Chapter 16: Air Quality

A. INTRODUCTION

This chapter examines the potential for air quality impacts from the proposed Brooklyn Bridge Park. Air quality impacts can be either direct or indirect. Direct impacts stem from emissions generated by stationary sources associated with the proposed project, such as emissions from fuel burned on site for heating, ventilation, and air conditioning (HVAC) systems.

Indirect effects include emissions from motor vehicles ("mobile sources") traveling to and from the project. In addition, the potential effects of vehicle emissions on the Brooklyn Bridge Park from the Brooklyn-Queens Expressway and Manhattan Bridge are considered, due to their proximity to the project site.

The proposed project would also include parking garage facilities. Ventilation of air from the garages could potentially result in increases in carbon monoxide (CO) concentrations in the immediate vicinity of the ventilation outlets. Therefore, a stationary source parking garage analysis was conducted to evaluate potential future CO concentrations associated with the proposed parking garages. The predicted increments due to garage ventilation were also added, where appropriate, to the predicted concentrations from the mobile source analysis, to assess the cumulative impact of both sources.

In addition, because portions of the proposed project would be located adjacent to a zoned industrial area, air quality impacts from nearby sources of air pollution may be a concern. Indirect effects due to pollutants emitted from the exhaust vents of existing industrial facilities nearby have the potential to adversely impact future visitors to Brooklyn Bridge Park and residents of the proposed residential buildings on the project site, and, accordingly, are considered in the impacts assessment.

The results discussed below show that the maximum predicted CO and particulate matter (PM_{10} and $PM_{2.5}$) concentrations from mobile sources with the proposed project would be below the ambient air standards. In addition, the parking garage analysis determined that the parking facilities under the proposed project would not cause any significant adverse air quality impacts. The stationary source screening analyses determined that there would be no potential significant adverse air quality impacts from HVAC systems at the proposed project, and an analysis of the impacts of industrial sources on the proposed project found that the maximum concentration levels were below the guideline levels established by regulatory agencies. Thus, the proposed project is not expected to result in any significant adverse air quality impacts.

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. Typically, ambient concentrations of CO are predominantly influenced by mobile source emissions. Volatile organic compounds (VOCs) and nitrogen oxides (NO and NO_2, collectively referred to as NO_x) are emitted from both mobile and stationary sources. Emissions of sulfur dioxide (SO_2) are associated mainly with stationary sources, and non-road diesel sources such as locomotives, marine engines and construction equipment, but diesel-powered on-road vehicles, primarily heavy-duty trucks and buses, also contribute somewhat to these emissions. However, diesel fuel regulations, which will begin to take effect in 2006, will reduce SO_2 emissions from mobile sources to extremely low levels. Particulate matter (PM) is emitted from both stationary and mobile sources. Fine particulate matter is also formed when emissions of NO_x, sulfur oxides (SO_x), ammonia, organic compounds, and other gases react or condense in the atmosphere. Ozone is formed in the atmosphere by complex photochemical processes that include NO_x and VOCs, emitted mainly from industrial processes and mobile sources.

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 project would increase traffic volumes on feeder streets to and from the proposed Brooklyn Bridge Park as well as within the park itself. Therefore, a mobile source analysis was conducted to evaluate future CO concentrations with and without the project. A parking garage analysis was also conducted to evaluate future CO concentrations with the operation of the proposed parking facilities, and to assess potential CO impacts from projected future background levels of traffic at proposed development sites in proximity to elevated roadways.

NITROGEN OXIDES, VOC, 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 metropolitan area, which is designated as a moderate non-attainment area for ozone by the U.S. Environmental Protection Agency (EPA).

The proposed project 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, there is a standard for average annual NO_2 concentrations, which is normally examined only for fossil fuel energy sources. An analysis was performed to estimate the potential for NO_2 impacts from the proposed project's stationary sources.

LEAD

Lead emissions in air are principally associated with industrial sources and motor vehicles that use gasoline containing lead additives. Most U.S. vehicles produced since 1975, and all produced after 1980, are designed to use unleaded fuel. As these newer vehicles have replaced the older ones, motor vehicle-related lead emissions have decreased. As a result, ambient concentrations of lead have declined significantly. Nationally, the average measured atmospheric lead level in 1985 was only about one–quarter the level in 1975.

In 1985, EPA announced new rules drastically reducing the amount of lead permitted in leaded gasoline. The maximum allowable lead level in leaded gasoline was reduced from the previous limit of 1.1 to 0.5 grams per gallon effective July 1, 1985, and to 0.1 grams per gallon effective January 1, 1986. Monitoring results indicate that this action has been effective in significantly reducing atmospheric lead concentrations. Effective January 1, 1996, the Clean Air Act 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 the 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 national standard of 1.5 micrograms per cubic meter (3–month average).

No significant sources of lead are associated with the proposed project, 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 volatile organic compounds, 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. Particulate matter also acts as a substrate for the adsorption 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, or $PM_{2.5}$, and particles with an aerodynamic diameter of less than or equal to 10 micrometers, or 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 adsorbed 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 particulate matter (often soon after the release from an exhaust pipe or stack) or from precursor gases reacting in the atmosphere to form secondary PM.

With respect to PM_{10}, the *City Environmental Quality Review* (*CEQR) Technical Manual* requires an analysis of actions which would result in a significant number of increased local or diesel vehicle trips. Since the proposed project is not located in an area of concern with respect to attainment of the PM_{10} standard, and would not result in a significant number of local diesel trips, a detailed analysis of the project's potential for PM_{10} emissions from project-generated mobile sources was not warranted. However, an analysis of potential PM_{10} impacts from projected future background levels of traffic at potential proposed development sites in proximity to elevated roadways was constructed. In addition, an analysis of $PM_{2.5}$ was conducted to ensure that peak project-generated traffic would not result in any significant adverse impacts.

An analysis was performed to estimate the potential for PM_{10} impacts from the proposed project's stationary sources.

SULFUR DIOXIDE

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 vehicular sources. Monitored SO_2 concentrations in New York City are below the national standards. Vehicular sources of SO_2 are not significant and therefore, an analysis of this pollutant from mobile sources was not warranted.

As part of the proposed project, No. 2 fuel could potentially be burned in the HVAC systems. Therefore, an analysis was performed to estimate the potential for SO_2 impacts from the proposed project's stationary sources.

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 the EPA. Federal ambient air quality standards do not exist for non-criteria compounds; 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 ambient guideline concentrations for numerous air toxic compounds. The NYSDEC guidance document DAR-1 (December 2003) 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.

Air toxic emissions from nearby industrial sources were analyzed for their potential impact on the proposed project.

C. AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the Clean Air Act, primary and secondary 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 protect public health and represent levels at which there are no known significant effects on human health. 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. For NO_2, ozone, lead and PM, the primary and secondary standards are the same; there is no secondary standard for CO. EPA promulgated additional NAAQS which became effective September 16, 1997: a new 8–hour standard for ozone, which replaced the 1–hour standard on June 15, 2005, and in addition to retaining the PM_{10} standards, EPA adopted 24–hour and annual standards for $PM_{2.5}$. The standards for these pollutants are presented in Table 16–1. These standards have also been adopted as the ambient air quality standards for New York State.

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS (SIP)

The Clean Air Act (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 is a state's plan on how it will meet the NAAQS under the deadlines established by the CAA.

EPA has 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 New York 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 boroughs of New York City as well as Nassau, Suffolk, Rockland, Westchester and Orange counties as $PM_{2.5}$ non-attainment areas under the CAA. State and local governments are required to develop implementation plans designed to meet the standards by early 2008.

Nassau, Rockland, Suffolk, Westchester and the five counties of New York City have been designated as severe non–attainment for the ozone 1–hour 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 one–hour ozone NAAQS by 2007. New York State has recently submitted revisions to the SIP; these SIP revisions included additional emission reductions that EPA requested to demonstrate attainment of the standard, and an update of the SIP estimates using two recently updated EPA models—the mobile source emissions model MOBILE6.2, and the non–road emissions model NONROAD—which have been updated to reflect current knowledge of engine emissions, and the latest mobile and non–road engine emissions regulations. On April 15, 2004, EPA designated these same counties as moderate non–attainment for the new 8–hour 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 will be 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. A new SIP for ozone will be adopted by the state no later than June 15, 2007, with a target attainment deadline of June 15, 2010.

DETERMINING THE SIGNIFICANCE 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 16-1) 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.

Table 16–1
Ambient Air Quality Standards

Pollutant	Primary		Secondary	
	ppm	µg/m³	ppm	µg/m³
Carbon Monoxide (CO)				
Maximum 8–Hour Concentration[1]	9	10,000	None	
Maximum 1–Hour Concentration[1]	35	40,000		
Lead				
Maximum Arithmetic Mean Averaged Over 3 Consecutive Months	NA	1.5	NA	1.5
Nitrogen Dioxide (NO_2)				
Annual Arithmetic Average	0.053	100	0.053	100
Ozone (O_3)				
8–Hour Average[2]	0.08	157	0.08	157
Total Suspended Particles (TSP)				
Annual Mean Rural Open Space Rural Residential Urban Residential Urban Industrial	NA	 45 55 65 75	None	
Maximum 24–Hour Concentration	NA	250		
Respirable Particulate Matter (PM_{10})				
Average of 3 Annual Arithmetic Means	NA	50	NA	50
24–Hour Concentration[1]	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Average of 3 Annual Arithmetic Means	NA	15	NA	15
24–Hour Concentration[3]	NA	65	NA	65
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean	0.03	80	NA	NA
Maximum 24–Hour Concentration[1]	0.14	365	NA	NA
Maximum 3–Hour Concentration[1]	NA	NA	0.50	1,300

Notes: ppm – parts per million
µg/m³ – micrograms per cubic meter
NA – not applicable
Particulate matter concentrations are in µg/m³. Concentrations of all gaseous pollutants are defined in ppm — approximately equivalent concentrations in µg/m³ are presented.
TSP levels are regulated by a New York State Standard only. All other standards are National Ambient Air Quality Standards (NAAQS).
[1] Not to be exceeded more than once a year.
[2] Three–year average of the annual fourth highest daily maximum 8–hr average concentration.
[3] Not to be exceeded by the 98th percentile averaged over 3 years.
Sources: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards; 6 NYCRR Part 257: Air Quality Standards.

DE MINIMIS CRITERIA REGARDING CO IMPACTS

New York City has developed *de minimis* criteria to assess the significance of the incremental increase in CO concentrations that would result from proposed projects or actions, 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.

INTERIM GUIDANCE CRITERIA REGARDING $PM_{2.5}$ IMPACTS

The New York City Department of Environmental Protection (NYCDEP) is currently employing interim guidance criteria for evaluating potential $PM_{2.5}$ impacts from NYCDEP projects subject to CEQR. The interim guidance criteria currently employed by NYCDEP for determination of potential significant adverse impacts from $PM_{2.5}$ are as follows:

- Predicted 24–hour (daily) average increase in $PM_{2.5}$ concentrations greater than 5 µg/m^3 at a discrete location of public access, either at ground or elevated levels (microscale analysis); and
- Predicted annual average increase in ground–level $PM_{2.5}$ concentrations greater than 0.1 µg/m^3 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 impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating background monitoring stations).

In addition, NYSDEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts. This policy would apply only to facilities applying for permits or major permit modification under the State Environmental Quality Review Act (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 µg/m^3 averaged annually or more than 5 µg/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.

Actions that would increase $PM_{2.5}$ concentrations by more than the interim guidance criteria above are considered to have potential significant adverse impacts. NYCDEP recommends that for actions subject to CEQR that would potentially cause exceedance of these criteria, an environmental impact statement be prepared and potential measures to reduce or eliminate such impacts be examined.

The above NYCDEP and NYSDEC interim guidance criteria have been used for the purpose of evaluating the significance of predicted impacts of the proposed project on $PM_{2.5}$ concentrations from mobile sources, and determine the need to minimize particulate matter emissions from the proposed project.

D. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

MOBILE SOURCES

The prediction of vehicle–generated CO and PM concentrations in an urban environment incorporates 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 concentrations of pollutants, particularly under adverse meteorological conditions.

The mobile source analyses for the proposed project employ models approved by EPA, CAL3QHC, and CAL3QHCR, that have been widely used for evaluating air quality impacts of projects in New York City, other parts of New York State, and throughout the country. The modeling approach includes a series of conservative assumptions relating to meteorology, traffic, and background concentration levels resulting in a conservatively high estimate of expected pollutant concentrations that could ensue from the proposed project. The assumptions used in the PM analysis were based on the latest $PM_{2.5}$ interim guidance developed by the 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 CAL3QHC modeling.

To determine motor vehicle-generated PM concentrations, the CAL3QHCR model was applied. This 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.

Tier I Analyses–CAL3QHC

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, the wind angle that maximized the pollutant concentrations was used in the analysis regardless of frequency of occurrence. These assumptions ensured that worst-case meteorology was used to estimate impacts.

Tier II Analyses—CAL3QHCR

A Tier II analysis performed with the CAL3QHCR model, which includes the modeling of hour-by-hour concentrations based on hourly traffic data and 5 years of monitored hourly meteorological data, was performed to predict maximum 24-hour and annual average PM levels. The data consists of surface data collected at LaGuardia Airport and upper air data collected at Brookhaven, New York for the period 1999-2003. All hours are modeled, and the highest resulting concentration for each averaging period is presented.

ANALYSIS YEAR

The microscale analyses were performed for existing conditions and 2012, the year by which the proposed park is expected to be completed. The future analysis was performed both without the proposed project (the No Build condition) and with the proposed project (the Build condition).

VEHICLE EMISSIONS DATA

Vehicular CO and PM emission factors were computed using the EPA mobile source emissions model, MOBILE6.2[2]. This is the most current emissions model capable of calculating engine emission factors for various vehicle types, based on the fuel (gasoline, diesel, or natural gas), meteorological conditions, vehicle speeds, vehicle age, roadway types, number of starts per day, and 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 the NYSDEC and NYCDEP.

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[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-02-028, October 2002.

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 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. The general categories of vehicle types for specific roadways were further categorized into subcategories based on their relative fleet-wide breakdown.[1]

An ambient temperature of 43° Fahrenheit was used. The use of this temperature is recommended in the *CEQR Technical Manual* for the borough of Brooklyn and is consistent with current NYCDEP guidance.

PM emission rates were determined with fugitive road dust to account for their impacts in local microscale analyses. However, in accordance with the NYCDEP $PM_{2.5}$ interim guidance criteria, fugitive road dust was not included in the neighborhood scale $PM_{2.5}$ microscale analysis, since it is considered to be an insignificant contribution on that scale.

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 action (see Chapter 14, "Traffic and Parking"). Traffic data for the future without and with the proposed project were employed in the respective air quality modeling scenarios. The weekday PM (5 to 6 PM) and Sunday (2 to 3 PM) peak periods were subjected to microscale analysis. These time periods were selected for the mobile source analysis because they produce the maximum anticipated project–generated and future traffic and therefore have the greatest potential for significant air quality impacts.

For particulate matter, the weekday and weekend peak traffic volumes were used as a baseline; traffic volumes for other hours due to No Build traffic and the project were determined by adjusting the peak period volumes by the 24-hour distributions of actual vehicle counts collected for the project. 24-hour PM impacts were determined by using the 24-hour distribution associated with the highest total daily vehicle count; for annual impacts, average weekday and weekend 24-hour distributions were used to more accurately simulate traffic patterns over longer periods.

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 concentration used in this analysis was 2.0 ppm for the 2012 predictions. This value, obtained from NYCDEP, is based on CO concentrations measured at NYSDEC monitoring stations and is adjusted to reflect the reduced vehicular emissions expected in the analysis year. For purposes of this adjustment, based on EPA guidance, it was assumed that 20 percent of the background value is caused by stationary source emissions that

[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).

have remained relatively unchanged with time and that 80 percent of the background value is caused by mobile sources that decrease with time. This decrease reflects the increasing numbers of federally mandated lower-emission vehicles that are projected to enter the vehicle fleet as older, higher-polluting vehicles are retired (i.e., vehicle turnover), and the continuing benefits of the New York State inspection and maintenance program.

The PM_{10} annual and 24-hour background concentrations are based on the highest and second highest concentrations, respectively, measured over the most recent 3-year period at the nearest NYSDEC monitoring site. For the proposed action, the background concentrations for the annual and 24-hour periods are 21 $\mu g/m^3$ and 50 $\mu g/m^3$, respectively. For $PM_{2.5}$, background concentrations are not considered, since impacts are determined on an incremental basis only.

MOBILE SOURCE ANALYSIS SITES

Figure 16-1

A total of four intersection locations were selected for microscale analysis (see Table 16-2 and Figure 16-1). These intersections were selected because they are the 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 concentrations would be expected. Multiple receptors (i.e. precise locations at which concentrations are predicted) were modeled at each of the selected sites; receptors were placed along the approach and departure links at spaced intervals. The receptors were placed at sidewalk or roadside locations near intersections with continuous public access.

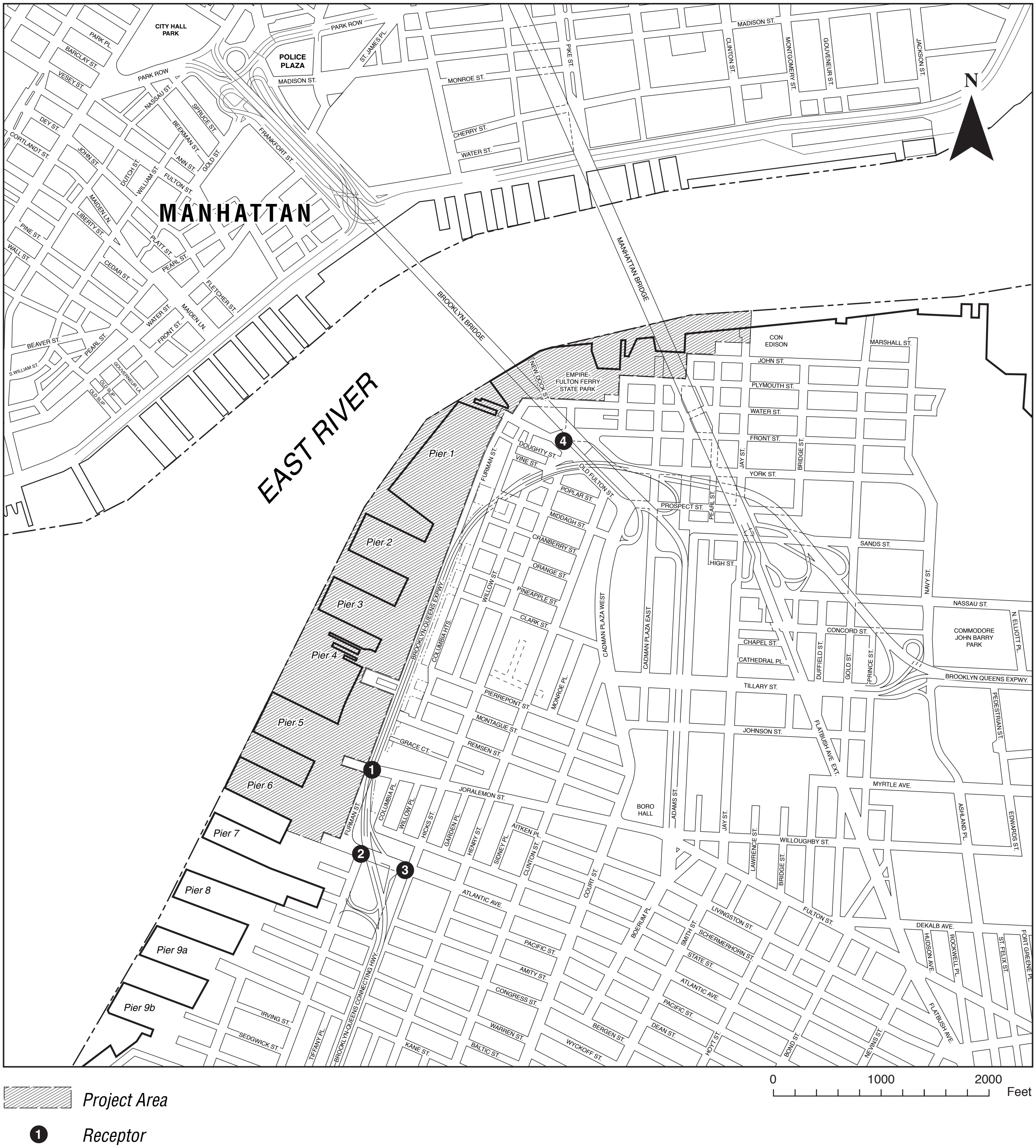
Table 16-2
Mobile Source Analysis Intersection Locations

Analysis Site	Location
1	Furman Street and Joralemon Street
2	Furman Street/Columbia Street and Atlantic Avenue
3	Hicks Street and Atlantic Avenue
4	Old Fulton Street and Front Street

Impacts at proposed development sites were also analyzed due to their proximity to an atypical source of vehicular pollutants, as recommended in the *CEQR Technical Manual*. These sites consisted of the proposed development site at: 1) 360 Furman Street which is adjacent to the elevated Brooklyn Bridge Expressway; and 2) the John Street Site, which is directly north of the Manahttan Bridge. Receptors were placed at various locations and elevations on each of these development sites to assess potential CO impacts from projected future background levels of traffic. The 360 Furman Street development site was also analyzed for PM_{10} impacts since it is directly adjacent to the elevated Brooklyn-Queens Expressway. ($PM_{2.5}$ impacts were not analyzed in this case since it is assessed as an increment, and in the No Build condition, no development would occur. Therefore, it is impossible to assess what the incremental impacts of $PM_{2.5}$ would be.)

PARKING FACILITIES

Adequate, accessible parking would be needed for both park users and commercial venues in the proposed park and development sites. The air exhausted from the garages' ventilation systems would contain elevated levels of CO due to emissions from vehicles using the garages. The ventilation air could potentially affect ambient levels of CO at receptors near the outlet vents. An analysis was performed using the methodology set forth in the *CEQR Technical Manual*, 6.3.05



Air Quality Receptor Locations
Figure 16-1

applying modeling techniques to the vent structures and calculating pollutant levels at various distances from the vents.

Of the parking associated with the proposed development sites, the proposed approximately 650 space parking garage at 360 Furman Street was analyzed. This site has the greatest potential parking demand and, therefore, the highest potential air quality impact.

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 43°F. For all arriving and departing vehicles, an average speed of 5 miles per hour was conservatively assumed for travel within the parking garages. In addition, all departing vehicles were assumed to idle for 1 minute before proceeding to the exit. 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 of garage area. To determine compliance with the NAAQS, CO concentrations were determined for the maximum 8-hour average period. (No exceedances of the 1-hour standard would occur based on the required ventilation criteria and the 8-hour values are the most critical for impact assessment.)

To determine pollutant levels in the vicinity of the vents, the ventilation from the garage was analyzed as a "virtual point source" using the methodology in EPA's *Workbook of Atmospheric Dispersion Estimates, AP-26*. This methodology estimates CO concentrations at various distances from the vents 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. Maximum emissions would result in the highest CO levels and the greatest potential impacts. Traffic data for the parking garage analysis were derived from the trip generation analysis described in the traffic chapter of this DEIS.

Because there are currently no specific garage designs upon which the modeling of emissions could be based, worst-case assumptions were made regarding the design of the garages' mechanical ventilation systems. The exhaust from the proposed parking garage was assumed to be vented through a single exhaust with a centerline height of 12 feet. The vent was assumed to exhaust directly onto the street, and a "near" receptor was placed along the sidewalks at a pedestrian height of 6 feet and at a distance 5 feet from the vent. A "far" receptor was placed directly across the street from the assumed vent location. An 8-hour persistence factor of 0.7 was used to account for meteorological variability over the average 8-hour period.

Background and on–street 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 from the traffic survey conducted for the project.

STATIONARY SOURCES

A stationary source analysis was conducted to evaluate potential impacts from the proposed project's HVAC systems. In addition, an assessment was conducted to determine the potential for impacts due to industrial activities within the project area, and from any nearby large emission sources.

HVAC ANALYSIS

Screening

A screening analysis was performed to assess air quality impacts associated with emissions from the HVAC systems of the proposed project. The methodology described in the *CEQR Technical Manual* was used for the analysis and considered impacts on sensitive uses (both existing residential developments as well as other residential developments planned or under construction). The *CEQR Technical Manual* methodology determines the threshold of development size below which the action would not have a significant adverse impact. The screening procedures utilize information regarding the type of fuel to be burned, the maximum development size, and the HVAC exhaust stack height to evaluate whether a significant adverse impact is likely. 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,* 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 analysis is required.

Each of the proposed project's development sites was evaluated to assess impacts on existing buildings and other proposed development sites (i.e., project-on-project impacts). In addition, other proposed residential developments (i.e., No Build) were reviewed for analysis as potential receptor sites. Proposed development sites in close proximity to each other and of similar height were analyzed for potential cumulative impacts.

The maximum development floor area of each proposed development 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 HVAC systems, and that the stack would be located 3 feet above roof height (as per the *CEQR Technical Manual*).

Dispersion modeling

The screening analysis indicated that dispersion modeling would be required to assess the potential air quality impacts of stationary source emissions from the proposed development sites at 360 Furman Street and the lower (8-story) building at the uplands of Pier 6 on receptors at the proposed taller (30-story) building at the uplands of Pier 6. The screening analysis also identified the potential for air quality impacts due to the proposed Empire Stores development site on receptors at an adjacent existing building. For these development and receptor sites, refined dispersion modeling was required. Potential impacts were re–evaluated using the Industrial Source Complex Short Term (ISCST3) dispersion model developed by EPA, and described in *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models* (EPA-454/B-95-003a). The ISCST3 model 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 ISCST3 analyses of potential impacts from exhaust stacks were made assuming stack tip downwash, buoyancy-induced dispersion, gradual plume rise, urban dispersion coefficients and wind profile exponents, no collapsing of stable stability classes, and elimination of calms. ISCST3 was run without the building downwash algorithms enabled, since this option results in the calculation of worst-case impacts at elevated receptor locations. The meteorological data set consisted of the latest 5 years of concurrent meteorological data that are available: surface data collected at La Guardia Airport (1999-2003) and concurrent upper air data collected at Brookhaven, New York.

Receptor Locations. Discrete receptors (i.e., locations at which concentrations are calculated) were chosen on the affected sites for the stationary source modeling analysis. The model receptor network consisted of locations along the sides and roof of the sites being analyzed, at operable windows, intake vents or otherwise accessible locations such as terraces. Rows of receptors were placed in the model at spaced intervals on the building at multiple elevations.

Emission Estimates and Stack Parameters. Fuel consumption was estimated based on procedures outlined in the *CEQR Technical Manual* as discussed above. Fuel was assumed to be No. 2 fuel oil for SO_2 and PM_{10}, and natural gas for NO_2.

Emission factors from the fuel oil and natural gas combustion sections of EPA's AP-42 were utilized to calculate emission rates for the proposed development site's heating and hot water systems (see Table 16-3). The annual average NO_2 impacts from the proposed actions were conservatively calculated assuming that all of the nitrogen oxides emitted by these operations were NO_2.

Table 16-3
Stack Parameters and Emission Rates for Proposed Development Sites

Parameter	Value		
	360 Furman Street	Pier 6 Upland Building B	Empire Stores
Stack Height	152	100	45
Stack Diameter	0 feet*	0 feet*	0 feet*
Stack Exit Velocity	0.00328 feet/second*	0.00328 feet/second*	0.00328 feet/second*
Stack Exit Temperature	68 ºF*	68 ºF*	68 ºF*
SO_2 Emission Rate (Short-term/Annual)	3.15 lbs per hr / 0.86 lbs per hr	0.64 lbs per hr / 0.18 lbs per hr	1.36 lbs per hr / 0.37 lbs per hr
NO_x Emission Rate	0.38 lbs per hr	0.08 lbs per hr	0.16 lbs per hr
PM_{10} Emission Rate (Short-term/Annual)	0.20 lbs per hr / 0.055 lbs per hr	0.04 lbs per hr / 0.011 lbs per hr	0.09 lbs per hr / 0.024 lbs per hr

Note:
* Worst-case assumptions per *CEQR Technical Manual* Guidance.

Background Concentrations. To estimate the maximum expected total pollutant concentrations at a given receptor, the predicted levels were added to corresponding background concentrations (See Table 16-4). The background levels were based on concentrations monitored at the nearest NYSDEC ambient air monitoring stations. The measured background concentration was added to the predicted contribution from the modeled source to determine the maximum predicted total pollutant concentration. It was conservatively assumed that the maximum background concentrations occur on all days.

Table 16-4
Maximum Background Pollutant Concentrations

Pollutant	Average Period	Location	Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)
NO_2	Annual	PS 59, Manhattan	77	100
SO_2	3 hour	PS 59, Manhattan	217	1,300
	24 hour		123	365
	Annual		37	80
PM_{10}	24 Hour	JHS 126, Brooklyn	50	150
	Annual		21	50

Sources: 1999-2003 Annual New York State Air Quality Report Ambient Air Monitoring System, NYSDEC.

INDUSTRIAL SOURCE ANALYSIS

Potential effects from existing industrial operations in the surrounding area on the proposed project were analyzed. Industrial air pollutant emission sources within 400 feet of the proposed project boundaries were considered for inclusion in the air quality impact analyses. These boundaries were used to identify the extent of the study area for determining air quality impacts associated with the proposed project.

Initially, land use and Sanborn maps were reviewed to identify potential sources of emissions from manufacturing/industrial operations. Next, a field survey was conducted to identify buildings within 400 feet of the project site that have the potential for emitting air pollutants. The survey was conducted on May 3, 2005. The field survey focused on the northern portion of the study area since it is adjacent to existing manufacturing zoned areas. A review of recent industrial source analyses conducted in this area was also performed.

A list of the identified businesses was then submitted to the New York City Department of Environmental Protection's (NYCDEP) Bureau of Environmental Compliance (BEC) to obtain all the available certificates of operation for these locations and to determine whether manufacturing or industrial emissions occur. In addition, a search of Federal and State-permitted facilities within the study area was conducted using the EPA's Envirofacts database.[1]

Screening

An air quality dispersion model screening database, ISC3, was used to estimate maximum potential impacts from different sources at various distances from the site. Impact distances selected for each source were the minimum distances between the boundary of the project site and the source site. Predicted worst-case impacts on the proposed development were compared with the short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs) recommended in the New York State Department of Environmental Conservation (NYSDEC)'s *DAR-1 AGC/SGC Tables*.[2] These guideline concentrations present the airborne concentrations, which are applied as a screening threshold to determine whether future occupants of the proposed project could be significantly impacted from nearby sources of air pollution.

To assess the effects of multiple sources emitting the same pollutants, cumulative source impacts were determined. Concentrations of the same pollutant from industrial sources that were within 400 feet of the proposed project were combined and compared to the guideline concentrations discussed above.

As discussed in Section G, the screening analysis predicted a potential exceedance of a NYSDEC guideline concentration. Therefore, a refined dispersion modeling analysis was performed.

Dispersion Modeling

Since the screening analysis of potential air quality impacts of the industrial source emissions analyzed resulted in a potential exceedance on the proposed project, refined dispersion modeling was required. These potential impacts were evaluated using ISCST3 dispersion model. The

[1] http://oaspub.epa.gov/enviro/ef_home2.air

[2] NYSDEC Division of Air Resources, Bureau of Stationary Sources, December, 2003.

ISCST3 model was used to predict concentrations from industrial sources utilizing the model computation options of command in the *CEQR Technical Manual* (i.e., stack tip downwash, buoyancy-induced dispersion, gradual plume rise, urban dispersion coefficients and wind profile exponents, no collapsing of stable stability classes, and elimination of calms). Since the highest concentrations were predicted to occur on elevated (flagpole) receptors, the ISCST3 model was run without downwash. The meteorological data set consisted of five years of surface data collected at LaGuardia Airport (1999–2003) and concurrent upper air data collected at Brookhaven, Suffolk County, New York.

Discrete receptors (i.e., locations at which concentrations were calculated) were placed at spaced intervals at ground level within the project site and along the sides of proposed development sites from the ground floor to the upper level. Emission rates and stack parameters, obtained from the NYCDEP permits, were input into the ISCST3 dispersion model.

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, incinerator or asphalt 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. Therefore, a review of existing permitted facilities was conducted. Within the 1,000 foot area around the proposed project area, "major" combustion-related facilities as well as proposed electrical generating facilities were considered. Within the 400-foot study area boundary, other sources such as those permitted under NYSDEC's Title V program were considered. Sources of information reviewed included the NYCDEP permit data, EPA's Envirofacts database, and the NYSDEC Title V permit Web site.

No large emission sources were found within the 1,000 foot study area, and no Title V permitted facilities were identified within a 400 foot study area. Consequently, impacts on the proposed project from major stationary sources of air pollution are considered to be minor, and no analysis of additional sources is necessary.

E. EXISTING CONDITIONS

EXISTING MONITORED AIR QUALITY CONDITIONS

Monitored background concentrations of SO_2, NO_2, CO, O_3, lead, and PM_{10} for the area are shown in Table 16-5. These values (2003) are the most recent monitored data that have been made available by NYSDEC. With the exception of ozone, which is a regional pollutant, there were no monitored violations of NAAQS at these monitoring sites.

PREDICTED POLLUTANT CONCENTRATIONS IN THE STUDY AREA

As noted previously, receptors were placed at multiple sidewalk locations next to the intersections under analysis. The receptor with the highest predicted CO concentrations was used to represent these intersection sites for the existing conditions. CO concentrations were calculated for each receptor location, at each intersection, for each peak period specified above.

Table 16-5
Representative Monitored Ambient Air Quality Data

Pollutants	Location	Units	Period	Concentrations			Number of Exceedances of Federal Standard	
				Mean	Highest	Second Highest	Primary	Secondary
CO	PS 59	ppm	8-hour	-	2.6	2.5	0	0
			1-hour	-	4.6	4.0	0	0
SO_2	PS 59	ppm	Annual	0.014	-	-	0	-
			24-hour	-	0.047	0.047	0	-
			3-hour	-	0.084	0.077	-	0
Respirable Particulates (PM_{10})	JHS 126	µg/m^3	Annual	20	-	-	0	0
			24-hour	-	66	50	0	0
Respirable Particulates ($PM_{2.5}$)	JHS 126	µg/m^3	Annual	14.8	-	-	0	0
			24-hour	-	51.5	46.5	0	0
NO_2	PS 59	ppm	Annual	0.038	-	-	0	0
Lead	Susan Wagner	µg/m^3	3-month	-	0.01	0.01	0	-
O_3	Susan Wagner	ppm	1-hour	-	0.127	0.120	1	0

Source: NYSDEC, 2003 New York State Air Quality Data.

Table 16-6 shows the maximum predicted existing (2005) CO 8-hour average concentrations at the receptor sites. (No 1-hour values are shown since predicted values are much lower than the standard.) At all receptor sites, the maximum predicted 8-hour average concentrations are below the national standard of 9 ppm.

Table 16-6
Maximum Predicted Existing 8-Hour Average Carbon Monoxide Concentrations for 2005 (parts per million)

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	Furman Street and Joralemon Street	PM	5.4
2	Furman Street/Columbia Street and Atlantic Avenue	PM	5.6
3	Hicks Street and Atlantic Avenue	PM	4.7
4	Old Fulton Street and Front Street	PM	4.0

Note: 8-hour standard is 9 ppm.

F. THE FUTURE WITHOUT THE PROPOSED PROJECT

MOBILE SOURCES ANALYSIS

TRAFFIC INTERSECTIONS

CO concentrations without the proposed project were determined for the 2012 analysis year at traffic intersections using the methodology previously described. Table 16-7 shows future maximum predicted 8-hour average CO concentrations at the analysis intersections without the proposed actions (i.e., 2012 No Build values). The values shown are the highest predicted concentrations for the receptor locations for any of the time periods analyzed. Note that $PM_{2.5}$ concentrations without the proposed project are not presented since impacts are evaluated on an incremental basis.

Table 16-7
Future (2012) Maximum Predicted 8-Hour Average Carbon Monoxide No Build Concentrations in the Project Study Area (parts per million)

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	Furman Street and Joralemon Street	PM	4.1
2	Furman Street/Columbia Street and Atlantic Avenue	PM	4.2
3	Hicks Street and Atlantic Avenue	PM	3.5
4	Old Fulton Street and Front Street	PM	3.2
Note: 8-hour standard is 9 ppm.			

Compared to Table 16-6, predicted No Build values are lower than Existing Conditions. The decrease in CO concentrations primarily reflects the increasing proportion of newer vehicles with more effective pollution controls, as well as the continuing benefits of the New York State I&M Program.

ADDITIONAL RECEPTOR SITES

As indicated in Section D, "Methodology for Predicting Pollutant Concentrations," at proposed development sites, receptors were analyzed due to their proximity to elevated roadway sources. These sites were analyzed for the Build condition only.

G. THE FUTURE WITH THE PROPOSED PROJECT

The proposed project would result in increased mobile source emissions in the immediate vicinity of the project site. The proposed project could also affect the surrounding community through emissions from HVAC equipment and parking garages. The following sections describe the results of the studies performed to analyze the potential impacts on the surrounding community from these sources. Impacts at proposed development sites were analyzed due to their proximity to elevated roadways. In addition, existing industrial facilities were assessed for potential adverse impacts on the future visitors to Brooklyn Bridge Park and residents of the proposed development sites. The areas of concern are discussed below.

MOBILE SOURCES ANALYSIS

TRAFFIC INTERSECTIONS

CO

CO concentrations with the proposed project were determined for the 2012 analysis year at traffic intersections using the methodology previously described. Table 16-8 shows the future maximum predicted 8-hour average CO concentration with the proposed actions at the four intersections studied. (No 1-hour values are shown since no exceedances of the standard would occur and the *de minimis* criteria are only applicable to 8-hour concentrations. Therefore, the 8-hour values are the most critical for impact assessment.) The values shown are the highest predicted concentration for any of the time periods analyzed. The results indicate that the proposed project would not result in any violations of the CO standard or any significant impacts at the receptor locations.

Table 16-8
Future (2012) Maximum Predicted 8-Hour Average
No Build and Build Carbon Monoxide Concentrations (parts per million)

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)	
			No Build	Build
1	Furman Street and Joralemon Street	PM	4.1	4.4
2	Furman Street/Columbia Street and Atlantic Avenue	PM	4.2	4.5
3	Hicks Street and Atlantic Avenue	PM	3.5	3.7
4	Old Fulton Street and Front Street	PM	3.2	3.3
Note: 8-hour standard is 9 ppm.				

$PM_{2.5}$

$PM_{2.5}$ concentrations with the proposed project were determined for the 2012 analysis year using the methodology previously described. The purpose of the mobile source $PM_{2.5}$ analysis was to determine the maximum predicted incremental impacts, so that they could be compared to the interim guidance criteria that would determine the potential significance of the project's impacts.

The maximum predicted neighborhood-scale annual average and localized 24-hour average $PM_{2.5}$ incremental concentrations are presented in Table 16-9. The results show that the predicted annual and daily (24-hour) $PM_{2.5}$ increments are below the interim guidance criteria, and therefore the proposed project would not result in significant $PM_{2.5}$ impacts at the analyzed receptor location.

Table 16-9
Future (2012) Maximum Predicted Incremental 24-Hour and
Annual Average $PM_{2.5}$ Concentrations (μg/m^3)

Receptor Site	Location	Neighborhood Scale Analysis Annual Increment	Localized Analysis 24-Hour Increment
1	Furman Street and Joralemon Street	0.032	0.70
$PM_{2.5}$ Interim Guidance Criteria: Annual Average (Neighborhood Scale)—0.1 μg/m^3 24-Hour (Localized)—5.0 μg/m^3.			

If approved by the City of New York, as part of the proposed project, Joralemon Street would be closed to vehicular traffic at Furman Street to minimize park-generated traffic along Joralemon Street; it would remain open for pedestrians. Were Joralemon Street to remain open, additional traffic would occur along Joralemon Street leading to and from the proposed park. As presented in this chapter, the air quality analysis at Furman Street and Joralemon Street assumed Joralemon Street would be closed and determined that there would be no significant impacts. Alternatively, if Joralemon Street remained open, traffic would approach the park from one additional direction, but in total the same number of vehicles would be moving through this intersection. Therefore, pollutant concentrations would be similar. Furthermore, the additional project-generated traffic volumes along Joralemon Street would not be significant. Therefore, as with the proposed project, no significant air quality impacts would be predicted to occur if Joralemon Street remained open.

ADDITIONAL RECEPTOR SITES

CO

As described in Section D, “Methodology,” CO analyses were also undertaken to determine if there would be any CO impacts on proposed development sites at these locations (e.g., the upper floors that would be located near major traffic corridors such as the Brooklyn-Queens Expressway and the Manhattan Bridge). The maximum predicted 1-hour and 8-hour average CO concentrations on “worst-case” development sites at elevated receptors are presented in Table 16-10. The results show that future CO concentrations at development sites situated near elevated roadways are well below the standards.

Table 16-10
Maximum Predicted 1-Hour and 8-Hour Carbon Monoxide Concentrations on Development Sites for 2012 (parts per million)

Location	Time Period	1-Hour	8-Hour
Proposed Development Site at 360 Furman Street	Weekday PM	9.0	4.1
	Sunday MD	8.7	3.9
Proposed Development Site at John Street Site	Weekday PM	6.4	2.3
	Sunday MD	6.3	2.2

Notes:
National Ambient Air Quality Standards:
1-hour: 35 ppm.
8-hour: 9 ppm.

PM_{10}

PM_{10} concentrations with the proposed project at the proposed development site at 360 Furman Street were determined for the 2012 analysis year using the methodology previously described. Table 16-11 shows the future maximum predicted 24-hour and annual average PM_{10} concentrations with the proposed project. The values shown are the highest predicted concentrations for any of time periods analyzed. The results indicate that the proposed action would not result in any violations of the PM_{10} standard or any significant adverse impacts.

Table 16-11
Maximum Predicted 24-Hour and Annual PM_{10} Concentrations on Development Sites for 2012 ($\mu g/m^3$)

Location	24-Hour	Annual
Proposed Development Site at 360 Furman Street	67.4	27.4

Notes:
National Ambient Air Quality Standards:
24-hour: 150 $\mu g/m^3$.
Annual Average: 50 $\mu g/m^3$.

PARKING FACILITIES

Based on the methodology previously discussed, the maximum overall predicted future CO concentrations, including ambient background levels and on-site traffic, at sidewalk receptor locations, would be 7.76 ppm and 3.18 ppm for the 1- and 8-hour periods, respectively. The maximum 1- and 8-hour contribution from the parking garage would be 1.70 ppm and 1.10 ppm, respectively. The maximum concentrations were predicted at 360 Furman Street (approximately 650 spaces). The values are the highest predicted concentrations for any time period analyzed. These maximum predicted CO levels are below the applicable standards, and therefore, no significant adverse impacts from the proposed action's parking facilities are expected.

STATIONARY SOURCES

A stationary source analysis was conducted to evaluate potential impacts from the proposed project's HVAC systems. In addition, an assessment was conducted to determine the potential for impacts due to industrial activities within the project area.

HVAC SOURCE ANALYSIS

Screening

The screening analysis was performed to determine whether impacts from proposed development sites could potentially impact other proposed development sites or existing buildings. The analysis was performed assuming both natural gas and No. 2 fuel oil as the HVAC systems' fuel types. The primary pollutant of concern when burning natural gas is nitrogen dioxide, and when burning oil, sulfur dioxide.

The majority of the development sites were determined to pass the HVAC screening analysis using No. 2 fuel oil (i.e., the minimum distance from the source to the receptor is greater than the minimum distance specified in the *CEQR Technical Manual* HVAC screening figure). Three of the sites did not meet the minimum distance specified in *CEQR Technical Manual* using No. 2 fuel oil; therefore, a more refined analysis using natural gas was performed. In each of these cases, the use of natural gas did not meet the screening criteria either.

Therefore, a refined dispersion modeling analysis was conducted to assess the potential for impacts from the affected development sites. The results of this analysis are discussed and presented below.

Dispersion Modeling

Potential stationary source impacts from the HVAC systems of the proposed development site at 360 Furman Street and the lower building at Pier 6 on the proposed taller building at the uplands of Pier 6 were analyzed using the ISCST3 refined dispersion model. In the same manner, impacts from the proposed Empire Stores development site on an adjacent existing building were analyzed. The estimated concentrations from the modeling were added to the ambient background concentrations to estimate air quality impacts at the projected development sites. The results of this analysis are presented in Table 16-12. The results of the refined modeling analysis indicated that no significant impacts would occur if the location of the HVAC system exhaust associated with the development site at 360 Furman Street is a minimum of 160 feet from the proposed taller building at the uplands of Pier 6; the location of the HVAC system exhaust associated with the proposed lower building at the uplands of Pier 6 is a minimum of 56 feet from the proposed taller building at the Pier 6 uplands; and the location of the HVAC system exhaust associated with the development site at Empire Stores is a minimum of 72 feet from the existing building on Main Street between Water Street and Front Street. These restrictions are readily achievable based on the locations and potential development layout for these buildings.

Table 16-12
HVAC Dispersion Modeling Analysis
Maximum Predicted Pollutant Concentrations

Pollutants	Averaging Period	Background Concentration (ug/m^3)	Predicted Concentration (ug/m^3)	Total Predicted Concentration (ug/m^3)	Ambient Standard (ug/m^3)
Pier 6 Uplands, Lower Building on Pier 6, Taller Building					
Nitrogen Dioxide (NO_2)	Annual	77	2.8	78.2	100
Sulfur Dioxide (SO_2)	3-hour	217	985.8	1,202.8	1,300
	24-hour	123	191.6	314.6	365
	Annual	37	2.3	39.3	80
Inhalable Particulates (PM_{10})	24-hour	50	15.7	65.7	150
	Annual	21	0.4	21.4	50
360 Furman Street on Pier 6 Uplands, Taller Building					
Nitrogen Dioxide (NO_2)	Annual	77	1.2	79.8	100
Sulfur Dioxide (SO_2)	3-hour	217	816.5	1,033.5	1,300
	24-hour	123	226.4	349.4	365
	Annual	37	5.9	42.9	80
Inhalable Particulates (PM_{10})	24-hour	50	13.1	63.1	150
	Annual	21	0.1	21.1	50
Empire Stores on Existing Building					
Nitrogen Dioxide (NO_2)	Annual	77	1.9	78.9	100
Sulfur Dioxide (SO_2)	3-hour	217	941.8	1158.8	1,300
	24-hour	123	198.4	321.4	365
	Annual	37	3.9	40.9	80
Inhalable Particulates (PM_{10})	24-hour	50	14.0	64.0	150
	Annual	21	0.3	21.3	50

As shown in Table 16-12, the maximum predicted concentrations for the pollutants analyzed are below their respective standards. Therefore, no significant adverse air quality impacts would occur from the HVAC systems of the proposed development sites for these pollutants.

INDUSTRIAL SOURCE ANALYSIS

Screening

As discussed above, a study was conducted to identify manufacturing and industrial uses within 400 feet of the proposed project. NYCDEP-BEC and EPA permit databases were used to identify existing sources of industrial emissions. A total of three permitted facilities were identified within 400 feet of the proposed project. Table 16-13 shows the facility addresses and a description of each permitted industrial source.

Table 16-13
Business with Industrial Source Permits

Source Reference No.	Facility Address	Description of Source
1	201 Water Street	Metal Industry
2	20 Jay Street	Printing
3	20 Jay Street	Graphic Arts

The screening procedure used to estimate the emissions from these businesses is based on information contained in the operational permits obtained from DEP-BEC. The permits issued by DEP-BEC describe potential contaminants emitted by the permitted processes, hours per day and days per year in which there may be emissions (which is related to the hours of business operation), and the characteristics of the emission exhaust systems (temperature, exhaust velocity, height, and dimensions of exhaust). This screening analysis identified two businesses that could potentially have significant impacts on the proposed project due to emissions of particulate matter. Both businesses are located at 20 Jay Street.

Dispersion Modeling

As a result of the potential impacts predicted from the initial industrial source screening analysis, a detailed analysis of industrial source impacts was undertaken to analyze potential particulate matter impacts on the proposed project, following the methodology previously described. The maximum 1-hour particulate concentration at receptor locations within the project site from the two businesses located at 20 Jay Street using the ISCST3 model was 111.0 micrograms per cubic meter ($\mu g/m^3$). This concentration is well below the SGC of 380 $\mu g/m^3$.

The conservative screening procedure and detailed analyses used to estimate maximum potential impacts from these businesses showed their operations would not result in any predicted violations of the NAAQS or any exceedances of the recommended SGC or AGC. Therefore, based on the data available on the surrounding industrial uses, the proposed developments would not experience significant air quality impacts from these facilities.

ONE-WAY FURMAN STREET SCENARIO

As presented in the Traffic chapter, under this scenario, Furman Street would continue to operate as a one-way street. The No Build and Build conditions were analyzed to evaluate traffic conditions and potential project impacts if this were to be the circulation pattern on Furman Street. The air quality results for this scenario are described below.

CO

CO concentrations with and without the proposed project with Furman Street operating as a one-way street were determined for the 2012 analysis year at traffic intersections. Table 16-14 shows the future maximum predicted 8-hour average CO concentration with the proposed actions at the four intersections studied. (No 1-hour values are shown since no exceedances of the standard would occur and the *de minimis* criteria are only applicable to 8-hour concentrations. Therefore, the 8-hour values are the most critical for impact assessment.) The values shown are the highest predicted concentration for any of the time periods analyzed. The results indicate that the proposed project would not result in any violations of the CO standard or any significant impacts at the receptor locations with Furman Street operating as a one-way street.

CONSISTENCY WITH NEW YORK STATE AIR QUALITY IMPLEMENTATION PLAN

As addressed above, maximum predicted CO concentrations with the proposed project would be less than the applicable ambient air standard. Therefore, the proposed project would be consistent with the New York State Implementation Plan for the control of ozone and CO.

Table 16-14
Furman Street One-Way: Future (2012) Maximum Predicted 8-Hour Average No Build and Build Carbon Monoxide Concentrations (parts per million)

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)	
			No Build	Build
1	Furman Street and Joralemon Street	PM	4.1	4.2
2	Furman Street/Columbia Street and Atlantic Avenue	PM	4.2	4.4
3	Hicks Street and Atlantic Avenue	PM	3.5	3.7
4	Old Fulton Street and Front Street	PM	3.2	3.3

Note: 8-hour standard is 9 ppm.

$PM_{2.5}$

$PM_{2.5}$ concentrations with and without the proposed project assuming Furman Street as one-way were determined for the 2012 analysis year using the methodology previously described. The purpose of the mobile source $PM_{2.5}$ analysis was to determine the maximum predicted incremental impacts, so that they could be compared to the interim guidance criteria that would determine the potential significance of the project's impacts.

The maximum predicted neighborhood-scale annual average and localized 24-hour average $PM_{2.5}$ incremental concentrations are presented in Table 16-15. The results show that the predicted annual and daily (24-hour) $PM_{2.5}$ increments are below the interim guidance criteria, and therefore the proposed project would not result in significant $PM_{2.5}$ impacts at the analyzed receptor location assuming Furman Street operating as one-way.

Table 16-15
Furman Street One-Way: Future (2012) Maximum Predicted Incremental 24-Hour and Annual Average $PM_{2.5}$ Concentrations (μg/m^3)

Receptor Site	Location	Neighborhood Scale Analysis Annual Increment	Localized Analysis 24-Hour Increment
1	Furman Street and Joralemon Street	0.004	0.32

$PM_{2.5}$ Interim Guidance Criteria:
Annual Average (Neighborhood Scale)—0.1 μg/m^3
24-Hour (Localized)—5.0 μg/m^3.

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