits,

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

owners may either demonstrate compliance with the current limits or implement specified energy conservation measures where applicable.

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 projects' 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. USEPA'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 Empire State Development (ESD) would require the developer to demonstrate enhanced energy efficiency through the LEED and Energy Star programs as described later in this chapter.

METHODOLOGY

Climate change is driven by the collective contributions of diverse individual sources of emissions to global atmospheric GHG concentrations. Identifying potential GHG emissions from a proposed action can help decision makers identify practicable opportunities to reduce GHG emissions and ensure consistency with policies aimed at reducing overall emissions. 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. (Note that this differs from most other technical areas in that it does not account for only the increment between the condition with and without the proposed project. The reason for that different approach is that to truly account for the incremental emissions only would require speculation regarding where people would live in a No-Action condition if residential units are not built at this location, what energy use and efficiency might be like for those alternatives and other related considerations, and similar assumptions regarding commercial and other uses. The focus is therefore on the total emissions associated with the uses, and on the effect of measures to reduce those emissions.) This analysis estimates GHG emissions for the full build out of Phase II in 2028. Emissions for Phase I would be lower and are not presented separately in this analysis.

Estimates of potential GHG emissions associated with the proposed project are 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 associated with 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 is based on the average carbon intensity of electricity in 2008, which will likely be lower in the 2023 and 2028 analysis

years and lower still in future years as the fraction of electricity generated from renewable sources continues to increase.

Emissions from transportation apply the emission factors for the 2028 analysis year. Vehicular emission factors will also continue to decrease in future years as vehicle engine efficiency increases and emissions standards continue to decrease, resulting in lower emissions 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. Although mobile source emissions per vehicle-mile would be higher the earlier years of Phase I (2023–2028), the total emissions would be lower since the number of total trips would be lower. Overall, this analysis results in conservatively high estimates of potential GHG emissions for the 2028 analysis year, and emissions would decline in future years beyond 2028.

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 from building electricity and fuel use were prepared using building carbon intensity by use type as detailed in the *CEQR Technical Manual*. Per *CEQR Technical Manual* guidance, the building carbon intensity data represents 2008 citywide averages by use type and not projections for the analysis year (2028). Estimates of emissions due to hotel building and parking facility electricity and fuel use were prepared using hotel building carbon intensity calculated from the 2014 local law 88 benchmark data,[10] representing the citywide average for hotels and a reasonable worst-case intensity for parking facilities (carbon intensity for these uses is not available in the *CEQR Technical Manual*.) Future emissions are expected to be lower as efficiency and renewable energy use for grid-supplied electric power continue to increase with the objective of meeting state and city future GHG reduction goals.

Furthermore, the proposed project would be required to meet the 2019 local law 97 carbon annual intensity limits (annual metric tons CO2e per gsf) for buildings. The building carbon intensity by use type as detailed in the *CEQR Technical Manual* meets or falls below the immediate carbon intensity limits. However, future limits will be decreased over time in order to achieve the City's GHG reduction goals, and *CEQR Technical Manual* carbon intensities may exceed these limits beginning in 2030. Therefore, quantified emissions from building electricity and fuel use conservatively using building carbon intensity by use type as detailed in the *CEQR Technical Manual* result in conservatively high estimates of potential GHG emissions for the 2028 analysis year, and emissions would decline in future years beyond 2028.

The analysis does not assume any on-site cogeneration (electricity production combining the use of heat and power).

[10]NYCMOS. *2015 LL84 Energy and Water Data Disclosure* (Data for Calendar Year 2014). Latest version dated 12/8/15.

MOBILE SOURCE EMISSIONS

The number of annual weekday 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 and presented in Chapter 14, "Transportation." The assumptions used in the calculation include average daily weekday person trips and delivery trips by proposed use, the percentage of vehicle trips by mode, and the average vehicle occupancy. Trips associated with the community facility space were not included in the trip generation analysis; these trips would be very few and occasional, and would therefore be negligible on an annual scale. The proposed open space uses would not result in new incremental trips to the project site because they would replace existing open space uses already on the project site. Shuttle bus trips were included as well, including both the small on-campus shuttle bus trips and the larger shuttle bus trips connecting the campus with transit service at Westchester Square. This included an increase in off-campus shuttle trips of one round trip per hour, and an increase in distance for both shuttles to account for service to the new portions of the campus. The on-campus shuttle was assumed to run four times per hour during service hours (in the current condition), and the shuttle hours of operation were assumed to remain the same as the existing service. To calculate annual totals, the number of trips on weekends was estimated to be 16 percent of the weekday trips based on comparison of current local traffic volume counts which represent traffic from similar uses.

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 car, taxi, and truck miles traveled by road type, and shuttle bus distances[11] and roadway type distribution were estimated from street maps. The mobile GHG emissions calculator provided with the *CEQR Technical Manual* was used to estimate GHG emissions from all trips attributable to the proposed project.

Based on the latest fuel lifecycle model from Argonne National Laboratory,[12] emissions from producing and delivering fuel ("well-to-pump") are estimated to add an additional 25 percent to the GHG emissions from gasoline and 27 percent from diesel. 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 total annual vehicle miles traveled by roadway type, forming the basis for the GHG emissions calculations from mobile sources, are summarized in **Table 16-2**.

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[11] Shuttle service distance was conservatively estimated to the more distant Castle Hill Avenue station. If the shuttle only serves the Westchester Square-East Tremont Avenue subway station, the distance would be shorter and ensuing emissions lower.

[12] Based on GREET1_2016 model from Argonne National Laboratory.

Table 16-2
Vehicle Miles Traveled per Year—Full Build Out (Phase II)

Roadway Type	Passenger	Taxi	Shuttle Bus	Truck
Local	8,413,884	521,856	12,727	797,124
Arterial	17,248,462	1,069,805	12,727	1,634,104
Interstate/Expressway	16,407,074	1,017,619	0	1,554,391
Total	**42,069,419**	**2,609,280**	**25,454**	**3,985,618**

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, 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 building floor area, emission intensity, and resulting GHG emissions from each of the uses are presented in detail in **Table 16-3**. The analysis presents the total emissions after Phase II construction; emissions including only Phase I would be lower. In general, the uses with more floor area result in greater annual GHG emissions, except for the garage parking, which has a substantially lower GHG intensity than other uses.

Table 16-3
Annual Building Operational Emissions—Full Build Out (Phase II)

Source Use	Building Area (gsf)	GHG Intensity [1] (kg CO_2e / gsf / year)	Annual GHG Emissions (metric tons CO_2e)
Commercial Office[2]	467,029	9.43	4,404
Medical Office[2]	700,543	9.43	6,606
Bio-tech/Research	100,000	9.43	943
Accessory Use	250,000	6.59	1,648
College/Trade School	100,000	9.43	943
Hotel	124,303	9.00 (3)	1,118
Retail	40,000	9.43	377
Community Facility	2,000	9.43	19
Amenities Building	8,143	9.43	77
Little League Support Building	2,000	9.43	19
Garage Parking (excludes surface lots)	1,037,100	1.24 (3)	1,287
		TOTAL:	**17,440**

Notes: Totals may not sum due to rounding.

Per *CEQR Technical Manual* guidance, electricity emissions are representative of existing conditions in 2008 and not the analysis year (2028). 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.

Sources:

1. *CEQR Technical Manual*
2. The commercial and medical office space may include up to 20,000 gsf of pharmaceutical manufacturing floor area. This type of manufacturing is not expected to have a high energy intensity.
3. AKRF, 2017, based on *Local Law 84 Benchmarking Data Disclosure* (for 2015 disclosure, 2014 data)

MOBILE SOURCE EMISSIONS

The mobile-source-related GHG emissions from the proposed project are presented in detail in **Table 16-4**. In addition to the direct emissions included in the analysis, an additional approximately 25 percent would be emitted upstream, associated with fuel extraction, production, and delivery.

SUMMARY

A summary of GHG emissions by source type is presented in **Table 16-5**. Emissions associated with mobile sources represent approximately two thirds of the total emissions, and the building energy emissions represent approximately one third of the total. 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 16-4
Annual Mobile Source Emissions—Full Build Out (Phase II)
(metric tons CO_2e, 2028)

Use	Passenger Vehicle	Taxi	Shuttle Bus	Truck	*Total*
Accessory Use	471	8	0	234	*713*
Bio-tech/Research	312	16	0	498	*826*
College/Trade School	1,180	63	0	156	*1,399*
Conference Center - Employees	50	2	0	61	*113*
Conference Center - Patrons	98	18	0	0	*116*
Hotel	404	73	0	207	*684*
Retail	6	9	0	218	*233*
Medical Office	8,116	420	53 (1)	2,181	*10,770*
Commercial Office (excludes surface lots)	3,763	187	0	2,327	*6,277*
Total	**14,400**	**796**	**53**	**5,881**	***21,131***

Notes:
Accessory uses, including the Community Facility, Amenities Building, Little League Field Support Building, and Indoor Parking do not generate trips or generate negligible trips and, therefore, are not included in this table.
1. While person trips show a small fraction (5 percent) of trips via shuttle associated with office and conference center uses, since the shuttle trips are all using the same vehicle, they have all been associated here with the medical office for simplicity.

Table 16-5
Summary of Annual GHG Emissions, 2028—Full Build Out (Phase II)
(metric tons CO_2e)

Use	Building Operations	Mobile	*Total*
Commercial Office	4,404	6,277	*10,681*
Medical Office	6,606	10,770	*17,376*
Bio-tech/Research	943	826	*1,769*
Accessory Use	1,648	713	*2,360*
College/Trade School	943	1,399	*2,342*
Hotel (Including Conference Center)	1,118	913	*2,032*
Retail	377	233	*610*
Community Facility	19	NA[1]	*19*
Amenities Building	77	0	77
Little League Field Support Building	19	NA[1]	*19*
Garage Parking	1,287	0	*1,287*
Total	**17,440**	**21,131**	***38,571***

Note:
1. Trips associated with the community facility and support space were not included in the trip generation analysis; these trips would be very few and occasional, and would therefore be negligible on an annual scale. The proposed open space uses would not result in new incremental trips to the project site because they would replace existing open space uses already on the project site.

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 developer would be required to design and develop the proposed project so as to exceed the minimum energy efficiency required by the New York City building code at the time (see below). Since the above estimate reflects the average efficiency of existing buildings, the resulting emissions are conservatively high.

CONSISTENCY WITH THE CITYWIDE GHG REDUCTION GOALS

The proposed project would include a number of sustainable design features that would result in lower GHG emissions, detailed below, addressing the PlaNYC/OneNYC goals as outlined in the *CEQR Technical Manual*.

BUILD EFFICIENT BUILDINGS

In accordance with the existing agreement between ESD and the developer, the developer is committed to achieving LEED certification at the LEED-certified level and USEPA Energy Star rating. Specific mention is also made to the inclusion of light emitting diode (LED) lighting, reflective roofing materials, and low flow plumbing fixtures (which may already be required under New York City building code). The conditions of the GPP would specifically require that all buildings (with the exception of parking garages and the small retail building) be designed and constructed to achieve at least a 5 percent reduction in energy expenditure relative to the ASHRAE 90.1-2013 standard (equivalent to the current building code requirement), be designed to earn the USEPA Energy Star, and achieve LEED and Energy Star certification.

The developer has identified several measures that would reduce GHG emissions (directly or indirectly) that would be included (this list represents measures currently known, but other measures may be included once the specific design progresses, including measures aimed at achieving LEED and Energy Star certification):

- Green roof design, incorporating live vegetation;
- Stormwater/groundwater recharge;
- Require tenants to use Energy Star-rated appliances;
- LED lighting for site, base building, and tenant fit-out;
- Incorporate recycled content in some building materials, such as finishes, structural steel, and concrete design if practicable; and
- High albedo roofing materials to reduce building cooling load.

Furthermore, the GHG emissions associated with the proposed project's building energy use would fall below the immediate carbon intensity limits established in Local Law 97 of 2019, and would likely fall below the future 2030 carbon intensity limits with the implementation of the above measures. Additionally, the carbon intensity associated with grid electricity is expected to decrease as New York State and New York City target 100 percent renewable electricity.

USE CLEAN POWER

While the use of clean power would not be specifically required, the buildings would use natural gas, a lower carbon fuel, for the normal operation of the heat and hot water systems. It is also possible that local renewable power production (e.g., geothermal, solar, wind) would be considered while reviewing options for LEED, USEPA Energy Star, and achieving the above efficient building goal.

TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

The proposed project is located within walking distance from the Middletown Road No. 6 subway station, and supported by the Bx21 and Bx24 bus routes. The proposed project would also operate shuttle service connecting the campus with the subway service at the Westchester

Square-East Tremont Avenue subway station and shuttle service connecting the various buildings on campus. In addition, the proposed project would include a bike path to connect to the existing Hutchinson River Parkway bike path and to Marconi Street. Per the existing contract between ESD and the developer, the developer is also committed to the inclusion of electric vehicle charging stations.

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 may 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, and concrete content would be optimized to the extent feasible.

Through the LEED process, the use of local, rapidly renewable or certified sustainable wood, and recycled build-out materials would be considered. Construction waste would be diverted from landfills to the extent practicable by separating out materials for reuse and recycling, with a diversion target of at least 75 percent.

CONCLUSION

As described above, the proposed project would include substantial energy efficiency and other design measures and features aimed at reducing GHG emissions. 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*.

C. RESILIENCE TO CLIMATE CHANGE

The Waterfront Revitalization Program (WRP)[13] addresses climate change and sea-level rise. The WRP requires consideration of climate change and sea-level rise in planning and design of development within the defined Coastal Zone Boundary (the proposed project is within that zone). As set forth in more detail in the *CEQR Technical Manual*, the provisions of the WRP are also applied by the New York City Department of City Planning (DCP) and other city agencies when conducting environmental review. The proposed project's consistency with WRP policies is described in Chapter 2, "Land Use, Zoning, and Public Policy."

Since portions of the proposed project will be constructed and operated within the current and/or future floodplain, 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.

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

DEVELOPMENT OF POLICY TO IMPROVE CLIMATE CHANGE RESILIENCE

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.[14] The recommendations are to provide more protective standards for coastal development, wetlands protection, shoreline armoring, and post-storm recovery; to implement adaptive measures for 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.[15] New York State's Community Risk and Resiliency Act (CRRA)[16] requires that applicants for certain State programs demonstrate that they have taken into account future physical climate risks from storm surges, sea-level rise and flooding, and required NYSDEC to establish official State sea-level rise projections. In February 2017, NYSDEC adopted a rule (6 NYCRR Part 490) defining the existing projections for use. These projections provide the basis for State adaptation decisions and are available for use by all decision makers. 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. NYSDEC released draft implementation guidance for flood risk management and public infrastructure in June 2018 for public review and is currently reviewing public comments. Further guidance on natural resiliency measures will be made available for public review as it is prepared.

In New York City, the Climate Change Adaptation Task Force is tasked with fostering collaboration and cooperation between public and private organizations working to build the resilience of the City's critical infrastructure against rising seas, higher temperatures, and changing precipitation patterns. The Task Force is composed of over 57 New York City and State agencies, public authorities, and companies that operate, regulate, or maintain critical infrastructure in New York City. Led by the Mayor's office of Resilience and Recovery, the Task Force works together 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, NPCC has prepared a set of climate change projections for the New York City region,[17] which was subsequently updated,[18] and has suggested approaches to create

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

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

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

[17]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.

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 by up to 30 inches by the 2050s and up to 75 inches by the end of the century (more detailed ranges and timescales are available). In general, the probability of increased sea levels is characterized as "extremely likely," but there is uncertainty regarding the 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 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.[19] 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 one-percent annual chance floodplain (the area that would potentially be flooded in a severe coastal storm with a probability of 1-in-100 of occurring in any given year) to meet the same standards as buildings in the current one-percent annual chance flood hazard zone and to apply the standards up to future flood elevation levels.

While strategies and guidelines for addressing the effects of climate change are 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 revisions to the WRP and accompanying guidance[20] require consideration of climate change and sea-level rise in planning and design of waterfront development. As described in detail in Chapter 2, "Land Use, Zoning, and Public Policy," the provisions of the WRP have been applied in conducting the environmental review.

Climate change considerations and measures that would be implemented to increase climate resilience are discussed below. Additional climate change considerations may be incorporated into state and/or local laws prior to the development of the proposed project, and 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

Some of the project area is within the current one-percent annual chance flood hazard zone, and the entire project area is surrounded by the current flood hazard zone. The one-percent annual

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[18]New York City Panel on Climate Change. *New York City Panel on Climate Change 2015 Report*. Ann. N.Y. Acad. Sci. 1336. 2015.

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

[20]NYC Planning. The New York City Waterfront Revitalization Program: Climate Change Adaptation Guidance. March 2017.

chance flood hazard area would further increase in size in the future as sea level continues to rise. Under the NPCC projections for the "High" scenario, the entire project area would be within the flood hazard zone by 2100.

The potential one-percent annual chance flood elevation in the project area, as defined by FEMA, is currently 13 feet NAVD88. Note that this flood elevation is likely conservatively high, and may be revised in the near future. On October 17, 2016, FEMA and New York City Mayor De Blasio announced plans to revise the FEMA flood maps based on a 2015 New York City appeal of FEMA's flood risk calculations for New York City and the region. While revised flood maps have not yet been produced, the appeal generally identified potential reductions of 1.0 to 1.5 feet in the area of the project site. Therefore, it is possible that the revised FEMA current flood elevations would be lower, and the resulting future flood elevations, including sea-level rise, may also be lower than those presented here; affected areas within the project site would also be somewhat smaller with some areas potentially affected later in the century and some later still.

A reasonably conservative approach to designing for future conditions at uses such as the proposed project would address at least a 50-year lifetime. While residential uses would normally be designed to address a longer outlook, the residential uses within the proposed project would be accessory to other uses in the proposed project. Therefore, NPCC projections for the high end of the "Middle Range" scenario for 2080s would apply. Currently sea-level rise for that scenario is projected to be +39 inches. As is the case when designing for current flood elevations, one foot of freeboard is added to account for rounding and uncertainty.

The conditions of the GPP would require that each development would be designed to be resilient to flood elevations of up to the base flood elevation defined by FEMA at the time (currently 13 feet NAVD88) with 1 foot of freeboard plus sea-level rise projected by NPCC for at least 50 years beyond the construction date for the high end of the "Middle Range" scenario (currently 39 inches). Until FEMA floodplains and/or NPCC projections are updated, the applicable elevation for design purposes would be 17 feet NAVD88, including 1 foot of freeboard. In the event that elevation and other solutions prove to be impracticable, the flood design may also include deployable flood protection for building openings. All critical infrastructure would be either elevated or sealed up to the above defined design elevation. ✷