Chapter 15: Air Quality

A. INTRODUCTION

This chapter addresses the potential air quality impacts associated with the proposed projects focusing on fossil-fuel fired heating, ventilation, and air conditioning (HVAC) systems and the proposed accessory parking garage on the East Site. An analysis of the proposed Center for Comprehensive Care is not warranted since the heating and hot water systems for this building would be served by Con Edison steam. There would not be any fossil fuel-fired HVAC stack exhausts from this building and, therefore, there would not be any significant stationary source impacts from this site.

The proposed projects are not expected to significantly alter traffic conditions in the study area. The maximum hourly incremental traffic from the proposed projects would not exceed the *City Environmental Quality Review (CEQR) Technical Manual* carbon dioxide screening threshold of 170 peak hour trips at nearby intersections in the study area, nor would it exceed the particulate matter emission screening threshold discussed in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*. This level of traffic will not have the potential to significantly change air quality conditions; therefore, a quantified assessment of on-street mobile source emissions is not warranted.

The proposed East Site project would include an accessory parking garage on the East Site. Therefore, analyses were conducted to evaluate potential future pollutant concentrations in the vicinity of the proposed parking garage's ventilation outlets.

The operational air quality measures referenced in this chapter will be included in the Restrictive Declaration that will be executed in connection with the LSGD special permits.

PRINCIPAL CONCLUSIONS

As discussed above, the proposed projects would not significantly alter traffic conditions; therefore, no analysis of on-street mobile source emissions is warranted. Based on the analysis of the proposed East Site project's accessory parking garage in the residential development, there would not be any significant adverse air quality impacts. Thus, the proposed projects would not have significant adverse impacts from mobile source emissions.

Based on the stationary source analyses, there would be no potential significant adverse stationary source air quality impacts from emissions of nitrogen dioxide, sulfur dioxide, and particulate matter from the proposed fossil fuel-fired HVAC systems of the residential development on the East Site. As stated above, there would be no significant adverse impacts from the Center for Comprehensive Care since the heating and hot water needs for the building would be served by Con Edison steam.

B. POLLUTANTS FOR ANALYSIS

Ambient air quality is affected by air pollutants produced by both motor vehicles and stationary sources. Emissions from motor vehicles are referred to as mobile source emissions, while emissions

from fixed facilities are referred to as stationary source emissions. Ambient concentrations of carbon monoxide (CO) are predominantly influenced by mobile source emissions. Particulate matter (PM), volatile organic compounds (VOCs), and nitrogen oxides (nitric oxide, NO, and nitrogen dioxide, NO_2, collectively referred to as NO_x) are emitted from both mobile and stationary sources. Fine PM is also formed when emissions of NO_x, sulfur oxides (SO_x), ammonia, organic compounds, and other gases react or condense in the atmosphere. Emissions of sulfur dioxide (SO_2) are associated mainly with stationary sources, and sources utilizing non-road diesel such as diesel trains, marine engines, and non-road vehicles (e.g., construction engines). On-road diesel vehicles currently contribute very little to SO_2 emissions since the sulfur content of on-road diesel fuel, which is federally regulated, is extremely low. Ozone is formed in the atmosphere by complex photochemical processes that include NO_x and VOCs.

CARBON MONOXIDE

CO, a colorless and odorless gas, is produced in the urban environment primarily by the incomplete combustion of gasoline and other fossil fuels. In urban areas, approximately 80 to 90 percent of CO emissions are from motor vehicles. Since CO is a reactive gas which does not persist in the atmosphere, CO concentrations can vary greatly over relatively short distances; elevated concentrations are usually limited to locations near crowded intersections, heavily traveled and congested roadways, parking lots, and garages. Consequently, CO concentrations must be predicted on a local, or microscale, basis.

As described in Chapter 14, "Transportation," the proposed projects are not expected to significantly alter traffic conditions. Since the proposed actions would result in fewer new peak hour vehicle trips than the *CEQR Technical Manual* screening threshold of 170 trips at nearby intersections in the study area, a quantified assessment of on-street CO emissions is not warranted.

A parking garage analysis was conducted to evaluate future CO concentrations with the operation of the proposed parking garage.

NITROGEN OXIDES, VOCS, AND OZONE

NO_x are of principal concern because of their role, together with VOCs, as precursors in the formation of ozone. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Because the reactions are slow, and occur as the pollutants are advected downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of NO_x and VOC emissions from all sources are therefore generally examined on a regional basis. The contribution of any action or project to regional emissions of these pollutants would include any added stationary or mobile source emissions; the change in regional mobile source emissions of these pollutants would be related to the total vehicle miles traveled added or subtracted on various roadway types throughout the New York City metropolitan area, which is designated as a moderate non-attainment area for ozone by the U.S. Environmental Protection Agency (EPA).

The proposed projects would not have a significant effect on the overall volume of vehicular travel in the metropolitan area; therefore, no measurable impact on regional NO_x emissions or on ozone levels is predicted. An analysis of project-related emissions of these pollutants from mobile sources was therefore not warranted.

In addition to being a precursor to the formation of ozone, NO_2 (one component of NO_x) is also a regulated pollutant. Since NO_2 is mostly formed from the transformation of NO in the atmosphere,

it has mostly been of concern further downwind from large stationary point sources, and is not a local concern from mobile sources. (NO_x emissions from fuel combustion consist of approximately 90 percent NO and 10 percent NO_2 at the source.) Potential impacts on local NO_2 concentrations from the combustion of fossil fuels from the proposed projects' HVAC systems were evaluated.

LEAD

Airborne lead emissions are currently associated principally with industrial sources. Effective January 1, 1996, the Clean Air Act (CAA) banned the sale of the small amount of leaded fuel that was still available in some parts of the country for use in on-road vehicles, concluding a 25-year effort to phase out lead in gasoline. Even at locations in the New York City area where traffic volumes are very high, atmospheric lead concentrations are far below the 3-month average national standard of 0.15 micrograms per cubic meter ($\mu g/m^3$).

No significant sources of lead are associated with the proposed projects and, therefore, analysis was not warranted.

RESPIRABLE PARTICULATE MATTER—PM_{10} AND $PM_{2.5}$

PM is a broad class of air pollutants that includes discrete particles of a wide range of sizes and chemical compositions, as either liquid droplets (aerosols) or solids suspended in the atmosphere. The constituents of PM are both numerous and varied, and they are emitted from a wide variety of sources (both natural and anthropogenic). Natural sources include the condensed and reacted forms of naturally occurring VOC; salt particles resulting from the evaporation of sea spray; wind-borne pollen, fungi, molds, algae, yeasts, rusts, bacteria, and material from live and decaying plant and animal life; particles eroded from beaches, soil, and rock; and particles emitted from volcanic and geothermal eruptions and from forest fires. Naturally occurring PM is generally greater than 2.5 micrometers in diameter. Major anthropogenic sources include the combustion of fossil fuels (e.g., vehicular exhaust, power generation, boilers, engines, and home heating), chemical and manufacturing processes, all types of construction, agricultural activities, as well as wood-burning stoves and fireplaces. PM also acts as a substrate for the adsorption (accumulation of gases, liquids, or solutes on the surface of a solid or liquid) of other pollutants, often toxic and some likely carcinogenic compounds.

As described below, PM is regulated in two size categories: particles with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$) and particles with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}, which includes $PM_{2.5}$). $PM_{2.5}$ has the ability to reach the lower regions of the respiratory tract, delivering with it other compounds that adsorb to the surfaces of the particles, and is also extremely persistent in the atmosphere. $PM_{2.5}$ is mainly derived from combustion material that has volatilized and then condensed to form primary PM (often soon after the release from a source exhaust) or from precursor gases reacting in the atmosphere to form secondary PM.

Diesel-powered vehicles, especially heavy duty trucks and buses, are a significant source of respirable PM, most of which is $PM_{2.5}$; PM concentrations may, consequently, be locally elevated near roadways with high volumes of heavy diesel powered vehicles. The proposed projects would not result in any significant increases in truck traffic near the project area or in the region, nor other potentially significant increase in $PM_{2.5}$ vehicle emissions as defined in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual* and therefore, an analysis of potential impacts from PM was not warranted.

The proposed fossil fuel-fired HVAC systems for the East Site would result in emissions of PM; therefore, it was evaluated to determine potential impacts.

SULFUR DIOXIDE

SO_2 emissions are primarily associated with the combustion of sulfur-containing fuels (oil and coal). Monitored SO_2 concentrations in New York City are lower than the national standards. Due to the federal restrictions on the sulfur content in diesel fuel for on-road vehicles, no significant quantities are emitted from vehicular sources. Vehicular sources of SO_2 are not significant and therefore, an analysis of SO_2 from mobile sources is not warranted.

As part of the proposed East Site project, the proposed fossil fuel-fired HVAC systems for the East Site would utilize natural gas and/or ultra low sulfur fuel oil (i.e., No. 2 fuel oil), which have negligible levels of sulfur; therefore, impacts of SO_2 would not be significant. Nevertheless, potential future levels of SO_2 from stationary sources were examined.

C. AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the CAA, primary and secondary National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, respirable particulate matter (both $PM_{2.5}$ and PM_{10}), sulfur dioxide (SO_2), and lead. The primary standards represent levels that are requisite to protect the public health, allowing an adequate margin of safety. The secondary standards are intended to protect the nation's welfare in a broader sense, and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the environment. The primary and secondary standards are the same for NO_2 (annual), ozone, lead, and PM, and there is no secondary standard for CO and NO_2 (1-hour). The NAAQS are presented in **Table 15-1**. The NAAQS for CO, annual NO_2, and SO_2 have also been adopted as the ambient air quality standards for New York State, but are defined on a running 12-month basis rather than for calendar years only.

EPA revised the NAAQS for PM in 2006. The revision included lowering the level of the 24-hour $PM_{2.5}$ standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$ and retaining the level of the annual standard at 15 $\mu g/m^3$. The PM_{10} 24-hour average standard was retained and the annual average PM_{10} standard was revoked.

EPA has also revised the 8-hour ozone standard, lowering it from 0.08 to 0.075 parts per million (ppm), effective as of May 2008. On January 6, 2010, EPA proposed a change in the 2008 ozone NAAQS, lowering the primary NAAQS from the current 0.075 ppm level to within the range of 0.060 to 0.070 ppm. EPA is also proposing a secondary ozone standard, measured as a cumulative concentration within the range of 7 to 15 ppm-hours aimed mainly at protecting sensitive vegetation; however, revised standards have not been adopted to date.

EPA lowered the primary and secondary standards for lead to 0.15 $\mu g/m^3$, effective January 12, 2009. EPA revised the averaging time to a rolling 3-month average and the form of the standard to not-to-exceed across a 3-year span. The current lead NAAQS will remain in place for one year following the effective date of attainment designations for any new or revised NAAQS before being revoked, except in current non-attainment areas, where the existing NAAQS will not be revoked until the affected area submits, and EPA approves, an attainment demonstration for the revised lead NAAQS.

EPA established a new 1-hour average NO_2 standard of 0.100 ppm, effective April 12, 2010, in addition to the annual standard. The statistical form is the 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations in a year.

Table 15-1
National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary		Secondary	
	ppm	µg/m^3	ppm	µg/m^3
Carbon Monoxide (CO)				
8-Hour Average [1]	9	10,000	None	
1-Hour Average [1]	35	40,000		
Lead				
Rolling 3-Month Average [2]	NA	0.15	NA	0.15
Nitrogen Dioxide (NO_2)				
1-hour Average [3]	0.100	188	None	
Annual Average	0.053	100	0.053	100
Ozone (O_3)				
8-Hour Average [4,5]	0.075	150	0.075	150
Respirable Particulate Matter (PM_{10})				
24-Hour Average [1]	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Annual Mean	NA	15	NA	15
24-Hour Average [6]	NA	35	NA	35
Sulfur Dioxide (SO_2)[7]				
1-Hour Average [8]	0.075	196	NA	NA
Maximum 3-Hour Average [1]	NA	NA	0.50	1,300

Notes: ppm – parts per million
µg/m^3 – micrograms per cubic meter
NA – not applicable
All annual periods refer to calendar year.
PM concentrations (including lead) are in µg/m^3 since ppm is a measure for gas concentrations. Concentrations of all gaseous pollutants are defined in ppm and approximately equivalent concentrations in µg/m^3 are presented.

[1] Not to be exceeded more than once a year.
[2] EPA has lowered the NAAQS down from 1.5 µg/m^3, effective January 12, 2009.
[3] 3-year average of the annual 98th percentile daily maximum 1-hr average concentration. Effective April 12, 2010.
[4] 3-year average of the annual fourth highest daily maximum 8-hr average concentration.
[5] EPA has proposed lowering this standard further to within the range 0.060-0.070 ppm.
[6] Not to be exceeded by the annual 98th percentile when averaged over 3 years.
[7] EPA revoked the 24-hour and annual primary standards, replacing them with a 1-hour average standard. Effective August 23, 2010.
[8] 3-year average of the annual 99th percentile daily maximum 1-hr average concentration. Effective August 23, 2010.

Source: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards.

EPA established a new 1-hour average SO_2 standard of 0.075 ppm, replacing the 24-hour and annual primary standards, effective August 23, 2010. The statistical form is the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations in a year.

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS

The CAA, as amended in 1990, defines non-attainment areas (NAA) as geographic regions that have been designated as not meeting one or more of the NAAQS. When an area is designated as non-attainment by EPA, the state is required to develop and implement a State Implementation

Plan (SIP), which delineates how a state plans to achieve air quality that meets the NAAQS under the deadlines established by the CAA.

In 2002, EPA re-designated New York City as in attainment for CO. The CAA requires that a maintenance plan ensure continued compliance with the CO NAAQS for former non-attainment areas. New York City is also committed to implementing site-specific control measures throughout the city to reduce CO levels, should unanticipated localized growth result in elevated CO levels during the maintenance period.

Manhattan was designated as a moderate NAA for PM_{10}. On December 17, 2004, EPA took final action designating the five New York City counties—as well as Nassau, Suffolk, Rockland, Westchester, and Orange counties—as a $PM_{2.5}$ non-attainment area under the CAA due to exceedance of the annual average standard. Based on recent monitoring data (2006-2009), annual average concentrations of $PM_{2.5}$ in New York City no longer exceed the annual standard. EPA has determined that the area has attained the annual $PM_{2.5}$ NAAQS, effective December 15, 2010; however, it has not yet officially re-designated the area as in attainment of the standard.

As described above, EPA has revised the 24-hour average $PM_{2.5}$ standard in 2006. In October 2009, EPA finalized the designation of the New York City Metropolitan Area as nonattainment with the 2006 24-hour $PM_{2.5}$ NAAQS, effective in November 2009. The nonattainment area includes the same 10-county area EPA originally designated as nonattainment with the 1997 $PM_{2.5}$ NAAQS. By November 2012, New York will be required to submit a SIP demonstrating attainment with the 2006 24-hour standard by November 2014 (EPA may grant attainment date extensions for up to five additional years).

Nassau, Rockland, Suffolk, Westchester, Lower Orange County Metropolitan Area (LOCMA), and the five New York City counties were previously designated as a severe non-attainment area for ozone (1-hour average standard). In November 1998, New York State submitted its *Phase II Alternative Attainment Demonstration for Ozone*. These SIP revisions included additional emission reductions that EPA requested to demonstrate attainment of the standard, and an update of the SIP estimates using the latest versions of the mobile source emissions model, MOBILE6.2, and the nonroad emissions model, NONROAD—which have been updated to reflect current knowledge of engine emissions and the latest mobile and nonroad engine emissions regulations.

On April 15, 2004, EPA designated these same counties as moderate non-attainment for the 8-hour average ozone standard, which became effective as of June 15, 2004. EPA revoked the 1-hour standard on June 15, 2005; however, the specific control measures for the 1-hour standard included in the SIP are required to stay in place until the 8-hour standard is attained. The discretionary emissions reductions in the SIP would also remain but could be revised or dropped based on modeling. On February 8, 2008, the New York State Department of Environmental Conservation (DEC) submitted final revisions to the SIP for the 8-hour ozone NAAQS to EPA. DEC has determined that achieving attainment for ozone before 2012 is unlikely, and has therefore made a request for a voluntary reclassification of the New York nonattainment area as "serious." EPA has not completed its review of the voluntary classification at this time.

In March 2008 EPA strengthened the 8–hour ozone standards. SIPs will be due three years after the final designations are made. On March 12, 2009, DEC recommended that the counties of Suffolk, Nassau, Bronx, Kings, New York, Queens, Richmond, Rockland, and Westchester be designated as a "serious" non-attainment area for the 2008 ozone NAAQS (NY portion of the New York–Northern New Jersey–Long Island, NY-NJ-CT nonattainment area).

New York City is currently in attainment of the annual-average NO_2 standard. EPA has promulgated a new 1-hour standard. The existing monitoring data for New York City indicates background concentrations below the standard. DEC has determined that the present monitoring does not meet the revised EPA requirements in all respects and has recommended a designation of "unclassifiable" for the entire state. Therefore, it is likely that New York City will be designated by EPA as "unclassifiable" at first (January 2012), and then classified once three years of monitoring data are available (2016 or 2017).

EPA has established a new 1-hour SO_2 standard, replacing the 24-hour and annual standards, effective August 23, 2010. Based on the available monitoring data, all New York State counties currently meet the 1-hour standard. Additional monitoring will be required to confirm compliance. EPA plans to make final attainment designations in June 2012, based on 2008 to 2010 monitoring data and refined modeling. SIPs for nonattainment areas will be due by June 2014.

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The State Environmental Quality Review Act (SEQRA) regulations and the *CEQR Technical Manual* state that the significance of a predicted consequence of a project (i.e., whether it is material, substantial, large or important) should be assessed in connection with its setting (e.g., urban or rural), its probability of occurrence, its duration, its irreversibility, its geographic scope, its magnitude, and the number of people affected.[1] In terms of the magnitude of air quality impacts, any action predicted to increase the concentration of a criteria air pollutant to a level that would exceed the concentrations defined by the NAAQS (see **Table 15-1**) would be deemed to have a potential significant adverse impact. In addition, in order to maintain concentrations lower than the NAAQS in attainment areas, or to ensure that concentrations will not be significantly increased in non-attainment areas, threshold levels have been defined for certain pollutants; any action predicted to increase the concentrations of these pollutants above the thresholds would be deemed to have a potential significant adverse impact, even in cases where violations of the NAAQS are not predicted.

As mentioned earlier, EPA recently promulgated a new 1-hour NAAQS for NO_2. DEC is projecting lower NO_x (including NO_2) concentrations in the future due to existing plans for reducing emissions aimed at attaining the ozone standards.

Overall, the proposed projects may result in some increases in local NO_2 concentrations due to project-generated traffic. The amount of NO emitted that would rapidly transform to NO_2 in the immediate vicinity of roadways and intersections with project-generated traffic would generally be very small. At the present time there are not sufficient data and established technical analysis techniques and guidance to determine reliably whether concentrations due to emissions from mobile sources in the project study area would be above or below the 1-hour standard in the Build condition. These analysis limitations preclude the performance of an accurate quantitative assessment of the significance of the 1-hour NO_2 increments from the increase in traffic resulting from the proposed projects. Nevertheless, the levels of project-generated traffic would not result in 50 or more vehicle trips during a given peak hour and are therefore not expected to significantly alter traffic conditions in the study area. Therefore, while the proposed projects may result in some increases in local NO_2 concentrations due to project-generated traffic, these increases are not considered large enough to warrant additional analysis.

[1] *CEQR Technical Manual*, Chapter 17, section 400, May 2010; and State Environmental Quality Review Regulations, 6 NYCRR § 617.7

Methodologies for assessing annual average NO_2 concentrations from stationary sources such as the proposed projects' fossil fuel-fired HVAC systems are well established. Background concentrations are currently monitored at several sites within New York City, which are used for reporting NO_2 concentrations on a "community" scale. Because this data is compiled on a 1-hour average format, it can be used for comparison with the new 1-hour standard. Therefore, background 1-hour NO_2 concentrations currently measured at community-scale monitors can be considered representative of background concentrations for purposes of assessing the impact of the proposed projects at elevated receptors. Conversely, concentrations from elevated stationary sources such as buildings at receptors at or near ground-level locations that are near roadways, where information on background concentrations is not yet available, would be very low. Until such time as more research on conversion of NO_x to NO_2 over relatively short distances is done in order to establish near-roadway background concentrations in accordance with appropriate criteria, and modifications to existing models are made for mobile sources for reporting maximum concentrations consistent with the form of the 1-hour standard, no methodology exists that could provide reasonable predictions about concentrations from the proposed projects on the receptors at or near ground-level locations.

DE MINIMIS CRITERIA REGARDING CO IMPACTS

New York City has developed *de minimis* criteria to assess the significance of the increase in CO concentrations that would result from the impact of proposed projects or actions on mobile sources, as set forth in the *CEQR Technical Manual*. These criteria set the minimum change in CO concentration that defines a significant environmental impact. Significant increases of CO concentrations in New York City are defined as: (1) an increase of 0.5 ppm or more in the maximum 8-hour average CO concentration at a location where the predicted No Action 8-hour concentration is equal to or between 8 and 9 ppm; or (2) an increase of more than half the difference between baseline (i.e., No Action) concentrations and the 8-hour standard, when No Action concentrations are below 8.0 ppm.

$PM_{2.5}$ INTERIM GUIDANCE CRITERIA

DEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts[1]. This policy applies only to facilities applying for permits or major permit modifications under SEQRA that emit 15 tons of PM_{10} or more annually. DEC deems projects with emissions below this threshold to be insignificant with respect to $PM_{2.5}$ and does not require further assessment under the policy. The policy states that affected projects will be deemed to have a potentially significant adverse impact if the project's maximum impacts are predicted to increase $PM_{2.5}$ concentrations by more than 0.3 $\mu g/m^3$ averaged annually or more than 5 $\mu g/m^3$ on a 24-hour basis. Projects that exceed either the annual or 24-hour threshold will be required to prepare an Environmental Impact Statement (EIS) to assess the severity of the impacts, to evaluate alternatives, and to employ reasonable and necessary mitigation measures to minimize the $PM_{2.5}$ impacts of the source to the maximum extent practicable.

For projects subject to CEQR, the interim guidance criteria currently employed for determination of potential significant adverse $PM_{2.5}$ impacts are as follows:

- 24-hour average $PM_{2.5}$ concentration increments which are predicted to be greater than 5 $\mu g/m^3$ at a discrete receptor location would be considered a significant adverse impact on air

[1] CP33/Assessing and Mitigating Impacts of Fine Particulate Emissions, DEC 12/29/2003.

quality under operational conditions (i.e., a permanent condition predicted to exist for many years regardless of the frequency of occurrence);

- 24-hour average $PM_{2.5}$ concentration increments which are predicted to be greater than 2 $\mu g/m^3$ but no greater than 5 $\mu g/m^3$ would be considered a significant adverse impact on air quality based on the magnitude, frequency, duration, location, and size of the area of the predicted concentrations;
- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.1 $\mu g/m^3$ at ground level on a neighborhood scale (i.e., the annual increase in concentration representing the average over an area of approximately 1 square kilometer, centered on the location where the maximum ground-level impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating neighborhood scale monitoring stations); or
- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.3 $\mu g/m^3$ at a discrete receptor location (elevated or ground level).

Actions under CEQR predicted to increase $PM_{2.5}$ concentrations by more than the CEQR or DEC interim guidance criteria above will be considered to have a potential significant adverse impact. Actions subject to CEQR that fail the interim guidance criteria prepare an EIS and examine potential measures to reduce or eliminate such potential significant adverse impacts.

The proposed projects' annual emissions of PM_{10} are estimated to be well below the 15-ton-per-year threshold under DEC's $PM_{2.5}$ policy guidance. Nevertheless, the above interim guidance criteria have been used to evaluate the significance of predicted impacts of the proposed projects on $PM_{2.5}$ concentrations from stationary sources of emissions.

D. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

MOBILE SOURCES

As stated above, the proposed projects are not expected to significantly alter traffic conditions in the study area. The maximum hourly incremental traffic from the proposed projects would not exceed the *CEQR Technical Manual* carbon dioxide screening threshold of 170 peak hour trips at nearby intersections in the study area, nor would it exceed the particulate matter emission screening thresholds discussed in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*. This level of traffic will not have the potential to significantly change air quality conditions; therefore, a quantified assessment of on-street mobile source emissions is not warranted.

PARKING GARAGE

On the East Site, the proposed East Site project would include a 152-space below-grade accessory parking garage. The exhaust from the garage's ventilation systems could contain elevated levels of CO due to vehicular exhaust emissions in the garage. Since this could potentially affect ambient levels of CO at locations near the outlet vents, an analysis of the emissions from the outlet vents and their dispersion in the environment was performed. Pollutant levels in the surrounding area were calculated using the methodology set forth in the *CEQR Technical Manual*.

Emissions from vehicles entering, parking, and exiting the garage were estimated using the EPA MOBILE6.2 mobile source emission model and an ambient temperature of 50.0°F, as referenced in

the *CEQR Technical Manual*. All arriving and departing vehicles were conservatively assumed to travel at an average speed of 5 miles per hour within the parking garage. In addition, all departing vehicles were assumed to idle for 1 minute before exiting. The concentration of CO within the garage was calculated assuming a minimum ventilation rate, based on New York City Building Code requirements, of 1 cubic foot per minute of fresh air per gross square foot (gsf) of garage area.

To determine pollutant concentrations, the outlet vents was/were analyzed as a "virtual point sources" using the methodology in EPA's *Workbook of Atmospheric Dispersion Estimates, AP-26*. This methodology estimates CO concentrations at various distances from an outlet vent by assuming that the concentration in the garage is equal to the concentration leaving the vent, and determining the appropriate initial horizontal and vertical dispersion coefficients at the vent faces.

The CO concentrations were determined for the time periods when overall garage usage would be the greatest, considering the hours when the greatest number of vehicles would exit the facility. Departing vehicles were assumed to be operating in a "cold-start" mode, emitting higher levels of CO than arriving vehicles. Traffic data for the parking garage analysis were derived from the trip generation analysis described in Chapter 14, "Transportation."

Since the publication of the DEIS, the proposed parking garage exhaust location has been designed, and would be located on the roof of the new building at 140 West 12th Street (the site of the former Reiss Pavilion), at an elevation of 112 feet. At this location, the garage exhaust would be well removed from sidewalk receptor locations; therefore, potential cumulative impacts from the parking garage exhaust and on-street sources would not occur.

~~Since detailed ventilation plans have not yet been developed, worst-case assumptions were made regarding the design of the garage's mechanical ventilation system.~~ It was conservatively assumed that the air from the garage would be vented through a single outlet ~~at a height of approximately 10 feet~~. The vent face was modeled to ~~directly discharge to Seventh Avenue based on worst-case on-street traffic, and receptors were placed along the sidewalks on both sides of the street (both near the vent and across the street) at a pedestrian height of 6 feet and at a distance of 10 feet and 80 feet, respectively, from the vent. To~~ estimate maximum potential impacts on ~~the residential building,~~ sensitive receptors on nearby buildings ~~at the building façade~~ were ~~also~~ considered. A persistence factor of 0.79, supplied by New York City Department of Environmental Protection (DEP), was used to convert the calculated 1-hour average maximum concentrations to 8-hour averages, accounting for meteorological variability over the average 8-hour period.

Background CO concentrations were added to the modeling results to obtain the total ambient levels. The on-street CO concentration was determined using the methodology in Air Quality Appendix 1 of the *CEQR Technical Manual*, utilizing traffic volumes estimated based on field counts conducted for the proposed projects and projected using a growth rate of 0.25-percent annual background growth rate, as recommended in the *CEQR Technical Manual*.

STATIONARY SOURCES

Stationary source analyses were conducted for the fossil fuel-fired HVAC systems for the proposed East Site buildings (as described above, an analysis of stationary source impacts from the Center for Comprehensive Care is not warranted since this building would use Con Edison steam). Initially, a screening level analysis was performed following the *CEQR Technical Manual* procedures to evaluate potential impacts from the project's boilers. Further analysis was performed using the EPA-approved AERMOD refined model to specifically evaluate potential impacts of $PM_{2.5}$ with respect to the City's interim guidance criteria and impacts of 1-hour average NO_2 with

respect to the recently promulgated NAAQS. In addition, although ultra low sulfur fuel oil and/or natural gas would be used in the proposed boilers for the East Site, an analysis to evaluate potential 1-hour SO_2 impacts with respect to the recently promulgated NAAQS was performed.

CEQR TECHNICAL MANUAL HVAC SCREENING ANALYSIS

An initial screening analysis was performed using the methodology described in Section 322.1 of Chapter 17 of the *CEQR Technical Manual*. This methodology determines the threshold of development size below which the action would not have a significant impact. The screening procedure utilizes information regarding the type of fuel to be burned, the maximum development size, and the HVAC exhaust stack height, to evaluate whether or not a significant impact is possible.

Based on the distance from the development to the nearest building of similar or greater height, if the maximum development size is greater than the threshold size in the *CEQR Technical Manual*, then there is the potential for significant air quality impacts and a refined dispersion modeling analysis would be required. Otherwise, the source passes the screening analysis and no further study is required.

Any nearby development of similar or greater height was analyzed as a potential receptor. The design for the East Site assumes that boilers would used for heating and hot water systems, and the exhausts would be ducted to a single stack to be located above the roof of the proposed residential tower along Seventh Avenue. The screening analysis considered the potential for off-site impacts only, since the proposed East Site project's buildings are all shorter than the proposed boiler stack exhaust height.

The maximum development floor area of the entire East Site was used as input for the screening analysis. It was assumed that either natural gas or No. 2 fuel oil would be used in the boiler systems based on the current design. The primary pollutants of concern are NO_2 and SO_2 from natural gas and fuel oil combustion, respectively.

AERMOD ANALYSIS

Potential impacts from $PM_{2.5}$ and 1-hour NO_2 and SO_2 were evaluated using the EPA-approved AERMOD model (Version 07026, EPA, 1995). AERMOD is a state-of-the-art dispersion model, applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including point, area, and volume sources). AERMOD is a steady-state plume model that incorporates current concepts about flow and dispersion in complex terrain, including updated treatments of the boundary layer theory, turbulence and dispersion, and terrain interactions.

AERMOD calculates pollutant concentrations from one or more points (e.g., exhaust stacks) based on hourly meteorological data, and has the capability of calculating pollutant concentrations at locations when the plume from the exhaust stack is affected by the aerodynamic wakes and eddies (downwash) produced by nearby structures. The analysis of potential impacts from the exhaust stack was conducted assuming urban dispersion and surface roughness length and regulatory default model options.

The AERMOD model was run both with and without the selection of the building downwash option. The EPA's Building Profile Input Program (BPIPPRIME) was used to determine the projected building dimensions for the AERMOD model with the building downwash algorithm enabled. Modeling of downwash accounted for all obstructions within a radius equal to five obstruction heights of each stack.

Emission Rates and Stack Parameters

Table 15-2 presents the emission rates and stack exhaust parameters used in the AERMOD modeling analysis. Since the proposed project's boilers would be exhausted through a single stack, the AERMOD analysis was performed using a unitary emission rate of 1 gram per second (g/s) yielding maximum unitized impacts in units of micrograms per cubic meter per gram per second ($\mu g/m^3/g/s$). The unitized impacts were then multiplied by the pollutant specific emission rates shown in **Table 15-2** to determine the maximum modeled concentrations. **Appendix C** provides additional information on the boiler emissions and unitized impacts.

Table 15-2
Emission Rates and Stack Parameters

	HVAC System	
Stack Parameters		
Stack Height (ft)	206	
Stack Diameter (ft) (1)	2.5	
Exhaust Velocity (m/s) (1)	9.1	
Exhaust Temperature (°F) (1)	200	
Emission Rates (g/s)	**Natural Gas**	**Fuel Oil**
$PM_{2.5}$, 24-hour average	0.0326 (3)	0.0652 (4)
$PM_{2.5}$, annual average	0.0039 (3)	0.0093 (4)
NO_x, 1-hour	0.4284	0.6123
SO_2, 1-hour	0.0026	0.0065 (5)

Notes:
1. The stack diameter, exhaust velocity, and exhaust temperature are based on current design assuming operation at maximum load.
2. The emission rates are based on peak and annual average fuel usage for the design and AP-42 emission factors.
3. The $PM_{2.5}$ natural gas emissions rate includes both the filterable fraction (0.83 lb/1,000 gal)and condensable fractions (1.3 lb/1,000 gal).
4. The $PM_{2.5}$ natural gas emissions rate includes both the filterable fraction (1.9 lb/1,000,000 scf) and condensable fractions (5.7 lb/1,000,000 scf).
5. The SO_2 emission rate for fuel oil assumes the use of ultra low sulfur diesel with a maximum sulfur content of 15 parts per million.

Sources: EPA AP-42 Section 1.3 and Section 1.4; Jaros, Baum & Boles.

The exhaust stack for the boiler systems at the East Site would be located on the roof of the proposed residential building along Seventh Avenue. A height of 206 feet above-grade was utilized for the AERMOD analysis, based on available design information.

NO_2 concentrations from the boiler systems at the East Site were estimated using NO_2 to NO_x ratios of 0.63 for the annual average concentration and 0.8 for the maximum 1-hour concentration. The 0.63 ratio used for the annual average is based on the ambient annual average NO_2 to NO_x background ratio as measured at Bronx County monitoring stations over the most recent available three-year period (2007-2009), consistent with the EPA's *Guideline on Air Quality Models* at 40 CFR part 51 Appendix W, Section 5.2.4.[1]The 0.8 ratio used for the maximum 1-hour concentration is the recommended default ambient ratio per EPA's guidance memo providing additional clarification regarding application of Appendix W Modeling Guidance for the 1-hour NO_2 NAAQS.[2]

[1] http://www.epa.gov/scram001/guidance/guide/appw_05.pdf

[2] EPA, Memorandum, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard, March 1, 2011.

Meteorological Data

The meteorological data set consisted of the latest five years of concurrent meteorological data: surface data collected at LaGuardia Airport (2006-2010) and concurrent upper air data collected at Brookhaven, Suffolk County, New York. These stations were selected as they are considered to be temporarily and spatially representative of conditions in the area of the site.

Receptor Locations

Receptor information provides the distance from the source, terrain height, and height above ground for selected locations. The nearest sensitive receptor at a building of similar or greater height was determined to be the John Adams apartment building at 101 West 12th Street, approximately 633 feet northeast of the proposed stack. The building is approximately 205 feet high to the top of the mechanical zone; however, the highest residential receptor on this building is at a height of 200 feet, therefore, receptors were placed at this elevation around the building. In addition, a 500 meter ground level Cartesian grid with 25 meter spacing was modeled, with receptors modeled at a pedestrian height of 1.8 meters (6 feet). Flat terrain was assumed.

Background Concentrations

To estimate the maximum expected pollutant concentration at a given receptor, the predicted impact must be added to a background value that accounts for existing pollutant concentrations from other sources that are not directly accounted for in the model. The background levels are based on concentrations monitored at the nearest DEC ambient air monitoring stations over a recent five-year period for which data are available. Consistent with the form of the standard, for the 1-hour NO_2 averaging period, the 3-year average of the annual 98th percentile daily maximum 1-hour average concentration was used. These background concentrations, 134.7 $\mu g/m^3$ for NO_2 and 138.0 $\mu g/m^3$ for SO_2, were added to the maximum 1-hour NO_2 and SO_2 concentration, respectively, from the AERMOD model to obtain the total 1-hour NO_2 and SO_2 concentrations.

EMERGENCY GENERATOR

The proposed East Site project's development would also include one 1,500 kilowatt emergency generator to be located on the roof of Spellman Pavilion. The generator would be exercised for no more than 6 hours per in any month and approximately 20 hours per year for testing to ensure its availability and reliability in the event of an actual emergency. In addition, the Center for Comprehensive Care would include a 350 kilowatt emergency generator which would be tested every 20 to 40 days for 30 minutes and tri-annually for 4 hours. The emergency generators would not be utilized in a peak load shaving program,[1] minimizing the use of this equipment during non-emergency periods. Emergency generators are exempt from DEC air permitting requirements, but would likely require a permit or registration issued by DEP. The emergency generators would be installed and operated in accordance with DEP requirements, and other applicable codes and standards. Potential air quality impacts from the emergency generators would be insignificant, since they would be used only for testing purposes outside of an actual emergency use and no significant adverse impact would result.

[1] The term "peak load shaving" refers to the use of customer-operated (non-utility) generators to produce electricity at the request of the local electrical utility to reduce the electrical demand during peak demand periods, particularly during the summer period.

ADDITIONAL SOURCES

The *CEQR Technical Manual* requires an assessment of any actions that could result in the location of sensitive uses within 1,000 feet of a large emission source (e.g., a power plant), or within 400 feet of commercial, institutional, or large-scale residential developments where the proposed structure would be of a height similar to or greater than the height of an existing emission stack. To assess the potential effects of these existing sources on the proposed projects, a review of existing permitted facilities was conducted. Sources of information reviewed included the EPA's Envirofacts database[1], the DEC Title V and state facility permit web sites[2], the New York City Department of Buildings web site[3], and DEP permit data.

Since no commercial, institutional, or large-scale residential developments of sufficient size were identified within 400 feet of the project area, and no large sources were identified within 1,000 feet; therefore, an analysis of the proposed projects was not warranted.

E. EXISTING CONDITIONS

The most recent concentrations of all criteria pollutants at DEC air quality monitoring stations nearest the study area are presented in **Table 15-3**. These existing concentrations presented in **Table 15-3** are the latest (2009) measured values that have been made available by DEC. Concentrations are averaged according to the NAAQS (e.g., $PM_{2.5}$ concentrations are averaged over the three years).

Table 15-3
Representative Monitored Ambient Air Quality Data

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	CCNY, Manhattan	ppm	8-hour	1.8	9
			1-hour	2.3	35
SO_2	I.S. 52, Bronx	µg/m^3	1-hour	138.0	196
			3-hour	136	1,300
PM_{10}	I.S. 52, Bronx	µg/m^3	24-hour	43	150
$PM_{2.5}$	P.S. 19, Manhattan	µg/m^3	Annual	13.6	15
			24-hour	31	35
NO_2	I.S. 52, Bronx	µg/m^3	1-hour	134.7	188
			Annual	47	100
Lead	J.H.S. 126, Brooklyn	µg/m^3	3-month	0.019(1)	0.15
Ozone	CCNY, Manhattan	ppm	8-hour	0.076	0.075

Notes:
Based on the NAAQS definitions, the CO, PM_{10}, and SO_2 concentrations are the second-highest from the year. $PM_{2.5}$ annual concentrations are the average of 2007, 2008, and 2009, and the 24-hour concentration is the average of the annual 98th percentiles in 2007, 2008, and 2009, consistent with the form of the standards. 8-Hour average ozone concentrations are the average of the fourth highest-daily values from 2007 to 2009.
Source: DEC, New York State Ambient Air Quality Data.

There were no monitored violations of the NAAQS for the pollutants at these sites in 2009 with the exception of the 8-hour ozone standard of 0.075 ppm.

[1] EPA, Envirofacts Data Warehouse, http://oaspub.epa.gov/enviro/ef_home2.air; [*December 30, 2009]*.

[2] DEC Title V and State Facility permit websites: http://www.dec.ny.gov/dardata/boss/afs/issued_atv.html; http://www.dec.ny.gov/dardata/boss/afs/issued_asf.html

[3] DOB website: http://www.nyc.gov/html/dob/html/applications_and_permits/applications_and_permits.shtml

F. THE FUTURE WITHOUT THE PROPOSED PROJECTS

As discussed in Chapter 2, "Land Use, Zoning, and Public Policy," the EIS analysis conservatively assumes that the East Site buildings would remain vacant in the future without the proposed projects and that the O'Toole Building would be used for doctor's offices and other health-related services. HVAC emissions in the No Build condition would likely be similar to existing conditions.

G. PROBABLE IMPACTS OF THE PROPOSED PROJECTS

PARKING GARAGE

Based on the methodology previously described, the maximum overall predicted CO concentrations were estimated at ~~several receptor locations, including a near-side receptor on the same side of the street as the parking facility, a far-side receptor on the opposite side of the street from the parking facility for a street-side vent and~~ a window or air intake location ~~above~~ near the garage ~~vent on the building façade~~. The total CO concentrations included ~~both~~ background CO levels and contributions from traffic on adjacent roadways (for the far side receptor only). The background concentrations used for the parking garage analysis are the highest values over the past five years, and are used as a conservative estimate of the highest background concentrations for future conditions.

As shown in **Table 15-4**, the maximum predicted CO concentrations were predicted to be ~~3.4~~ 3.1 ppm for the 1-hour period and ~~2.5~~ 2.2 ppm for the 8-hour period. The maximum concentration for the 1-hour period ~~was predicted to occur at the building façade receptor above the modeled vent and includes~~ represents a contribution of ~~1.1~~ 0.8 ppm from the proposed garage and a 2.3 ppm background level. For the 8-hour period, the maximum concentration ~~was predicted to occur at the far side receptor and includes~~ represents a contribution of ~~0.6 ppm from on street traffic, 0.1~~ 0.4 ppm from the proposed garage~~,~~ and a 1.8 ppm background level.

Table 15-4
Maximum Modeled CO Concentrations from Proposed Parking Garage (in ppm)

Averaging Period	~~Receptor Site~~	Modeled Impact from Garage	~~Modeled On-Street Contribution~~	Background	Total Concentration
1-hour	~~Building façade~~	~~1.1~~ 0.8	~~0.0~~	2.3	~~3.4~~ 3.1
8-hour	~~Sidewalk – "Far" side~~	~~0.1~~ 0.4	~~0.6~~	1.8	~~2.5~~ 2.2
Note: 8-hour standard is 9 ppm.					

The effect of CO emissions in all locations from the proposed parking garage, including in the immediate vicinity of the exhaust vents, would result in CO levels substantially below the applicable standards of 35 ppm and 9 ppm for the 1-hour and 8-hour averages, respectively. Therefore, the accessory parking associated with the proposed East Site project would not result in any significant adverse air quality impacts.

STATIONARY SOURCES

CEQR TECHNICAL MANUAL HVAC SCREENING ANALYSIS

A screening analysis was performed following the *CEQR Technical Manual* to evaluate the potential for significant adverse impacts to air quality from operation of boiler systems at the proposed residential development on the East Site. The primary pollutants of concern are NO_2 while

burning natural gas and SO_2 while burning No. 2 fuel oil. The screening methodology in the *CEQR Technical Manual* was performed assuming the total size of the proposed East Site development (724,880 gsf) and the use of both natural gas and No. 2 fuel oil. The exhaust stack would be located on the roof of the proposed residential tower along Seventh Avenue at the height of the mechanical zone (approximately 206 feet) based on the proposed East Site project design. The nearest distance to a building of similar or greater height to the proposed residential tower along Seventh Avenue was determined to be the John Adams apartment at approximately 633 feet. Therefore, a distance of 400 feet was chosen in accordance with the guidance provided in the *CEQR Technical Manual*. Burning either No. 2 fuel oil or natural gas would not result in any significant stationary source air quality impacts because the proposed development on the East Site is below the maximum development size shown in Figures 17-5 and 17-7 of the Air Quality Appendix of the *CEQR Technical Manual*, respectively (See **Appendix C**). Therefore, based on the *CEQR Technical Manual* HVAC screening analysis, no potential significant adverse stationary source air quality impacts are predicted from the proposed projects.

AERMOD ANALYSIS

An analysis was performed using AERMOD model to evaluate potential impacts of $PM_{2.5}$, 1-hour NO_2 and 1-hour SO_2 from operation of boiler systems at the proposed residential development on the East Site. For 1-hour NO_2 and SO_2, the maximum predicted concentration from the modeling analysis was added to the maximum 1-hour ambient background concentration and compared to the NAAQS. For $PM_{2.5}$, maximum concentrations from the proposed projects were compared to the City's interim guidance criteria for 24-hour and localized annual average incremental $PM_{2.5}$ concentrations. The results of this analysis are presented in **Table 15-5**.

Table 15-5
Maximum Modeled Pollutant Concentration (in µg/m^3)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	NAAQS / Threshold
NO_2	1-hour	41.96 (1)	134.7	176.7	188
SO_2	1-hour	0.56	138.0	138.6	196
$PM_{2.5}$	24-hour	1.82	NA	1.82	5/2 (2)
	Annual	0.08	NA	0.08	0.3/0.1 (3)

Notes:
(1) Includes a conversion ratio of NO_2 to NOx of 80 percent.
(2) 24-hour $PM_{2.5}$ interim guidance criterion, > 2 µg/m^3 (5 µg/m^3 not to exceed value), depending on the magnitude, frequency, duration, location, and size of the area of the predicted concentrations.
(3) Annual $PM_{2.5}$ interim guidance criterion, > 0.3 µg/m^3 at any discrete receptor location for localized impacts and >0.1 µg/m^3 averaged over a 1km by 1km ground level receptor grid for neighborhood-scale impacts.
(4) Annual NO_2 impacts were not analyzed using the AERMOD model since they determined to be not significant using the *CEQR Manual* HVAC screening analysis as indicated previously.

As shown in **Table 15-5**, the predicted 1-hour NO_2 and SO_2 concentrations are less than their respective NAAQS, and the maximum incremental concentrations of $PM_{2.5}$ are below the City's interim guidance criteria. In addition, since the maximum annual average impact at a discrete receptor was predicted to be 0.08 µg/m^3, neighborhood-scale impacts would not exceed the City's interim guidance criterion of 0.1 µg/m^3. Based on the AERMOD analysis, there would be no potential significant adverse stationary source air quality impacts from the proposed projects.✷