A. INTRODUCTION

This section identifies and quantifies the potential direct and indirect air quality impacts of the proposed actions. Direct effects would stem from emissions generated by stationary sources associated with the proposed development, such as boilers associated with the heating, ventilation, and air conditioning (HVAC) system on site. These boilers produce air emissions from the combustion of fossil fuel for building heating and hot water. Other stationary source emissions include those from the parking garage ventilation system. Indirect impacts could be caused by emissions from nearby existing stationary sources (impacts on publicly accessible open space associated with the proposed actions from nearby industrial facilities) and the emissions due to mobile vehicle trips generated by the proposed actions or other changes to future traffic conditions due to the proposed actions.

PRINCIPAL CONCLUSIONS

An air quality analysis has been performed to determine potential impacts as described above. The results of these studies indicate that the proposed actions would have no significant adverse air quality impacts from either direct or indirect air emission sources.

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.

The proposed actions would result in changes in traffic patterns and an increase in traffic volume in the study area. Therefore, a mobile source analysis was conducted at critical intersections in the study area to evaluate future CO concentrations with and without the proposed actions. A parking garage analysis was also conducted to evaluate future CO concentrations with the operation of the proposed parking garage.

NITROGEN OXIDES AND VOLATILE ORGANIC COMPOUNDS

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 metropolitan area, which is designated as a moderate non-attainment area for ozone by the U.S. Environmental Protection Agency (EPA).The proposed actions 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 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.) However, with the promulgation of the 2010 1-hour average standard for NO_2, local sources such as vehicular emissions may become of greater concern for this pollutant.

Potential impacts on local NO_2 concentrations from the fuel combustion for the proposed action's heat and hot water boiler systems were evaluated.

LEAD

Airborne lead emissions are currently associated principally with industrial sources. Lead in gasoline has been banned under the Clean Air Act, and therefore, lead is not a pollutant of concern for the proposed project. ~~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 actions 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 actions would not result in any significant increases in truck traffic near the project site or in the region. However, since incremental project volumes for overall traffic are expected to be high, an analysis of potential impacts from PM was performed.

SULFUR DIOXIDE—SO_2

SO_2 emissions are primarily associated with the combustion of sulfur-containing fuels: oil and coal. Due to the federal restrictions on the sulfur content in diesel fuel for on-road vehicles, no significant quantities are emitted from mobile sources. Monitored SO_2 concentrations in New York City are below the national standards. However, SO_2 is also of concern as a precursor to $PM_{2.5}$ and is regulated as a $PM_{2.5}$ precursor under the New Source Review permitting program for large sources. Due to the federal restrictions on the sulfur content in diesel fuel for on-road and non-road vehicles, vehicular sources of SO_2 are not significant and therefore, an analysis of SO_2 from mobile sources was not warranted. As part of the proposed actions, fuel oil could be burned in the heat and hot water systems. Therefore, potential future levels of SO_2 from boilers were examined.

AIR TOXICS

In addition to the criteria pollutants discussed above, air toxics are of concern. Air toxics are emitted by a wide range of man-made and naturally occurring sources. Emissions of air toxics from industries are regulated by EPA. Federal ambient air quality standards do not exist for non

criteria air toxics; however, the New York State Department of Environmental Conservation (NYSDEC) has issued standards for certain non-criteria compounds, including beryllium, gaseous fluorides, and hydrogen sulfide. NYSDEC has also developed guideline concentrations for numerous air toxic compounds. The NYSDEC guidance document DAR-1 (September 2007) contains a compilation of annual and short term (1-hour) guideline concentrations for these compounds. The NYSDEC guidance thresholds represent ambient levels that are considered safe for public exposure.

C. AIR QUALITY STANDARDS

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: CO, NO_2, ozone, respirable PM (both $PM_{2.5}$ and PM_{10}), 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, 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 the 1-hour NO_2 standard. The NAAQS are presented in **Table 12-1**.

EPA has revised the NAAQS for PM, effective December 18, 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.

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 daily maximum 1-hour average concentration in a year.

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 (the 4th highest daily maximum corresponds approximately to 99th percentile for a year.)

Table 12-1
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 [6,7]	NA	35	NA	35
Sulfur Dioxide (SO_2)				
1-Hour Average [9]	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 has lowered the NAAQS down from 65 µg/m^3, effective December 18, 2006.
(8) EPA revoked the 24-hour and annual primary standards, replacing them with a 1-hour average standard. Effective August 23, 2010.
(9) 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.

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLAN (SIP)

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 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 has been designated as a moderate NAA for PM_{10}. On December 17, 2004, EPA took final action designating the five New York City counties and 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 1997 annual $PM_{2.5}$ NAAQS, effective December 15, 2010.

As described above, EPA has revised the 24-hour average $PM_{2.5}$ standard. 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 originally designated as nonattainment with the 1997 annual $PM_{2.5}$ 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 had been 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*, which was finalized and approved by EPA effective March 6, 2002, addressing attainment of the 1-hour ozone NAAQS by 2007. 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 (LOCMA was moved to the Poughkeepsie moderate non-attainment area for 8-hour ozone). 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, NYSDEC submitted final revisions to a new SIP for ozone to EPA. NYSDEC 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.”

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, NYSDEC recommended that the counties of Suffolk, Nassau, Bronx, Kings, New York, Queens, Richmond, Rockland, and Westchester be designated as a non-attainment area for the 2008 ozone NAAQS (NY portion of the New York–Northern New Jersey–Long Island, NY-NJ-CT nonattainment area). EPA has proposed to determine that the Poughkeepsie nonattainment area (Dutchess, Orange, Ulster, and Putnam counties) has attained the 2008 one-hour and eight-hour NAAQS for ozone. It is unclear at this time what the attainment status of these areas will be under the newly proposed standard due to the range of concentrations proposed.

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 NYC indicates background concentrations below the standard. NYSDEC 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. 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 City *Environmental Quality Review (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 12-1**) 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.

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

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

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.

CRITERIA REGARDING $PM_{2.5}$ IMPACTS

DEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts[1]. This policy would apply only to facilities applying for permits or major permit modifications under SEQRA that emit 15 tons of PM_{10} or more annually. The policy states that such a project 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.

In addition, DEP is currently recommending interim guidance criteria for evaluating the potential $PM_{2.5}$ impacts for projects subject to CEQR. The interim guidance criteria currently employed by DEP for determination of potential significant adverse $PM_{2.5}$ impacts under CEQR 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 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 DEP or DEC interim guidance criteria above will be considered to have a potential significant adverse impact. DEP recommends that its actions subject to CEQR that fail the interim guidance criteria prepare an environmental impact statement (EIS) and examine potential measures to reduce or eliminate such potential significant adverse impacts.

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

D. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

MOBILE SOURCES

The prediction of motor-vehicle-generated CO and PM concentrations in an urban environment is characterized by meteorological phenomena, traffic conditions, and physical configurations. Air pollutant dispersion models mathematically simulate how traffic, meteorology, and geometry combine to affect pollutant concentrations. The mathematical expressions and formulations contained in the various models attempt to describe an extremely complex physical phenomenon as closely as possible. However, because all models contain simplifications and approximations of actual conditions and interactions, and it is necessary to predict the reasonable worst-case condition, most of these dispersion models predict conservatively high pollutant concentrations, particularly under adverse meteorological conditions.

The CO and PM analyses for the proposed actions employ a modeling approach approved by EPA that has been widely used for evaluating air quality impacts of projects in New York City, New York State and throughout the country. The modeling approach includes a series of conservative assumptions relating to meteorology, traffic, and background concentration levels, which results in a conservatively high estimate of expected concentrations that could ensue from the proposed actions. The assumptions used in the PM analysis were based on the latest $PM_{2.5}$ draft interim guidance developed by NYCDEP.

DISPERSION MODEL FOR MICROSCALE ANALYSES

Maximum CO concentrations adjacent to streets near the project site, resulting from vehicle emissions, were predicted using the CAL3QHC model Version 2.0.[1] The CAL3QHC model employs a Gaussian (normal distribution) dispersion assumption and includes an algorithm for estimating vehicular queue lengths at signalized intersections. CAL3QHC predicts emissions and dispersion of CO from idling and moving vehicles. The queuing algorithm includes site–specific traffic parameters, such as signal timing and delay calculations (from the 2000 *Highway Capacity Manual* traffic forecasting model), saturation flow rate, vehicle arrival type, and signal actuation (i.e., pre-timed or actuated signal) characteristics to accurately predict the number of idling vehicles. The CAL3QHC model has been updated with an extended module, CAL3QHCR, which allows for the incorporation of hourly meteorological data into the modeling, instead of worst-case assumptions regarding meteorological parameters. This refined version of the model, CAL3QHCR, is employed if maximum predicted future CO concentrations are greater than the applicable ambient air quality standards or when *de minimis* thresholds are exceeded using the first level of CAL3QHC modeling.

To determine motor vehicle generated PM concentrations adjacent to streets near the proposed action area, the CAL3QHCR model was applied. This refined version of the model can utilize hourly traffic and meteorology data, and is therefore more appropriate for calculating 24-hour and annual average concentrations.

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[1] *User's Guide to CAL3QHC, A Modeling Methodology for Predicted Pollutant Concentrations Near Roadway Intersections,* Office of Air Quality, Planning Standards, EPA, Research Triangle Park, North Carolina, Publication EPA-454/R-92-006.

METEOROLOGY

In general, the transport and concentration of pollutants from vehicular sources are influenced by three principal meteorological factors: wind direction, wind speed, and atmospheric stability. Wind direction influences the accumulation of pollutants at a particular prediction location (receptor), and atmospheric stability accounts for the effects of vertical mixing in the atmosphere.

CO calculations were performed using the CAL3QHC model. In applying the CAL3QHC model, the wind angle was varied to determine the wind direction resulting in the maximum concentrations at each receptor.

Following the EPA guidelines[1], CO computations were performed using a wind speed of 1 meter per second, and the neutral stability class D. The 8-hour average CO concentrations were estimated by multiplying the predicted 1-hour average CO concentrations by a factor of 0.70 to account for persistence of meteorological conditions and fluctuations in traffic volumes. A surface roughness of 3.21 meters was chosen. At each receptor location, concentrations were calculated for all wind directions, and the highest predicted concentration was reported, regardless of frequency of occurrence. These assumptions ensured that worst-case meteorology was used to estimate impacts.

PM calculations were performed using the CAL3QHCR model. In applying the CAL3QHCR model, the meteorological data set consisted of the latest five years of data that are available: surface data collected at John F. Kennedy Airport (2005-2009) and upper air data collected at Brookhaven, New York (2005-2009).

BUILD YEAR

The CO and PM micro-scale analyses were performed for 2013, the year of completion of the proposed actions. The future analysis was performed both without the proposed actions (the No Build) and with the proposed actions (Build).

VEHICLE EMISSIONS DATA

Vehicular CO and PM engine emission factors were computed using the EPA mobile source emissions model, MOBILE6.2[2]. This emissions model is capable of calculating engine emission factors for various vehicle types, based on the fuel type (gasoline, diesel, or natural gas), meteorological conditions, vehicle speeds, vehicle age, roadway types, number of starts per day, engine soak time, and various other factors that influence emissions, such as inspection maintenance programs. The inputs and use of MOBILE6.2 incorporate the most current guidance available from NYSDEC and the New York City Department of Environmental Protection (NYCDEP).

Vehicle classification data were based on field studies and data obtained from other traffic studies. Appropriate credits were used to accurately reflect the inspection and maintenance program. The inspection and maintenance programs require inspections of automobiles and light

[1] *Guidelines for Modeling Carbon Monoxide from Roadway Intersections*, EPA Office of Air Quality Planning and Standards, Publication EPA-454/R-92-005.

[2] EPA, User's Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model, EPA420-R-03-010, August 2003.

trucks to determine if pollutant emissions from the vehicles exhaust systems are below emission standards. Vehicles failing the emissions test must undergo maintenance and pass a repeat test to be registered in New York State.

All taxis were assumed to be in hot stabilized mode (i.e., excluding any start emissions). The general categories of vehicle types for specific roadways were further categorized into subcategories based on their relative breakdown within the fleet.[1]

An ambient temperature of 43° Fahrenheit was used. This temperature, calculated based on the latest guidance from EPA and NYSDEC, represents the average temperature measured during the 10 highest 8-hour CO events measured at NYSDEC monitoring stations.

Road Dust

The contribution of re-entrained road dust to PM_{10} concentrations, as presented in the PM_{10} SIP, is considered to be significant; therefore, the PM_{10} estimates include both exhaust and road dust. In accordance with the DEP $PM_{2.5}$ interim guidance criteria methodology, $PM_{2.5}$ emission rates were determined with fugitive road dust to account for their impacts in local microscale analyses. However, fugitive road dust was not included in the neighborhood scale $PM_{2.5}$ microscale analyses, since DEP considers it to have an insignificant contribution on that scale. Road dust emission factors were calculated according to the latest procedure delineated by EPA[2] and the 2010 *CEQR Technical Manual*.

TRAFFIC DATA

Traffic data for the air quality analysis were derived from existing traffic counts, projected future growth in traffic, and other information developed as part of the traffic analysis for the proposed actions (see Chapter 11, "Transportation"). Traffic data for the future without and with the proposed actions were employed in the respective air quality modeling scenarios. The weekday evening (5 to 6 PM); Saturday midday (4:15 to 5:15) peak periods were analyzed. These time periods were selected for the mobile source analysis because they produce the maximum anticipated project-generated traffic and therefore have the greatest potential for significant air quality impacts.

BACKGROUND CONCENTRATIONS

Background concentrations are those pollutant concentrations not directly accounted for through the modeling analysis, which directly accounts for vehicle-generated emissions on the streets within 1,000 feet and line-of-sight of the receptor location. Background concentrations must be added to modeling results to obtain total pollutant concentrations at a study site.

The 8-hour average background CO concentration used in this analysis was 2.0 parts per million (ppm) for the 2013 predictions. This value is representative for the mobile source receptor locations in the future year. The 24-hour average background concentration for PM_{10} was 67.7

[1] The MOBILE6.2 emissions model utilizes 28 vehicle categories by size and fuel. Traffic counts and predictions are based on broader size categories, and then broken down according to the fleet-wide distribution of subcategories and fuel types (diesel, gasoline, or alternative).

[2] EPA, Compilations of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Ch. 13.2.1, NC, http://www.epa.gov/ttn/chief/ap42, January 2011.

micrograms per cubic meter ($\mu g/m^3$). The background data was obtained from a nearby NYSDEC monitoring station that best represented the area surrounding the site.

MOBILE SOURCE ANALYSIS SITES

~~Three~~ Four intersections were selected for microscale analysis (see **Table 12-2**). These intersections were selected because they are the key locations in the study area where the largest levels of project-generated traffic are expected, and therefore where the greatest air quality impacts and maximum changes in the CO concentrations would be expected. The PM analysis was performed at Analysis Site 1.

Table 12-2
Mobile Source Analysis
Intersection Locations

Analysis Site	Location
1	Bay Parkway and Cropsey Avenue
2	Bay Parkway and Belt Parkway EB Ramps
3	26th Avenue and Cropsey Avenue
4	Bay Parkway and 86th Street

RECEPTOR LOCATIONS

Multiple receptor sites were modeled at each of the selected intersections (i.e., receptors were placed along the approach and departure links at spaced intervals). The receptor sites are computer simulations of sidewalk or roadside locations near intersections with continuous public access.

PARKING GARAGE

The project site would include a 690-space, three-level parking structure. Emissions from vehicles using the parking areas could potentially affect ambient levels of CO at receptors adjacent to the parking facilities as well as nearby project intersections analyzed in the future Build scenario. Because cold-starting automobiles leaving a parking facility would emit far higher levels of CO than hot-stabilized vehicles entering a facility, the impact from a parking facility would be greatest during those periods that averaged the largest number of departing vehicles. An analysis was performed using the methodology set forth in the *CEQR Technical Manual* to calculate pollutant levels.

Impacts of CO from the proposed parking facility were assessed for their potential effects on receptor sites. The CO concentrations were determined for the time periods when overall garage usage would be the highest, considering the hours when the greatest number of vehicles would exit the facility. Departing vehicles are operating in a "cold-start" mode, emitting higher levels of CO than arriving "hot-stabilized" vehicles.

A "near" and "far" receptor was placed adjacent to nearby avenues directly opposite the project site. An 8-hour persistence factor of 0.70 supplied by NYCDEP was used to account for meteorological variability over the average 8-hour period.

Emissions from vehicles entering, parking, and exiting the parking garages were estimated using the EPA-developed MOBILE6.2 mobile source emission model and an ambient temperature of 43°F. For all arriving and departing vehicles, an average speed of 5 miles per hour was

conservatively assumed for travel within the parking facilities. In addition, all departing vehicles were assumed to idle for 1 minute before proceeding to the exit. To determine compliance with the NAAQS, CO concentrations were determined for the maximum 1- and 8-hour average periods.

HVAC SCREENING ANALYSIS

To assess air quality impacts associated with emissions from the proposed development's heating and hot water systems, a screening analysis was performed using the methodology described in the *CEQR Technical Manual*. This methodology determines the threshold of development size below which the action would not have a significant impact. If the analysis does not pass the CEQR screening, a detailed analysis using dispersion modeling is necessary. Required input includes the type of fuel to be burned, the maximum development size and type of development, the boiler stack height and 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 determined by the screening procedure, then there is the potential for significant air quality impacts and dispersion modeling should be used to determine if impacts would occur. If the maximum development size is less than the threshold size determined by the screening procedure, then the source passes and no further analysis is required.

INDUSTRIAL SOURCE SCREENING ANALYSIS

To assess air quality impacts on the proposed development associated with emissions from nearby industrial sources, a screening analysis was performed using the methodology described in the *CEQR Technical Manual*. The first step in this analysis was to perform a field survey to identify any processing or manufacturing facilities located within 400 feet of the proposed development. Once identified, information regarding the release of air contaminants from these facilities was obtained from the NYCDEP Bureau of Environmental Compliance. This information is based on the most current air permit data available. In addition, a comprehensive search was performed to identify NYSDEC Title V permits and permits listed in the EPA Envirofacts database.

If air permits were issued for any facility, the next step would be to determine the potential ambient concentrations of each air toxic contaminant. These concentrations would be determined using a screening database from the EPA Industrial Source Complex dispersion model. Estimates of worst-case short-term (1 hour) and annual averages would be predicted and then compared to the short-term (SGC) and annual (AGC) guideline concentrations. The guideline concentrations are established by NYSDEC and represent levels that are considered safe for inhalation exposure by the public. A significant impact occurs if the predicted concentration exceeds an SGC or AGC.

E. EXISTING CONDITIONS

EXISTING MONITORED AIR QUALITY CONDITIONS (2006)

Monitored background data were utilized to determine the background concentrations. Monitored ambient air concentrations of CO, SO_2, particulate matter, NO_2, lead, and ozone for the project area are shown in **Table 12-3** for the year 2006. These values are the most recent monitored data that have been made available by NYSDEC for nearby monitoring stations. There were no monitored violations of the NAAQS for the pollutants at these sites in 2006.

Table 12-3
Representative Monitored Ambient Air Quality Data

Pollutants	Location	Units	Period	Concentrations			Number of Times Federal Standard Exceeded	
				Mean	Highest	Second Highest	Primary	Secondary
CO	PS 59	ppm	8-hour	-	1.2	1.2	0	-
			1-hour	-	1.6	1.5	0	-
SO_2	PS 59	$\mu g/m^3$	Annual	28.8	-	-	0	-
			24-hour	-	81.1	48.5	0	-
			3-hour	-	117.8	109.9	-	0
Respirable Particulates (PM_{10})	PS 59	$\mu g/m^3$	Annual	26.0	-	-	0	0
			24-hour	-	53.0	46.0	0	0
Respirable Particulates ($PM_{2.5}$)	JHS 126	$\mu g/m^3$	Annual	12.0	-	-	-	-
			24-hour	-	35.7	31.4	-	-
NO_2	PS59	$\mu g/m^3$	Annual	67.7	-	-	0	0
Lead	JHS 126	$\mu g/m^3$	3-month	-	0.014	0.013	0	-
O_3	Botanical Gardens	ppm	1-hour	-	0.124	0.104	0	0

Source: 2007 Annual New York State Air Quality Report, NYSDEC (Draft).

BASELINE MOBILE SOURCES ANALYSIS

A quantified analysis of the CO concentrations from on-street vehicular traffic was conducted for the baseline condition (2008). The analysis was performed for the 8-hour averaging period. Since no violations of the 1-hour CO standard have been measured in New York City within the last 10 years, 1-hour averages were not summarized in this report (although all 1-hour predicted CO concentrations would be well within the applicable standard). The values shown are the highest predicted concentrations for the receptor locations at each intersection. As indicated in **Table 12-4**, the predicted 8-hour concentrations of CO, including background, are below the corresponding ambient air quality standard.

Table 12-4
Baseline (2008) Maximum Predicted 8-Hour Carbon Monoxide Concentrations (parts per million)

Site	Location	Time Period	Existing 8-Hour Concentration (ppm)
1	Bay Parkway and Cropsey Avenue	Weekday MD	2.7
		Weekday PM	2.8
		Saturday PM	3.9
2	Bay Parkway and Belt Parkway EB Ramps	Weekday MD	2.6
		Weekday PM	2.8
		Saturday PM	2.8
3	26th Avenue and Cropsey Avenue	Weekday MD	2.2
		Weekday PM	2.3
		Saturday PM	2.9
4	Bay Parkway and 86th Street	Weekday MD	3.2
		Weekday PM	3.2
		Saturday PM	3.1

Notes:
8-hour CO standard is 9 ppm.
An ambient background concentration of 2.0 ppm is included in the values presented above.
Values marked with an asterisk represent concentrations estimated using the refined CAL3QHCR model.

F. THE FUTURE WITHOUT THE PROPOSED ACTIONS

MOBILE SOURCES ANALYSIS

CO concentrations without the proposed actions were determined for the 2013 Build year using the methodology previously described. **Table 12-5** shows future maximum predicted 8-hour average CO concentration without the proposed actions (i.e., 2013 No Build values) at the analysis intersections in the project study area. The values shown are the highest predicted concentrations for the receptor locations at each intersection. As indicated in **Table 12-5**, the predicted 8-hour concentrations of CO, including background, are below the corresponding ambient air quality standard.

Table 12-5
No Build (2013) Maximum Predicted 8-Hour
Carbon Monoxide Concentrations (parts per million)

Site	Location	Time Period	No Build 8-Hour Concentration (ppm)
1	Bay Parkway and Cropsey Avenue	Weekday MD	2.6
		Weekday PM	2.6
		Saturday PM	3.1
2	Bay Parkway and Belt Parkway EB Ramps	Weekday MD	2.6
		Weekday PM	2.6
		Saturday PM	2.6
3	26th Avenue and Cropsey Avenue	Weekday MD	2.1
		Weekday PM	2.1
		Saturday PM	2.5
4	Bay Parkway and 86th Street	Weekday MD	3.1
		Weekday PM	3.2
		Saturday PM	3.1

Notes:
8-hour CO standard is 9 ppm.
An ambient background concentration of 2.0 ppm is included in the no build values presented above.
Values marked with an asterisk represent concentrations estimated using the refined CAL3QHCR model.

No build PM_{10} concentrations without the proposed actions were also determined for the 2013 Build year at Site 1 (i.e., Bay Parkway and Cropsey Avenue). The 24-hour average concentration (with background) was equal to 75.24 $\mu g/m^3$. This value is below the corresponding ambient air quality standard of 150 $\mu g/m^3$.

G. PROBABLE IMPACTS OF THE PROPOSED ACTIONS

INTRODUCTION

Impacts from project-generated mobile sources at roadway intersections near the project site and impacts on the surrounding community that are related to air emissions produced by the project heating systems and parking garages are presented below. Also presented below, are the results of the study to determine impacts on the proposed development from off-site industrial sources.

MOBILE SOURCES ANALYSIS

CO concentrations with the proposed actions were determined for the 2013 Build year using the methodology previously described. **Table 12-6** shows the future maximum predicted 8-hour average CO concentration with the proposed actions at the three intersections studied.

Table 12-6
Build (2013) Maximum Predicted 8-Hour
Carbon Monoxide Concentrations (parts per million)

Site	Location	Time Period	Project Build 8-Hour Concentration (ppm)	Not-To-Exceed *De minimis* Criteria (ppm)
1	Bay Parkway and Cropsey Avenue	Weekday MD	2.7	5.8
		Weekday PM	2.8	5.8
		Saturday PM	3.1	6.1
2	Bay Parkway and Belt Parkway EB Ramps	Weekday MD	2.7	5.8
		Weekday PM	2.7	5.8
		Saturday PM	2.8	5.8
3	26th Avenue and Cropsey Avenue	Weekday MD	2.3	5.6
		Weekday PM	2.3	5.6
		Saturday PM	2.6	5.7
4	Bay Parkway and 86th Street	Weekday MD	3.1	6.0
		Weekday PM	3.2	6.1
		Saturday PM	3.2	6.0

Notes:
8-hour CO standard is 9 ppm.
An ambient background concentration of 2.0 ppm is included in the project build values presented above.
Values marked with an asterisk represent concentrations estimated using the refined CAL3QHCR model.

The values shown are the highest predicted concentrations for the time period analyzed. Also shown in the table is a Not-to-Exceed value based on the *de minimis* criteria used to determine the significance of the incremental increase in CO concentrations that would result from the proposed actions. The *de minimis* criteria are derived using procedures outlined in the *CEQR Technical Manual* (2001) that set a minimum allowable change in 8-hour average CO concentrations due to a proposed action (i.e., the No Build concentration plus half the difference between No Build concentration and the 9.0 ppm standard).

The results in **Table 12-6** indicate that in the future with the proposed actions, there would be no potentially significant adverse mobile source air quality impacts for CO (i.e., *de minimis* criteria were not exceeded). In addition, with or without the proposed actions in 2013, maximum predicted CO concentrations in the study area of the proposed actions would be less than the corresponding ambient air quality standards.

PM_{10} concentrations with the proposed actions were also determined for the 2013 Build year at Site 1 (i.e., Bay Parkway and Cropsey Avenue). The 24-hour average concentration (with background) was equal to 75.91 $\mu g/m^3$. This value is below the corresponding ambient air quality standard of 150 $\mu g/m^3$. These results indicate that in the future with the proposed actions, there would be no potentially significant adverse mobile source air quality impacts for PM_{10}.

In addition, $PM_{2.5}$ concentrations with the proposed actions were determined for the 2013 Build year at Site 1. The 24-hour average incremental concentration was equal to 0.18 $\mu g/m^3$. This value is below the corresponding NYCDEP interim guidance criteria of 2.0 $\mu g/m^3$. The annual neighborhood-scale concentration was equal to 0.02 $\mu g/m^3$. This value is below the

corresponding NYCDEP interim guidance criteria of 0.1 $\mu g/m^3$. These results indicate that in the future with the proposed actions, there would be no potentially significant adverse mobile source air quality impacts for $PM_{2.5}$.

PARKING GARAGE

Based on the methodology described previously, the maximum predicted 8-hour average impact from the proposed parking garage on future CO levels at the near and far receptor would be 0.100 ppm, and 0.143 ppm, respectively. Therefore, including a background level of 2.0 ppm and on-street traffic with an estimated CO concentration of 0.43 ppm for the far receptor, the maximum predicted future (2013) 8-hour average CO levels with the proposed actions would be 2.5 ppm for the near receptor, and 2.6 ppm for the far receptor, which are well below the applicable standard of 9 ppm.

HVAC EQUIPMENT

The primary stationary source of air pollutants associated with the proposed actions would be the emissions from the natural gas-fired heating system boiler. The primary pollutant of concern when burning natural gas is nitrogen dioxide. The screening methodology in the *CEQR Technical Manual* was utilized for the analysis with the size of the proposed building in square feet (i.e., 214,000 sf). The closest building of similar height (or greater) found in the project study area was a distance of 303 feet from the boiler stack on the roof (i.e., 59 feet) of the proposed building. It was determined that the proposed actions would not result in any significant stationary source air-quality impacts because at this distance, the proposed actions would be well below the maximum permitted size shown in Figure 3Q-10 of the *CEQR Technical Manual*.

INDUSTRIAL SOURCE IMPACTS

The results of the field survey indicated that there were several industrial developments in the area surrounding the proposed project site. However, none of these facilities within 400 feet of the proposed project site had a NYCDEP air permit on file with the Bureau of Environmental Compliance. In addition, there were no large sources within 1,000 feet of the project site. From this information, it was determined that nearby industrial sources would not result in any significant air quality impacts.

CONSISTENCY WITH NEW YORK STATE AIR QUALITY IMPLEMENTATION PLAN

Maximum predicted CO concentrations with the proposed actions would be less than the corresponding ambient air standard. Therefore, the proposed actions would be consistent with the New York SIP for the control of CO. ✷