Chapter 16: Greenhouse Gas Emissions

A. INTRODUCTION

This chapter addresses the greenhouse gas (GHG) emissions that would be generated by the proposed projects and measures that would be implemented to limit those emissions.

There is general consensus in the scientific community that the global climate is changing as a result of increased concentrations of GHGs in the atmosphere. GHGs are those gaseous constituents of the atmosphere, from both natural and anthropogenic (i.e., resulting from the influence of human beings) emission sources, that absorb infrared radiation (heat) emitted from the earth's surface, the atmosphere, and clouds. This property causes the general warming of the earth's atmosphere, or the "greenhouse effect."

As discussed in the 2010 *City Environmental Quality Review (CEQR) Technical Manual*, climate change could 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. Through PlaNYC, the City has established sustainability initiatives and goals for both greatly reducing GHG emissions and adapting to climate change in the City. 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] Per the 2010 *CEQR Technical Manual*, the citywide GHG reduction goal is currently the most appropriate standard by which to analyze a project under CEQR. The *CEQR Technical Manual* recommends that a GHG consistency assessment be conducted for any project resulting in 350,000 square feet of development or more and other energy-intense projects. While the proposed projects would result in approximately 188,000 square feet less of developed space in the project area as compared to the future without the proposed projects ("No Build condition"), the proposed projects would result in the reactivation of existing unoccupied buildings as well as new development that together would be in excess of 350,000 gross square feet (gsf). Accordingly, A GHG consistency assessment is provided.

PRINCIPAL CONCLUSIONS

As discussed in the following sections, the building energy use and vehicle use associated with the proposed East Site project and Center for Comprehensive Care would result in approximately 10,037 metric tons of carbon dioxide equivalent (CO_2e) emissions per year. Of that amount, 3,367 metric tons of CO_2e would be generated by the Center for Comprehensive Care, while 6,671 metric tons of CO_2e would be generated by the uses on the East Site.

The proximity of the proposed projects to public transportation and efficient design are all factors that contribute to energy efficiency. At this time, the proposed projects are intending to meet the requirements for the United States Green Building Council's (USGBC) Leadership in

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

Energy and Environmental Design (LEED) Silver certification. As such, specific measures would need to be incorporated into the design of the proposed projects to qualify for the LEED rating, which would decrease the potential GHG emissions from the proposed projects. Based on these project components and efficiency measures, the proposed projects would be consistent with the City's emissions reduction goal, as defined in the *CEQR Technical Manual*.

B. 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." Water vapor, carbon dioxide (CO_2), nitrous oxide, methane, and ozone are the primary greenhouse gases in the Earth's atmosphere.

There are also a number of entirely anthropogenic (resulting from human activity) greenhouse gases in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances, which also damage the stratospheric ozone layer (contributing 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 project-related GHG assessments for most projects. Although ozone itself is also a major greenhouse gas, it does not need to be assessed as such at the project level since it is a rapidly reacting chemical 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.

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 projects.

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

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

Greenhouse Gas	100-year Horizon GWP
Carbon Dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous Oxide (N_2O)	298
Hydrofluorocarbons (HFCs)	124 to 14,800
Perfluorocarbons (PFCs)	7,390 to 12,200
Sulfur Hexafluoride (SF_6)	22,800
Source: IPCC, Climate Change 2007—The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report, Table 2-14, 2007.	

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

As a result of the growing consensus that human activity resulting in GHG emissions has the potential to profoundly impact 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 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 (EPA) is required to regulate greenhouse gases under the Clean Air Act (CAA), and has already begun preparing regulations. In May 2010, EPA issued a final rule (effective August 2010) to tailor the applicability criteria for stationary sources subject to permitting requirements under CAA, setting thresholds for GHG emissions that define when permits are required for new and existing industrial facilities under the New Source Review Prevention of Significant Deterioration (PSD) and title V Operating Permit programs.

In addition, EPA has published regulation regarding geological sequestration of CO_2, a GHG reporting rule to collect information on GHG emissions, and has also established various voluntary programs to reduce emissions and increase energy efficiency. The American Recovery and Reinvestment Act of 2009 (ARRA, "economic stimulus package") funds actions and research that can lead to reduced GHG emissions.

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 greenhouse gas capture and storage options. The most recent renewable fuel standards regulations (February 2010) require 12.95 billion gallons of renewable fuels to be produced in 2010, increasing annually up to 36.0 billion gallons in 2022. The renewable fuel standards regulations also set volume standards for specific categories of renewable fuels including cellulosic, biomass-based diesel, and total advanced renewable fuels, and specify lifecycle

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

GHG reduction thresholds ranging from 20 percent for renewable fuel to 60 percent for cellulosic biofuel (as compared to the baseline gasoline or diesel replaced).

In March 2009, the U.S. Department of Transportation (USDOT) set combined corporate average fuel economy (CAFE) standards for light duty vehicles for the 2011 model year (MY). In June 2009, EPA granted California a previously denied waiver to regulate vehicular GHG emissions, allowing 19 other states (representing 40 percent of the light-duty vehicle market, including New York) to adopt the California mobile source GHG emissions standards. In April 2010, EPA and USDOT established the first GHG emission standards and more stringent CAFE standards for MY 2012 through 2016 light-duty vehicles. The agencies also proposed the first-ever program to reduce GHG emissions and improve fuel efficiency of medium- and heavy-duty vehicles, such as large pickup trucks and vans, semi trucks, and vocational vehicles. These regulations would 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 to 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 (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. Each power source with a generating capacity of 25 megawatts or more must purchase a tradable CO_2 emission allowance for each ton of CO_2 it emits. The 10 RGGI states and Pennsylvania have also announced plans to reduce GHG emissions from transportation, through the use of biofuel, alternative fuel, and efficient vehicles.

Many local governments worldwide, including New York City, are participating in the Cities for Climate Protection™ (CCP) campaign and have committed to adopting policies and implementing quantifiable measures to reduce local GHG emissions, improve air quality, and enhance urban livability and sustainability. New York City's long-term 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 (e.g., projects with 350,000 gsf or more of development or other energy intense projects), an analysis of the projects' contribution of GHG emissions is required to determine

[1] http://www.nyclimatechange.us/

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

their consistency with the City's citywide reduction goal, which is currently the most appropriate standard by which to analyze a project under CEQR, and is therefore applied in this chapter.

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 10 years, to optimize building energy efficiency, and to "benchmark" the building energy and water consumption annually, using an EPA online tool. By 2025, commercial buildings over 50,000 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 Code, which requires equipment installed during a renovation to meet current efficiency standards.

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. It is noteworthy that the proposed projects will strive to attain LEED Silver certification.

EPA's Energy Star is a voluntary labeling program designed to identify and promote the construction of new energy efficient buildings, facilities, and homes and the purchase of energy efficient appliances, heating and cooling systems, office equipment, lighting, home electronics, and building envelopes.

D. 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. 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 projects and identifies the measures that would be implemented and measures that are still under consideration to limit the emissions. Since the energy use and vehicle use associated with the proposed open space on the Triangle Site would be insignificant, this analysis focuses on the redevelopment on the East Site as well as the Center for Comprehensive Care.

The analysis of GHG emissions that would be generated by the proposed projects is based on the methodology presented in the 2010 *CEQR Technical Manual*. Estimates of emissions of GHGs from the proposed projects have been quantified, including off-site emissions associated with use of electricity and steam on-site, on-site emissions from heat and hot water systems, and emissions from vehicle use attributable to the proposed projects. GHG emissions that would result from construction and renovation of the proposed projects are discussed as well.

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

carbon dioxide equivalent (CO_2e) emissions per year (see Section B, "Pollutants Of Concern," above).

BUILDING OPERATIONAL EMISSIONS

Emissions due to electricity, steam, and fuel oil use were developed using projections of energy consumption developed by the mechanical, electrical, and plumbing engineers specifically for the proposed projects and the emission factors referenced in the 2009 inventory of GHG emissions for New York City.[1]

For the residential and other uses on the East Site, it is projected that 308,040 gallons of No. 2 fuel oil would be needed per year for heat, hot water, and emergency generators (assuming that oil rather than natural gas is used). The calculation of East Site electricity consumption is based on rates of 5.5 kilowatt hours per gross square foot per year (kWh/gsf/yr) for the 31,917 gsf row houses and 9 kWh/gsf/yr for the 692,963 gsf of all other development on the East Site. The total East Site electricity consumption is projected to be approximately 6,412 MWh per year.

For the Center for Comprehensive Care, it is projected that approximately 14.3 million pounds of steam per year would be needed to meet the heating demand. Electricity demand is projected to be 3,250 megawatt hours per year, and 800 gallons of No. 2 fuel oil are assumed for annual emergency generator testing and maintenance.

MOBILE SOURCE EMISSIONS

The number of annual weekday vehicle trips by mode (cars, taxis, trucks, and ambulances) that would be generated by the proposed projects was calculated using the transportation planning assumptions developed for the analysis presented in Chapter 14, "Transportation." The assumptions used in the calculation include average daily weekday person trips and delivery trips by proposed use, the percentage of vehicle trips by mode, and the average vehicle occupancy. Travel distances shown in Table 18-4 of the 2010 *CEQR Technical Manual* were used in the calculations of annual vehicle miles traveled by cars and trucks. An average one way taxi trip of 2.32 miles, which is based on regional modeling for taxi trips with either Manhattan as the trip origin and/or destination, was provided by the Mayor's Office. The trip distance for ambulances was assumed to be 1.5 miles, reflecting the fact that many areas in Manhattan are no more than 3 miles away from a hospital. The average 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 projects. The GHG emissions for ambulances were based on a 4 miles per gallon (MPG) fuel efficiency, developed through a survey of manufacturer and owner data, and the emission factor for diesel fuel referenced in the PlaNYC inventory.

EPA 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, fuel

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[1] *Inventory of New York City Greenhouse Gas Emissions*, Mayor's Office of Long-Term Planning and Sustainability, PlaNYC2030, September 2010.

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

alternatives are not being considered for the proposed projects, and as per the *CEQR Technical Manual* guidance, the well-to-pump emissions are not considered in the analysis for the proposed projects. The assessment of tailpipe emissions only is in accordance with the 2010 *CEQR Technical Manual* guidance on assessing GHG emissions and the methodology used in developing the New York City GHG inventory, which is the basis of the GHG reduction goal.

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

Table 16-2
Annual Vehicle Miles Traveled
(miles per year)

Mode	Center for Comprehensive Care	East Site	Total Annual Miles
Car	488,385	528,204	1,016,589
Taxi	210,585	320,112	230,697
Truck	627,885	406,217	1,034,102
Ambulance	168,652	N/A	168,652
Total	***1,495,507***	***1,254,533***	***3,156,257***

CONSTRUCTION EMISSIONS

Due to the relatively modest size of the proposed projects, emissions associated with construction have not been estimated explicitly for the projects, but other similar analyses 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 emissions from the operation of the projects over approximately 5 to 10 years. Since the proposed projects would facilitate the reuse of existing buildings, the emissions from renovation and reconstruction of existing buildings would be less than the 5 to 10 year estimate, which represents projects of similar size involving construction of entirely new buildings.

EMISSIONS FROM SOLID WASTE MANAGEMENT

The proposed projects would not fundamentally change the City's solid waste management system. Therefore, as per the 2010 *CEQR Technical Manual*, the GHG emissions from solid waste generation, transportation, treatment, and disposal are not quantified.

E. PROJECTED GHG EMISSIONS FROM THE PROPOSED PROJECTS

BUILDING OPERATIONAL EMISSIONS

The fuel consumption, emission factors, and resulting GHG emissions from each of the projects is presented in detail in **Table 16-3**.

Table 16-3
Building Operational Emissions

	Steam	#2 Fuel Oil	Electricity	
Annual Fuel Consumption				
Units:	*Mlbs*	*gal*	*kWh*	
Center for Comprehensive Care	14.3	800	3,250,000	
East Site other than row houses		298,240	6,236,667	
East Site row houses		9,800	175,554	
Total	*14.3*	*308,840*	*9,662,211*	
Emission Factor (lb/unit fuel) *	166	23	0.692	
GHG Emissions (lbs CO_2e/year)				
Center for Comprehensive Care	2,372	18,103	2,249,801	
East Site	none	6,970,422	4,438,831	
GHG Emissions (metric tons CO_2e/year)				**TOTAL**
Center for Comprehensive Care	1.1	8.2	1,020.5	**1,030**
East Site	none	3,161.7	2,013.4	**5,175**
Total	**1.1**	**3,169.9**	**3,033.9**	**6,205**

Note: * From PlaNYC inventory (for 2009)

MOBILE SOURCE EMISSIONS

The detailed mobile source related GHG emissions from each of the projects is presented in detail in **Table 16-4**.

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

Roadway Type	Passenger Vehicle	Taxi	Truck	Ambulance	Total
Center for Comprehensive Care					
Local	117	46	480	95	**737**
Arterial	155	60	646	207	**1067**
Int/Exp	68	26	309	129	**533**
Subtotal	*340*	*131*	*1,435*	*431*	***2,337***
East Site					
Local	126	69	310	none	**506**
Arterial	167	91	418	none	**676**
Int/Exp	74	40	200	none	**314**
Subtotal	*367*	*200*	*928*	*none*	***1,495***
Total	**707**	**331**	**2,363**	**431**	**3,832**

CONSTRUCTION EMISSIONS

Due to the relatively modest size of the proposed projects, construction emissions were not explicitly quantified. An estimated range is presented, as described in Section D, "Methodology."

EMISSIONS FROM SOLID WASTE MANAGEMENT

The proposed projects would not fundamentally change the City's solid waste management system. Therefore, emissions from solid waste management were not quantified.

SUMMARY

A summary of GHG emissions by emission source type, for the Center for Comprehensive Care, and for the East Site, along with total annual emissions, is presented in **Table 16-5**. Note that if the proposed buildings were to be constructed elsewhere to accommodate the same number of patients, visitors, workers, and residents, the emissions from the use of electricity, energy for heating and hot water, and vehicle use could equal or exceed those of the proposed projects, depending on their location, access to transit, building type, and energy efficiency measures. As described in Section D, "Methodology," 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 projects are not expected to fundamentally change the City's solid waste management system, and therefore emissions associated with solid waste are not presented.

Table 16-5
Summary of Annual GHG Emissions 2015
(metric tons CO_2e)

Emissions Source	Center for Comprehensive Care	East Site	Total
Building Operations	1,030	5,175	6,205
Mobile	2,337	1,495	3,832
TOTAL	***3,367***	***6,671***	***10,037***

It is important to note that 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 and steam to be used on-site. It is anticipated that the proposed projects would, at a minimum, achieve certification under the LEED for New Construction and Major Renovations Rating System. To attain LEED certification, the proposed projects would need to meet energy efficiency requirements that exceed code. Therefore, the minimum energy efficiency requirements needed to achieve the LEED rating are included in the estimate of emissions from building operations. The proposed projects would limit the emissions associated with electricity consumption and heating through energy-efficient design, and reduce emissions associated with transportation because of the available alternatives to driving. In addition, through reuse of existing buildings, the proposed projects would limit the amount of new construction materials, such as cement and steel—materials whose production is energy intensive and also results in process GHG emissions, as well as emissions from transportation of those materials to the construction site. Through building reuse, emissions from construction waste management would also be lower than if the existing buildings were demolished and new buildings constructed in their place. (See more detail in Section F, "Elements of the Proposed Projects that Would Reduce GHG Emissions".)

F. ELEMENTS OF THE PROPOSED PROJECTS THAT WOULD REDUCE GHG EMISSIONS

The proposed projects would include a number of sustainable design features which would, among other benefits, result in lower GHG emissions. Many of the measures that may be included in the proposed projects to achieve LEED certification would also result in a smaller carbon footprint. In general, as a prerequisite for LEED, the East Site would use at least 10 percent less energy than code and the O'Toole Building would be renovated to reduce energy

consumption by at least 5 percent. These energy efficiency assumptions were included in the GHG emissions calculations presented above. In general, the dense, mixed-use development and reuse of existing buildings and developed land with access to transit and existing roadways are consistent with sustainable land use planning and smart growth strategies to reduce the carbon footprint of new development. These features and other measures currently under consideration are discussed in this chapter, addressing the PlaNYC goals as outlined in the *CEQR Technical Manual*.

BUILD EFFICIENT BUILDINGS

EAST SITE

The buildings on the East Site will be designed with an energy efficient building envelope and will incorporate window glazing to optimize daylighting (new buildings only, with some enlargement of openings for existing facades), heat loss, and solar heat gain. High-efficiency heating, ventilation, and air conditioning (HVAC) systems will be selected. The buildings will use water conserving fixtures exceeding building code requirements, and collect storm water for reuse. As part of the LEED process, third-party fundamental building energy systems commissioning would be conducted to ensure energy performance.

Other measures that may be incorporated include green roofs and/or high-albedo roofing, motion sensors and lighting and climate control, efficient lighting and elevators, Energy Star appliances, directed exterior lighting, and water-efficient landscaping.

Additional measures under consideration include the likely use of recycled and/or locally manufactured building materials, rapidly renewable materials, certified sustainable wood products, and the provision of construction and design guidelines to facilitate sustainable design for build-out by tenants.

CENTER FOR COMPREHENSIVE CARE

As described above, it is anticipated that the renovation will achieve a LEED Silver rating. As such, the energy consumption of the Center for Comprehensive Care will be at least 5 percent lower than that of the O'Toole Building.

USE CLEAN POWER

EAST SITE

As part of the LEED process for the East Site, on-site renewable power generation and geothermal wells may be considered. It is unknown at this time weather the heating systems would be natural gas only or dual-fuel systems that accommodate both natural gas and fuel oil—in either event, the use of the cleaner and lower-GHG natural gas will be possible. If a dual-fuel system is elected, the opportunity for enabling biofuel (B20 grade biodiesel) will be investigated.

CENTER FOR COMPREHENSIVE CARE

The Center would use steam provided by Con Edison for heat and hot water. This centralized system results in higher energy efficiency than a conventional on-site oil or gas system due to the combined production of electric power associated with the steam production (similar to on-site cogeneration).

Given the limited space available on the roof of the O'Toole Building, and the planned use of that roof space for necessary systems, on-site renewable power generation such as photovoltaic or building-integrated wind generation would not be possible.

TRANSIT-ORIENTED DEVELOPMENT AND SUSTAINABLE TRANSPORTATION

The projects are located in an area supported by many transit options (both bus and subway service are immediately adjacent to the projects), includes mixed use, and locates residential uses within walking distance of many retail options immediately adjacent to the projects on both Seventh Avenue and Eighth Avenue. Designated on-site parking for alternative vehicles and charging stations for electric vehicles are being considered. In addition, the proposed East Site project is designed to support walking and bicycling, and is located next to the major bike route on Eighth Avenue.

The O'Toole Building has an indoor parking garage; this space will be converted for the Center for Comprehensive Care and will not be used for parking. The decision to remove the parking is consistent with the sustainable transportation goal in the *CEQR Technical Manual*.

REDUCE CONSTRUCTION OPERATION EMISSIONS

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

The use of biodiesel for construction is not practicable at this time.

USE BUILDING MATERIALS WITH LOW CARBON INTENSITY

The carbon footprint of the building materials ("embedded" energy/emissions) will be reduced by the reuse of some existing buildings. Recycled steel and cement replacements such as fly ash and/or slag will be used to the extent practicable.

CONCLUSION

The projects will include substantial energy efficiency measures and design elements which would result in energy efficient buildings, the use of clean power, transit-oriented development and the use of sustainable transportation. Based on these project components and efficiency measures, the proposed projects would be consistent with the City's emissions reduction goal, as defined in the *CEQR Technical Manual*. ✷