Chapter 9: Greenhouse Gas Emissions

A. INTRODUCTION

This chapter discusses the emissions of greenhouse gases (GHGs) that would potentially result from the Proposed Project, the measures that could be implemented to reduce those emissions, as well as the measures that would be taken to increase resilience of the Proposed Project to the potential effects of climate change. The analysis presented accounts for the additional information that has become available for the proposed development program since the *Final Generic Environmental Impact Statement for the Phased Redevelopment of Governors Island* (2011 FGEIS). The assessment also considers the potential cumulative emissions of the Proposed Project along with the previously approved Phase 1, which consisted of specific portions of the park and public spaces and infrastructure improvements.

As described in greater detail in Chapter 1, "Project Description," the Phased Redevelopment of Governors Island (the Proposed Project) would expand and improve considerable amounts of publicly accessible open space on the island, re-tenant a number of historic structures within the Governors Island Historic District on the North Island by 2022, and introduce new uses and buildings on the two South Island Development Zones by 2030. Two potential development scenarios, the Mixed-Use Option and the University/Research Option, have been identified for the Later-Phases Island Redevelopment component of the Proposed Project, which would result in up to 3 million square feet (ft) of new development. As in the 2011 FGEIS, this analysis considers the University/Research Option, since the energy use, vehicle use, and resulting GHG emissions would be greater than with the Mixed-Use Option.

This chapter presents a quantified analysis of GHG emissions associated with the proposed program on the North Island by 2022. Similar to the 2011 FGEIS, the South Island Development Zones are considered based on a generic development program since there are no specific development plans or proposals for those areas, and a quantified assessment is not included. The 2011 FGEIS considered the cumulative GHG emissions from the full development of Governors Island, including those project components that would be complete by the 2022 analysis year and the completion of the South Island Development Zones by 2030. As in the 2011 FGEIS, total development would remain at 3 million sf. Although the overall program and phasing has been refined since the 2011 FGEIS, these refinements would not have the potential to substantially affect the building operational and vehicle trip GHG emissions projected in the 2011 FGEIS. Based on project-specific information, the emissions from ferry service would be greater than estimated in the 2011 FGEIS. For the 2030 analysis year, the updated estimate of emissions from ferry trips is included, as well as the updated overall emissions from the Proposed Project. However, the focus of this chapter is on the Proposed Project elements that would be implemented by 2022 on the North Island.

As discussed in the 2012 *City Environmental Quality Review* (CEQR) *Technical Manual*, increased concentrations of GHG in the atmosphere are changing the global climate, resulting in wide-ranging effects on the environment, including rising sea levels, increases in temperature,

and changes in precipitation levels. Although this is occurring on a global scale, the environmental effects of climate change are also likely to be felt at the local level. Through PlaNYC, the City has established sustainability initiatives and goals for both greatly reducing GHG emissions and adapting to climate change. The goal to reduce citywide GHG emissions to 30 percent below 2005 levels by 2030 was codified by Local Law 22 of 2008, known as the New York City Climate Protection Act (the "GHG reduction goal").[1] The *CEQR Technical Manual* requires that a project resulting in 350,000 square feet of development or more and other energy-intense projects quantify project-related GHG emissions and assess the project's consistency with the citywide GHG reduction goal.

The City is also engaged in several initiatives to assess potential local effects of global climate change and develop strategies to make existing and proposed infrastructure and development citywide more resilient to the effects of climate change. The Proposed Project includes improvements that would increase the Island's resilience to current weather conditions and to some extent, the potential effects of climate change.

B. PRINCIPAL CONCLUSIONS

2022 ANALYSIS YEAR

On the North Island, the Proposed Project (under the University/Research Option, the more GHG-intensive scenario) would result in annual GHG emissions of 41,265 metric tons of CO_2e. Of that amount, approximately 10,971 metric tons of CO_2e would be emitted as a result of grid electricity use and fuel consumption in on-site energy systems. Mobile sources (vehicle and ferry trips generated by the proposed uses) would account for the remaining emissions of 30,293 metric tons CO_2e. The re-tenanting of the North Island would involve the reuse of existing historic buildings, which in and of itself would result in lower GHG emissions compared to new construction. To the extent practicable, energy efficiency measures would be implemented, and sustainability would be favored and encouraged by The Trust through the design process and any RFP. To the extent that Local Law 86 of 2005, the New York City Green Building law, applies to the Proposed Project, the Trust would comply with the law's requirements.

As described in the 2011 FGEIS, the Master Plan has accounted for a sea level rise of 2 feet, reducing the Island's vulnerability to storm surges as compared to existing conditions by designing the new topography on the island for Phase 1 to be at least 4 feet above the current 1-in-100 year flood levels (this includes an additional 2 feet to elevate tree roots above saltwater levels during future 1-in-100 year events). In fact, elevations in most of the park and public space will be significantly higher than this, sheltering thousands of trees planted in the new park and public space from the effects of projected sea-level rise. Finally, saltwater tolerant plant species will be used in low lying areas where practicable.

To the extent feasible, practicable, or required, the Proposed Project would incorporate measures to accommodate a 2-foot increase in the 1-in-100 year storm level by the end of the century (or the most recent appropriate level based on the best information available at the time final designs are made). These measures may include raising the grade, creating storm barriers, and sealing critical infrastructure. As detailed local climate change projections become available and are adopted into the City's infrastructure design criteria, such criteria would be incorporated into the Proposed Project.

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

2030 ANALYSIS YEAR

Anticipated program and phasing refinements would not have the potential to substantially affect the GHG building operational and mobile source emissions projected in the 2011 FGEIS, except for emissions from ferry trips. Accounting for the estimated increase in ferry trip emissions, the overall 2030 analysis year annual GHG emissions for the North Island and South Island Development Zones would be 164,118 metric tons of CO_2e. The South Island Development Zones are expected to incorporate climate resilience and energy efficiency measures. It is expected that GHG emissions and the climate resilience of the South Island Development Zones will be analyzed as part of any future environmental review to ensure development is consistent with the City's GHG reduction goal.

C. SUMMARY OF 2011 FGEIS FINDINGS

The 2011 FGEIS concluded that the building energy use and transportation associated with the Phased Redevelopment of Governors Island (Phase 1 and Later Phases combined) would result in approximately 52,761 metric tons of carbon dioxide equivalent (CO_2e) emissions per year. The 2011 FGEIS also described measures that would be implemented to incorporate climate resilience and energy efficiency measures in Phase 1, and acknowledged the need to consider climate change in the future when undertaking detailed design of the Later Phases to ensure that the Later Phases are developed in a manner consistent with the GHG reduction goal.

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

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 which set emissions targets for GHGs, in a step toward the development of national climate change regulation, the U.S. has committed to reducing emissions to 17 percent lower than 2005 levels by 2020 and to 83 percent lower than 2005 levels by 2050 (pending legislation) via the Copenhagen Accord.[1] Without legislation focused on this goal, the U.S. Environmental Protection Agency (USEPA) is required to regulate GHGs under the Clean Air Act (CAA), and has begun preparing regulations addressing newly manufactured vehicles and permitted large stationary sources. In addition, the American Recovery and Reinvestment Act of 2009 (ARRA, "economic stimulus package") funded actions and research that can lead to reduced GHG emissions, and the Energy Independence and Security Act of 2007 includes provisions for increasing the production of clean renewable fuels, increasing the efficiency of products, buildings, and vehicles, and for promoting research on GHG capture and storage options.

U.S. Department of Transportation (USDOT) and USEPA have also established GHG emission standards and more stringent combined corporate average fuel economy (CAFE) standards for vehicles. These regulations will all serve to reduce vehicular GHG emissions over time.

There are also regional, state, 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 by 80 percent, compared with 1990 levels, by 2050, and creating a Climate Action Council

[1] Todd Stern, U.S. Special Envoy for Climate Change, letter to Mr. Yvo de Boer, UNFCCC, January 28, 2010.

tasked with preparing a climate action plan outlining the policies required to attain the GHG reduction goal (that effort is currently under way[1]). The 2009 New York State Energy Plan[2] outlines the state's energy goals and provides strategies and recommendations for meeting those goals. The state's goals include:

- Implementing programs to reduce electricity use by 15 percent below 2015 forecasts;
- Updating the energy code and enacting product efficiency standards;
- Reducing vehicle miles traveled by expanding alternative transportation options; and
- Implementing programs to increase the proportion of electricity generated from renewable resources to 30 percent of electricity demand by 2015.

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 10 northeastern and mid-Atlantic states have committed to regulate the amount of CO_2 that power plants are allowed to emit. The regional emissions cap for power plants will be held constant through 2014, and then gradually reduced to 10 percent below the initial cap through 2018. 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 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 sustainability program, PlaNYC 2030, includes GHG emissions reduction goals, specific initiatives that can result in emission reductions and initiatives targeted at adaptation to climate change impacts. For certain projects subject to CEQR, an analysis of the project's GHG emissions and an assessment of the project's consistency with the City's citywide emission reduction goal are required.

In December 2009, the New York City Council enacted four laws addressing energy efficiency in 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 every ten years, to optimize building energy efficiency, and to "benchmark" the building energy and water consumption annually, using a 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 sub-meters, so that tenants can be provided with information on their electricity consumption. The legislation also created a New York City Energy Code, which along with the New York State Energy Conservation Code (as revised in 2010), requires equipment installed during a renovation to meet energy efficiency standards.

A number of voluntary rating systems for energy efficiency and green building design have also been developed. For example, Leadership in Energy and Environmental Design (LEED®) system is a benchmark for the design, construction, and operation of high performance green buildings that includes energy efficiency components. New York City Local Law 86 of 2005 requires new buildings, additions, and substantial building reconstruction work in capital projects, public and private that receive city funds to be designed and built in accordance with LEED® standards.

[1] http://www.dec.ny.gov/energy/80930.html

[2] New York State, 2009 New York State Energy Plan, December 2009.

The law also includes specific energy efficiency requirements for boilers, lighting systems, heating, ventilation, and air conditioning (HVAC) systems and potable water use efficiency requirements for plumbing installations or replacements. LEED (Leadership in Energy and Environmental Design), one of a number of voluntary rating systems for energy efficiency and green building design, is a benchmark for the design, construction, and operation of high performance green buildings that includes energy efficiency components.

Another voluntary rating system is USEPA's *Energy Star*—a 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.

E. METHODOLOGY

Although the contribution of any single project to climate change is infinitesimal, the combined GHG emissions from all human activity are believed to have a severe adverse impact on 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. As required by the *CEQR Technical Manual*, this chapter presents the total GHG emissions potentially associated with the Proposed Project and identifies the measures that would be implemented and measures that are still under consideration to limit the emissions.

This analysis of GHG emissions is based on the methodology presented in the *CEQR Technical Manual*. Emissions of GHGs have been quantified, including off-site emissions associated with on-site use of electricity, on-site emissions from heat and hot water systems, and emissions from vehicle use attributable to the Proposed Project. GHG emissions that would result from construction of the Proposed Project are discussed as well.

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 property causes the general warming of the Earth's atmosphere, or the "greenhouse effect."

Carbon dioxide (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 nitrous oxide also play an important role since the removal processes for these compounds are limited and a relatively high impact on global climate change as compared to 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 an EIS: CO_2, nitrous oxide (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 CO_2 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 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 9-1**.

Table 9-1
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
Source: IPCC, Climate Change 1995—Second Assessment Report.	

BUILDING OPERATIONAL EMISSIONS

Emissions from electricity and on-site fossil fuel use were calculated using the "carbon intensity factors" provided in the *CEQR Technical Manual* (Table 18-3) by use type. The carbon intensity factor for each use was multiplied by the approximate floor areas for the various components of the North Island Redevelopment phase of the Proposed Project, with the University/Research Option. The *CEQR Technical Manual* large residential building (defined as greater than 4 families) carbon intensity factor was used to calculate the CO_2 emissions associated with the student dormitory and hotel uses, the institutional building carbon intensity factor was used to calculate the CO_2 emissions associated with the university and public school uses, and the commercial building carbon intensity factor was used to calculate CO_2 emissions from the artists' studios, service retail, restaurant, movie theater, and office uses.

MOBILE SOURCE EMISSIONS

Ferries are the main mode of transportation to and from the Island. As discussed in Chapter 7, "Transportation," vehicle trips would be generated by the Proposed Project at the Brooklyn and Manhattan ferry terminals serving Governors Island. It is anticipated that ferry service would be provided 7 days per week between Governors Island and the Battery Maritime Building (BMB) in Manhattan and between Governors Island and Pier 6 in Brooklyn. In addition to day time trips, a late night ferry service would be provided between Governors Island and Pier 11 in Manhattan.

The number of annual motorized vehicle trips by mode (car, taxi, truck) to and from the ferry terminals that would be generated by the Proposed Project was calculated using the transportation planning assumptions developed for the analysis presented in Chapter 7, "Transportation." The assumptions used in the calculation include average daily weekday person trips and delivery trips, the percentage of vehicle trips by mode, and the average vehicle occupancy. Travel distances for Brooklyn and Manhattan shown in Table 18-4 and Table 18-5 of the *CEQR Technical Manual* were used to calculate annual vehicle miles traveled by cars and

taxis to and from the ferry terminals analyzed. The average one-way truck trip was assumed to be 38 miles, as per the *CEQR Technical Manual*. Table 18-6 of the *CEQR Technical Manual* was used to determine the percentage of vehicle miles traveled by road type and the mobile GHG emissions calculator was used to obtain an estimate of car, taxi, and truck GHG emissions attributable to the Proposed Project.

The projected annual vehicle miles traveled (VMT) are presented in **Table 9-2**, for vehicle trips to and from the Brooklyn ferry terminal, and in **Table 9-3** for vehicle trips to and from the Manhattan terminal. The annual vehicle miles traveled form the basis for the GHG emissions calculations from mobile sources.

Table 9-2
Annual Vehicle Miles Traveled (VMT), Brooklyn

Use	Car	Taxi
Artists' Studios	60,711	2,024
University	238,125	19,844
Service Retail/Restaurant	16,710	0
Student Dormitory	49,635	9,789
Hotel	33,665	10,713
Movie Theater	17,570	0
Office	7,456	249
Public School	0	206
Total	**423,872**	**42,825**
Notes: All deliveries would be made to the Manhattan ferry terminal. Therefore, no truck VMT is shown here, for the Brooklyn ferry terminal.		

Table 9-3
Annual Vehicle Miles Traveled (VMT), Manhattan

Use	Car	Taxi	Truck
Artists' Studios	152,725	26,181	183,157
University	178,315	317,004	301,156
Service Retail/Restaurant	50,051	0	137,191
Student Dormitory	167,518	77,090	259,752
Hotel	26,277	43,231	199,728
Movie Theater	45,256	159,233	1,276
Office	18,756	3,215	22,493
Public School	122,762	97,731	102,919
Total	**400,208,310**	**346,777,887**	**1,207,672**

To account for the emissions from the proposed school generated school bus trips to the Manhattan ferry terminal, 49 metric tons of CO_2e per year were added to the public school mobile source emissions shown in **Table 9-6** and **Table 9-8**. These school bus emissions were calculated based on the projected number of 6 school buses needed to serve the proposed school, and the annual school bus GHG emissions of 8.13 metric tons of CO_2e per bus, based on PlaNYC GHG emissions inventory and related information.

The emissions from ferries that would serve Governors Island were also accounted for in the mobile source analysis. Trip generation rates were developed by the type of vessel serving the Island. The GHG emissions were calculated using the engine types of each vessel. Fuel consumption (in gallons per hour) was obtained from engine manufacturer specifications for each engine model. The fuel consumption was multiplied by the number of engines on each vessel, and the anticipated annual

hours of operation (based on the number of trips) to determine the amount of fuel consumed per year. The GHG emission factors were based on the diesel fuel carbon content,[1] assuming that all carbon is transformed to CO_2, resulting in an emission factors of 10,186 grams of CO_2 per gallon of diesel. The estimated engine specifications and fuel usage are presented in **Table 9-4**.

Table 9-4
Ferry Engine Fuel Usage

Vessel Type	Passenger Capacity	Engine Type	Number of Engines	Fuel Consumption (gallons/hour)
Water Taxi	149	Caterpillar 3406E	4	29.3
Waterways Small	339	Caterpillar C-18	2	36.8
Waterways Large	499	Caterpillar	2	35.6

Note: The fuel consumption rate of 250 gallons per day for the Coursen with cars was provided by the Governors Island Trust
Sources: Engine specifications were found on the Caterpillar Marine Power Systems website: http://marine.cat.com/cda/layout?m=214643&x=7

USEPA estimates that the well-to-pump GHG emissions of gasoline and diesel are approximately 22 percent of the tailpipe emissions.[2] 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, as per the *CEQR Technical Manual* guidance, the well-to-pump emissions are not considered in the analysis for the Proposed Project.

CONSTRUCTION EMISSIONS

Unlike typical ground-up construction, the North Island component of the Proposed Project—the re-tenanting of existing buildings in the Governors Island Historic District—would not involve extensive demolition, foundation, or superstructure construction activities, which often generate the highest levels of construction activity emissions. The improvements to North Island and the re-tenanting of the Historic District would not require large amounts of new construction materials. Therefore, GHG emissions associated with construction (both direct emissions and emissions embedded in the production of materials, including on-site construction equipment, delivery trucks, and upstream emissions from the production of steel, rebar, aluminum, and cement used for construction) would not be substantial. As such, emissions associated with construction have not been estimated explicitly, but other analyses have shown that construction emissions (both direct and 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 emissions from the operation of the project over approximately 5 to 10 years.

EMISSIONS FROM SOLID WASTE MANAGEMENT

The Proposed Project would not 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.

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[1] The Code of Federal Regulations (40 CFR 600.113).

[2] Environmental Protection Agency, *MOVES2004 Energy and Emission Inputs*, Draft Report, EPA420-P-05-003, March 2005.

F. PROJECTED GHG EMISSIONS

2022 ANALYSIS YEAR

BUILDING OPERATIONAL EMISSIONS

The estimated building operational GHG emissions from each component of the Proposed Project on the North Island are shown in **Table 9-5**. The total building operational emissions for the North Island would be approximately 44 percent of the building operational emissions for all of the proposed re-tenanting of the North Island buildings and proposed development of the South Island Development Zones, reported in the 2011 FGEIS.

Table 9-5
Building Operational Annual Emissions
University/Research Option

Use	Approximate Size (gsf)	Use Type	Carbon Intensity (kg CO_2e/sf)	GHG Emissions (metric tons of CO_2e)
Artists' Studios (Office)	57,000	Commercial	9.43	537.5
University	422,000	Institutional	11.42	4,819.2
Service Retail/Restaurant	37,800	Commercial	9.43	356.5
Student Dormitory	262,000	Large Residential	6.59	1,726.6
Hotel	256,250	Large Residential	6.59	1,688.7
Movie Theater	9,200	Commercial	9.43	86.8
Office	7,000	Commercial	9.43	66.0
Public School	148,000	Institutional	11.42	1,690.2
TOTAL	**1,199,250**	**N/A**	**N/A**	**10,971**

Sources: GHG intensities were obtained from the 2012 *CEQR Technical Manual*, Table 18-3.

MOBILE SOURCE EMISSIONS

The estimated GHG emissions from the mobile sources for each component of the Proposed Project on the North Island are presented in **Table 9-6**. Without the ferry emissions, the annual mobile source GHG emissions for the North Island would be approximately 3,733 metric tons of CO_2e, which is approximately 22 percent of the emissions from mobile sources (excluding the ferry) reported for the proposed re-tenanting of the North Island buildings and the proposed development of the South Island Development Zones in the 2011 FGEIS. Based on project-specific information regarding the intended ferry use, and conservative assumptions regarding the operation of the ferries, the annual emissions from the ferry trips on a per square foot basis were estimated to be substantially greater than those reported in the 2011 FGEIS. Assuming that similar ferry service would be provided for the South Island Development Zones, the annual GHG emissions from ferry trips for the overall development program are estimated to be 120,722 metric tons of CO_2e.

The estimated annual GHG emissions from ferries serving Governors Island from Manhattan and Brooklyn are presented in **Table 9-7**.

Table 9-6
Summary of Mobile Source Annual Emissions
(Metric Tons of CO_2e per year)

Use	Mobile Brooklyn	Mobile Manhattan	Total
Artists' Studios	23.8	496.3	520.1
University	97.3	916.5	1,013.8
Service Retail/Restaurant	6.4	323.7	330.0
Student Dormitory	26.8	748.6	775.4
Hotel	19.8	496.0	515.8
Movie Theater	8.1	113.2	121.2
Office	2.9	61.0	63.9
Public School	0.1	393.7*	393.7
Ferry	7,368.1	19,191.4	26,559.5
Total	**7,553**	**22,740**	**30,293**
Note: *Includes school bus emissions (49 MT CO_2e) associated with the proposed school.			

Table 9-7
Annual GHG Emissions from Ferry Trips

Use	Passenger Capacity	Manhattan (metric tons CO_2e)	Brooklyn (metric tons CO_2e)
Coursen with Cars	890	5,020	-
Waterways Large	499	3,407	-
Waterways Small	399	5,623	2,694
Water Taxi	149	5,141	4,674
Total	-	**19,191**	**7,368**
Note: It is anticipated that only the small Waterways ferry and the Water Taxi would serve Governors Island from the Brooklyn terminal.			

SUMMARY

As shown in **Table 9-8**, the Proposed Project on the North Island would result in annual GHG emissions estimated at 41,265 metric tons of CO_2e. Of that amount, it is estimated that approximately 10,971 metric tons of CO_2e would be emitted through grid electricity use and fuel consumption in on-site energy systems. The remaining emissions of 30,293 metric tons of CO_2e would result from mobile sources (vehicle and ferry trips).

Table 9-8
Summary of Annual GHG Emissions (metric tons of CO_2e)

Use	Building Operations	Mobile Brooklyn	Mobile Manhattan	Total**
Artists' Studios (Office)	537.5	23.8	496.3	1,058
University	4,819.2	97.3	916.5	5,833
Service Retail/Restaurant	356.5	6.4	323.7	686
Student Dormitory	1,726.6	26.8	748.6	2,502
Hotel	1,688.7	19.8	496.0	2,204
Movie Theater	86.8	8.1	113.2	208
Office	66.0	2.9	61.0	130
Public School	1,690.2	0.1	393.7*	2,084
Ferry	-	7,368.1	19,191.4	26,559
Total	**10,971.4**	**7,553.2**	**22,740.3**	**41,265**
Notes: * Includes school bus emissions (49 MT CO_2e) associated with the proposed school. ** Minor differences in the reported total emissions are due to rounding.				

2030 ANALYSIS YEAR

As in the 2011 FGEIS, total development upon completion of the Proposed Project in 2030 would be 3 million sf. Although the overall program and phasing has been refined since the 2011 FGEIS, these refinements would not have the potential to substantially affect the GHG building operational and mobile source emissions projected in the 2011 FGEIS, except for emissions from ferry trips, which based on project-specific information would be greater than estimated in the 2011 FGEIS. Since there are still no specific development plans or proposals for the South Island Development Zones, the building operational and vehicle trip GHG emissions for the full development of Governors Island are considered to be the same as those presented in the 2011 FGEIS. Accounting for the estimated increase in ferry trip emissions, the overall 2030 analysis year annual GHG emissions for the North Island and South Island Development Zones would be 164,118 metric tons of CO_2e. The South Island Development Zones are expected to incorporate climate resilience and energy efficiency measures. It is expected that The Trust and/or future applicant will analyze GHG emissions and the climate resilience of the South Island Development Zones as part of future environmental review to ensure development is consistent with the GHG reduction goal.

G. ELEMENTS OF THE PROPOSED PROJECT THAT WOULD REDUCE GHG EMISSIONS

The Proposed Project would be accessible by ferry, with multiple subway and bus connections in Lower Manhattan and Brooklyn, and will include a network of bike lanes, availability of bicycle parking, and walkable streets. On the North Island, existing historic buildings that are currently vacant would be re-tenanted. By facilitating the sustainable reuse of existing buildings, the Proposed Project would reduce the demand for land and construction of new buildings that would otherwise be needed to accommodate the proposed uses. The proposed public school would be built according to the New York City Green Schools Guide, published by the New York City School Construction Authority, which guides the sustainable design, construction, and operation of new schools, modernization projects, and school renovations in New York City.

The Proposed Project would include sustainable design features that would, among other benefits, result in lower GHG emissions. These features are discussed in this section, assessing the consistency of the proposed actions with the GHG reduction goal outlined in the *CEQR Technical Manual*. Overall, as demonstrated below, the proposed design would include features aimed at reducing energy consumption and GHG emissions, and would, therefore, be consistent with the City's city-wide GHG reduction goal.

Additional measures are expected to be incorporated during the detailed design of the South Island Development Zones, to ensure that the development will be consistent with the City's GHG reduction goals, and goals relating to building energy efficiency, sustainable transportation (including the use of ferries), the use of clean power, construction emissions, and building materials. These measures will be analyzed and reviewed in subsequent environmental review.

BUILD EFFICIENT BUILDINGS

On the North Island, the Proposed Project involves the re-tenanting of existing space in the Governors Island Historic District. The reuse of vacant building space uses minimal new materials. Due to the requirements to preserve the historic structure, the options to improve efficiency may be limited. Nonetheless, the Proposed Project would strive to incorporate sustainability features and energy efficiency improvement measures during building renovation.

Through an RFP process, the Trust would look favorably upon proposals that enhance the energy-efficiency of buildings, use fewer raw materials, make the best of natural light where appropriate, improve indoor air quality, and decrease the total impact on the natural and human environment. These designs would include features aimed at reducing energy consumption and GHG emissions, such as:

- Energy efficient building envelopes to reduce cooling and heating;
- High-efficiency HVAC systems;
- Window glazing to optimize energy performance by allowing for daylighting while managing both heat loss and solar heat gain; and
- Fuel from renewable sources or less GHG-intense fuels, such as natural gas, or co-firing of biomass or use of biofuels for heating.

To the extent that Local Law 86 of 2005, the New York City Green Building Law, applies to the Proposed Project, The Trust would comply with the law's requirements, which would be set forth in future RFPs.

USE CLEAN POWER

The heating and hot water systems for the Proposed Project buildings would use natural gas; natural gas has lower carbon content per unit of energy than other fuels, and thus reduces GHG emissions. The potential to meet some of the North Island energy demand using solar panels will be explored. The use of clean power would be further considered for the South Island Development Zones, as their design progresses.

ENHANCE AND USE TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

To support the uses in the re-tenanted buildings and completed park and public space, additional ferry service would be provided so that ferries would operate 7 days per week between Governors Island and the BMB and Pier 6 in Brooklyn, with late night ferry service between Governors Island and Pier 11 in Manhattan. Ferry service would be provided 24 hours a day, enhancing the use of transit and transit-oriented development. Presently, transportation by ferry to Governors Island is free of charge during the summer.

As described above, The Trust will seek, through an RFP process, to use fuels and technology that would reduce GHG emissions. This may include using fuel from renewable sources or less GHG-intense fuels, such as natural gas or biofuels, in vehicles/equipment.

REDUCE CONSTRUCTION OPERATION EMISSIONS

As discussed above, the re-tenanting of the North Island would not involve extensive construction activity and therefore would not generate substantial GHG emissions during construction. For the development of the South Island, a diesel emissions reduction program including diesel particle filters for large construction engines and other measures will be considered. These measures would reduce particulate matter emissions; while particulate matter is not included in the list of standard greenhouse gases ("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

On the North Island, the Proposed Project would involve re-tenanting of existing historic buildings, which reduces the amount of materials used as compared to new construction. To the extent that new materials are used, efforts would be made to minimize GHG emissions, and to select materials with low embedded GHG emissions (from material production and transport), such as slag, fly ash, and calcined clay and other building materials with recycled content, as well as materials that are extracted and/or manufactured within the region. For the South Island Development Zones, specific measures to reduce GHG emissions will be identified when the program and design of that project component progresses.

H. ADAPTATION TO CLIMATE CHANGE

Currently, standards and a framework for analysis of the effects of climate change on a Proposed Project are not included in CEQR. However, the recently proposed revisions to the Waterfront Revitalization Program (WRP)[1] address climate change and sea level rise. If finalized, the revisions to the WRP would require 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 WRP are applied by the New York City Department of City Planning (DCP) and other city agencies when conducting environmental review. Since the project site is on the waterfront, the potential effects of global climate change on the Proposed Project and ways to address them are considered below.

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 representatives 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.[2]

The New York State Sea Level Rise Task Force was created to assess potential impacts to the state's coastlines from rising seas and increased storm surge. The Task Force has prepared a final report of its findings and recommendations including protective and adaptive measures.[3] 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

[1] City of New York Department of City Planning, The NYC Waterfront Revitalization Program: Proposed Revisions for Public Review, March 2012, http://www.nyc.gov/html/dcp/html/wrp/wrp_revisions.shtml

[2] 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 28, 2011.

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

State Climate Action Plan will also include strategies for adapting to climate change. The 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.[1]

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 and has suggested approaches to create an effective adaptation program for critical infrastructure.[2] 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. The NPCC projects that sea levels are likely to increase by 12 to 23 inches by the end of the century, with possible increase up to 55 inches in the event of rapid ice melt. In general, the probability of higher sea levels is characterized as "extremely likely," but there is high uncertainty regarding the probability of a rapid ice melt scenario. 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 (excluding the rapid ice melt scenario), 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 stormwater management.[3] 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 develop flood maps that reflect projected sea-level rise and increases in coastal flooding through 2080 and 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.

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

[2] 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.

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

The New York City Department of Environmental Protection (NYCDEP) is evaluating adaptive strategies for City water and wastewater infrastructure. The City has already developed a *New York City Green Infrastructure Plan*[1], and a *Sustainable Stormwater Management Plan.*[2] Many of the strategies discussed in these plans would improve the City's resilience to climate change.

Overall, strategies and guidelines for addressing the effects of climate change are rapidly being developed on all levels of government. Currently, standards and a framework for analysis of the effects of climate change on a Proposed Project are not included in the *CEQR Technical Manual*. While qualitative guidance on addressing the effect of climate change is in the process of being developed at the national, state, and local levels, no specific requirements for development projects are available at this time. Climate change considerations may be incorporated into state and local laws prior to the construction of the Proposed Project, and any future development would be constructed to meet or exceed the codes in effect at the time of construction.

RESILIENCE TO CLIMATE CHANGE

The current 100-year floodplain is presently the only regulatory standard relating to elevation of new development. However, projected sea level rise will be accounted for in the development of the Proposed Project.

For the park areas, the Master Plan has accounted for the 2-foot projected sea level rise, as identified by NPCC, reducing the Island's vulnerability to storm surges as compared to existing conditions. The creation of new topography on the island is designed specifically to address this issue by raising the grade of most park areas to at least 4 feet above the current 1-in-100 year flood levels, accounting for the 2-foot sea level rise by the end of the century and an additional 2 feet to elevate tree roots above saltwater levels during severe storms. In addition, saltwater tolerant plant species will be used in low lying areas where practicable.

The buildings constructed in the South Island Development Zones would incorporate the most recent building code requirements available at the time of construction and consider any prudent guidance and information available. To the extent practicable, measures would be taken to make the re-tenanted buildings more resilient to the potential effects of climate change, for example, by protecting the heating and hot water systems from flooding. Since the South Island Development Zones have not yet been designed in detail, it is unknown at this time how these areas will accommodate future sea level rise; however, the final design will incorporate measures such as raising the grade and/or protective measures such as storm barriers and sealed critical infrastructure designed to accommodate a 2-foot increase in the 1-in-100 year storm level by the end of the century, or the most recent appropriate level based on the best information available at the time final designs are made. ✷

[1] New York City, New York City Green Infrastructure Plan, September 2010.

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