Chapter 18: Air Quality

A. INTRODUCTION

The potential for air quality impacts from the proposed actions is examined in this chapter. Air quality impacts can be either direct or indirect. Direct impacts are impacts that result from emissions generated by stationary sources at a development site, such as emissions from on-site fuel combustion for heat and hot water systems, or emissions from parking garage ventilation systems. Indirect impacts are caused by emissions from nearby existing stationary sources (impacts on the proposed project) or from on-road vehicle trips generated by an action or other changes to future traffic conditions due to the action.

The reasonable worst-case development scenario (RWCDS) was analyzed because it would generate more than 100 vehicle trips during a peak hour at a number of intersections around the project sites, and therefore it would exceed the *City Environmental Quality Review (CEQR) Technical Manual* mobile source screening analysis threshold. The proposed actions would also include a number of accessory parking garages. Therefore, an analysis was conducted to evaluate potential future pollutant concentrations in the vicinity of the ventilation outlets for a prototypical garage that would be developed as a part of the proposed actions. The predicted increments from the garage ventilation were added, where appropriate, to the predicted concentrations from the mobile source analysis, to assess the cumulative impact of both sources.

The proposed actions would include new residential and retail development as well as a public school that would combust fossil fuels for heating and hot water systems. Therefore, a stationary source screening analysis was conducted to evaluate potential future pollutant concentrations from proposed heat and hot water systems.

This chapter also describes the expected use of potentially hazardous chemicals and the procedures and systems that would be employed in the proposed school laboratories to ensure the safety of staff and students at the school and the safety of people at other uses on the project sites and in the surrounding community in the event of a chemical spill.

Finally, potential impacts of stationary source emissions from existing nearby industrial facilities on the proposed uses were assessed.

PRINCIPAL CONCLUSIONS

As discussed below, the maximum predicted pollutant concentrations and concentration increments from mobile sources with the proposed actions would be in compliance with the corresponding guidance thresholds and ambient air quality standards. The parking facilities that would be built as part of the proposed actions would also not result in any significant adverse air quality impacts. Thus, the proposed actions would not have significant adverse impacts from mobile source emissions.

Based on a stationary source screening analysis, there would be no potential significant adverse air quality impacts from emissions of fossil fuel-fired heating and hot water systems associated with the proposed actions. For developments on certain parcels, restrictions would be placed on fuel type and/or stack placement on the rooftops to ensure that no significant adverse air quality impacts on nearby taller buildings would occur; these restrictions will be set forth in a Memorandum of Understanding (MOU) for Site A (or a Restrictive Declaration should portions of Site be disposed of to a private entity) and an (E) Designation for Site B. The concentrations of industrial source pollutants at the proposed uses would be lower than the corresponding guidance thresholds. Therefore, no significant adverse air quality impacts from existing nearby industrial sources on the proposed uses are predicted. Based on the analysis of the school laboratories' exhaust system, in the event of a chemical spill in a school laboratory there would be no predicted significant impacts in the proposed school, on other proposed uses, or on the surrounding community in the event of a chemical spill.

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 (NO and 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 using 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 that 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. In addition, a parking garage analysis was also conducted to evaluate future CO concentrations with the operation of a prototypical proposed parking garage.

NITROGEN OXIDES, VOCS, AND OZONE

NO_x are of principal concern because of their role, together with VOCs, as precursors in the formation of ozone. Ozone is formed through a series of reactions that take place in the

atmosphere in the presence of sunlight. Because the reactions are slow and occur as the pollutants are transported 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 emissions of these pollutants from mobile sources generated by the proposed actions was therefore not warranted. Potential impacts on local NO_2 concentrations from the fuel combustion in the heat and hot water boiler systems associated with the proposed actions were evaluated.

LEAD

Airborne lead emissions 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 that drastically reduced 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 (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 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 3-month average national standard of 1.5 micrograms per cubic meter ($\mu g/m^3$).

No significant sources of lead are associated with the proposed actions and, therefore, an 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, and wood-burning stoves and fireplaces. PM 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 the smaller $PM_{2.5}$. $PM_{2.5}$ 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 an exhaust pipe or stack) 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. An analysis was conducted to assess the worst-case $PM_{2.5}$ and PM_{10} impacts due to the increased traffic associated with the proposed actions.

SULFUR DIOXIDE

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

As part of the proposed actions, fuel oil could be burned in the new buildings' 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. The potential impact from adjacent industrial sources on air toxics concentrations within the proposed rezoning area was examined.

C. AIR QUALITY REGULATIONS, STANDARDS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the CAA, primary and secondary National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants: 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, ozone, lead, and PM, and there is no secondary standard for CO. The NAAQS are presented in **Table 18-1**. The NAAQS for CO, NO_2, and SO_2 have also been adopted as the ambient air quality standards for New York State, but are defined on a running 12-month basis rather than for calendar years only. New York State also has standards for total suspended particulate matter (TSP), settleable particles, non-methane hydrocarbons (NMHC), and ozone that correspond to federal standards that have since been revoked or replaced, and for beryllium, fluoride, and hydrogen sulfide (H_2S).

Table 18-1
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				
3-Month Average	NA	1.5	NA	1.5
Nitrogen Dioxide (NO_2)				
Annual Average	0.053	100	0.053	100
Ozone (O_3)				
8-Hour Average [2]	0.075	160	0.075	160
Respirable Particulate Matter (PM_{10})				
Average of Three Annual Means — revoked, effective December 18, 2006	NA	50	NA	50
24-Hour Average [1]	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Average of 3 Annual Means	NA	15	NA	15
24-Hour Average [3,4]	NA	35	NA	35
Sulfur Dioxide (SO_2)				
Annual Arithmetic Mean	0.03	80	NA	NA
Maximum 24-Hour Average [1]	0.14	365	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) 3-year average of the annual fourth highest daily maximum 8-hr average concentration. EPA has reduced these standards from 0.08 ppm, effective 60 days after publishing in the federal register.
(3) Not to be exceeded by the annual 98th percentile when averaged over 3 years.
(4) EPA has reduced these standards down from 65 µg/m^3, effective December 18, 2006.
Source: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards.

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 in May 2008.

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS

The CAA, as amended in 1990, defines non-attainment areas (NAAs) as geographic regions that have been designated as not meeting one or more of the NAAQS. When an area is designated as non-attainment by EPA, the state is required to develop and implement a State Implementation Plan (SIP), which delineates how a state plans to achieve air quality that meets the NAAQS under the deadlines established by the CAA.

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

Manhattan 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. New York State is required to develop a SIP by early 2008, which will be designed to meet the annual average standard by 2010. As described above, EPA has revised the 24-hour average $PM_{2.5}$ standard. Attainment designations for the revised 24-hour $PM_{2.5}$ standard would be effective by April 2010, and state and local governments in areas that are designated as non-attainment are required to develop SIPs by April 2013 which would be designed to attain the revised 24-hour $PM_{2.5}$ standards by April 2015, although this may be extended in some cases up to April 2020 (these milestones may occur at earlier dates).

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 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 new 8-hour 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. The State is currently formulating a new SIP for ozone, which is expected to be adopted in the near future. The SIP will have a target attainment deadline of June 15, 2010.

In 2007, EPA proposed to strengthen the ozone standards. If this rule is finalized in 2008, EPA expects designations based on 2007-2009 air quality data to take effect in 2010, and SIPs would be due in 2013. On February 8, 2008, the State submitted final revisions to a new SIP for ozone to EPA.

In March 2008 EPA strengthened the 8-hour ozone standards. EPA expects designations to take effect no later than March 2010 unless there is insufficient information to make these designation decisions. In that case, EPA will issue designations no later than March 2011. SIPs would be due three years after the final designations are made.

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The State Environmental Quality Review Act (SEQRA) regulations and the *CEQR Technical Manual* state that the significance of a likely consequence (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 18-1**) would be deemed to have a potential significant adverse impact. In addition, 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 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

NYSDEC has published a policy to provide interim direction for evaluating $PM_{2.5}$ impacts.[2] 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

[1] *CEQR Technical Manual*, section 222, 2001; and State Environmental Quality Review Act § 617.7

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

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, the New York City Department of Environmental protection (NYCDEP) 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 NYCDEP for determination of potential significant adverse $PM_{2.5}$ impacts under CEQR are as follows:

- 24-hour average $PM_{2.5}$ concentration increments 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 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 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 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 NYCDEP or NYSDEC interim guidance criteria above will be considered to have a potential significant adverse impact. NYCDEP recommends that its actions subject to CEQR that fail the interim guidance criteria prepare an EIS and examine potential measures to reduce or eliminate such potential significant adverse impacts.

The annual emissions of PM_{10} for the proposed actions are estimated to be well below the 15-ton-per- year threshold under NYSDEC's $PM_{2.5}$ policy guidance. The above NYCDEP and NYSDEC interim guidance criteria have been used to evaluate the significance of predicted impacts of the proposed actions on $PM_{2.5}$ concentrations and determine the need to minimize particulate matter emissions from the proposed actions.

D. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

MOBILE SOURCES

The prediction of vehicle-generated emissions and their dispersion in an urban environment incorporates meteorological phenomena, traffic conditions, and physical configuration. Air pollutant dispersion models mathematically simulate how traffic, meteorology, and physical configuration 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 since it is necessary to predict the reasonable worst-case condition, most dispersion analyses predict conservatively high concentrations of pollutants, particularly under adverse meteorological conditions.

The mobile source analyses for the proposed actions employ a model approved by EPA that has 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 actions. The assumptions used in the PM analysis were based on the latest $PM_{2.5}$ draft interim guidance developed by NYCDEP.

VEHICLE EMISSIONS

Engine Emissions

Vehicular CO and PM engine emission factors were computed using the EPA mobile source emissions model, MOBILE6.2[1]. 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 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 trucks to determine if pollutant emissions from each vehicle exhaust system are lower than 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 abundance within the fleet.[2] An ambient temperature of 43° Fahrenheit was used, in accordance with the *CEQR Technical Manual*.

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. Road dust emission factors were calculated according to the latest procedure delineated by EPA. The silt loadings used were based on EPA guidance and the representative *CEQR Technical Manual* values:

- 0.12 g/m^2 for local roadways with ADT between 500 and 5,000.

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

[2] 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).

- 0.06 g/m^2 ADT 5,000-10,0000 category roadways
- 0.03 g/m^2 ADT >10,000 category roadways

Fugitive $PM_{2.5}$ road dust was found to be negligible for roads with average daily traffic (ADT) of more than 500 vehicles, and was not included in the $PM_{2.5}$ microscale analyses based on the current EPA protocol for determining fugitive dust emissions from paved roads.[1]

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 16, "Traffic and Parking"). Traffic data for the future without and with the proposed actions were employed in the respective air quality modeling scenarios. The weekday morning (7:45 AM to 8:45 AM) and evening (4:45 to 5:45 PM) peak periods were analyzed. These time periods were selected for the mobile source analysis because they produce the maximum anticipated traffic generated by the proposed actions and therefore have the greatest potential for significant air quality impacts. For particulate matter, the peak morning and evening period traffic volumes were used as a baseline for determining off-peak volumes. Off-peak traffic volumes in the future without the proposed actions, and off-peak increments from the proposed actions, were determined by adjusting the peak period volumes by the 24-hour distributions of actual vehicle counts collected at appropriate locations. For annual impacts, average representative weekday 24-hour distributions were used to more accurately simulate traffic patterns over longer periods.

DISPERSION MODEL FOR MICROSCALE ANALYSES

Maximum CO concentrations adjacent to streets near project sites, resulting from vehicle emissions, were predicted using the CAL3QHC model Version 2.0.[2] 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 project sites, the CAL3QHCR model was applied. This refined version of the model can use hourly

[1] 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, November 2006, updated March 2007.

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

traffic and meteorology data, and is therefore more precise for calculating 24-hour and annual average concentrations.

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 direction in which pollutants are dispersed, and atmospheric stability accounts for the effects of vertical mixing in the atmosphere. These factors, therefore, influence the concentration at a particular prediction location (receptor).

Tier I Analyses—CAL3QHC

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], CAL3QHC 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.

Tier II Analyses—CAL3QHCR

A Tier II analysis performed with the CAL3QHCR model includes the modeling of hourly concentrations based on hourly traffic data and five years of monitored hourly meteorological data. The data consists of surface data collected at LaGuardia Airport and upper air data collected at Brookhaven, New York, for the period 2002-2006. All hours were modeled, and the highest resulting concentration for each averaging period is presented.

ANALYSIS YEAR

The microscale analyses were performed for existing conditions and 2017, the year by which the proposed actions are expected to be completed. The future analysis was performed both without the proposed actions (the No Build condition) and with the proposed actions (the Build condition).

BACKGROUND CONCENTRATIONS

Background concentrations are those pollutant levels 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 CO background concentration used in this analysis was 1.8 ppm. This background concentration represents the maximum of the annual second highest 8-hour average concentrations recorded at the Queens College monitoring station in 2004, 2005, and 2006. The

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

1-hour average CO background concentration used in the analysis was 3.1 ppm and was also based on the second maximum values collected over the three-year period at Queens College.

The 24-hour average PM_{10} background concentration of 50 $\mu g/m^3$ was based on the maximum of the annual second-highest 24-hour average concentrations recorded at the J.H.S. 126 monitoring station, in Brooklyn, in 2002, 2003, and 2004. J.H.S. 126 is the closest monitoring station to the proposed rezoning area that has available recorded data over a recent three-year period.

ANALYSIS SITES

A total of four analysis sites were selected for microscale analysis (see **Table 18-2** and **Figure 18-1**). These sites were selected because they are the locations in the study area where the largest levels of traffic generated by the proposed actions are expected, and, therefore, where the greatest air quality impacts and maximum changes in concentrations would be expected. Each of these intersections was analyzed for CO, while Site 3 was also analyzed for PM because this location is predicted to have the greatest number of action-generated truck trips, as well as total vehicle trips, and would therefore have the greatest potential to result in an increase in PM concentrations.

Table 18-2
Mobile Source Analysis Sites

Analysis Site	Location
1	49th Avenue and Jackson Avenue/11th Street
2	Borden Avenue and Vernon Boulevard
3	Borden Avenue and 2nd Street
4	Borden Avenue and Van Dam Street

Due to the proximity of Site 2 to the Queens Midtown Tunnel toll plaza, the potential combined effects of mobile source emissions that would be generated with the proposed actions from on-street traffic and the toll plaza and tunnel portals were considered. A previous study was used to obtain the concentrations associated with traffic from the tunnel and the toll plaza.[1]

RECEPTOR PLACEMENT

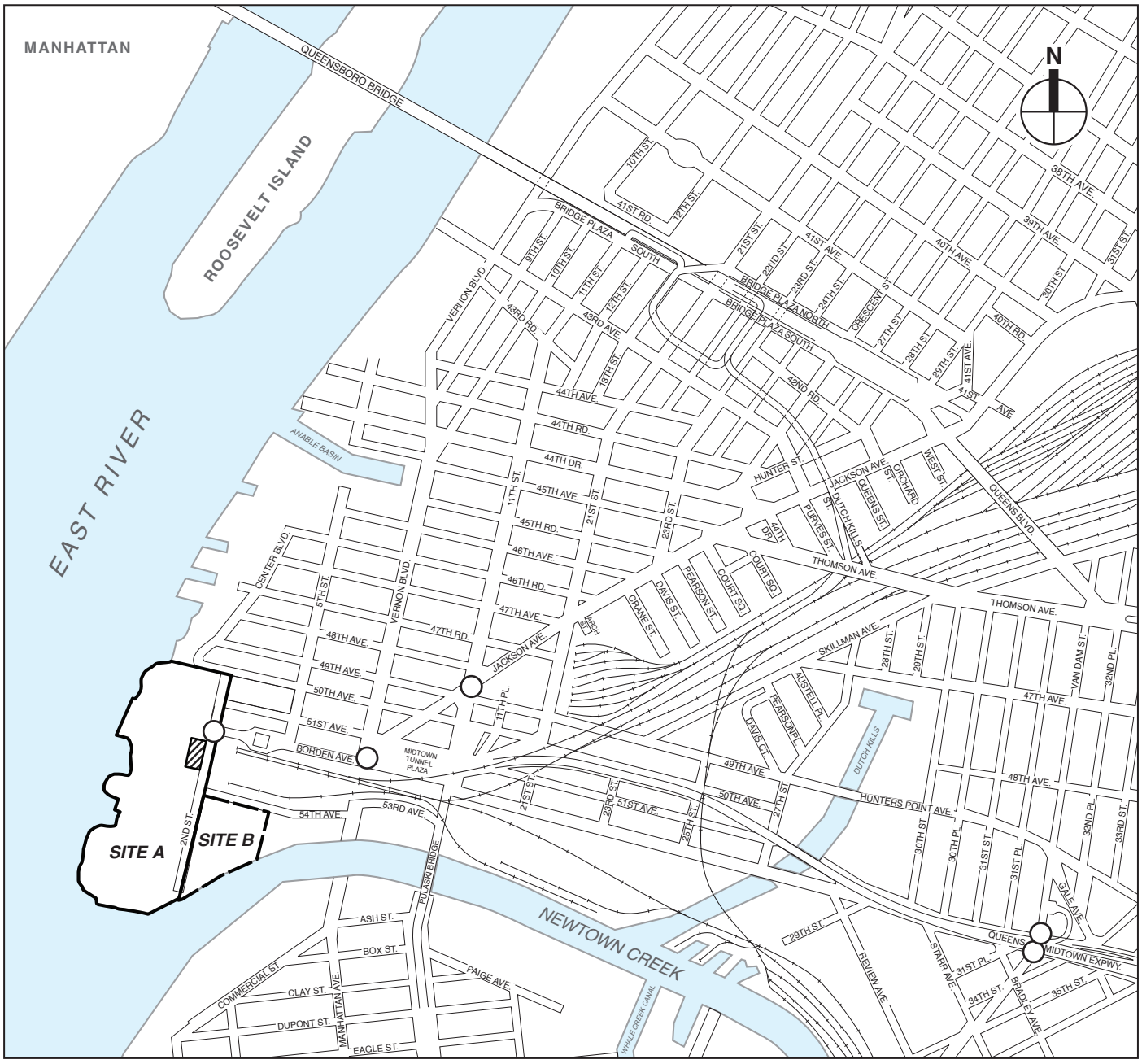
Multiple receptors (i.e., precise locations at which concentrations are predicted) were modeled at each of the selected sites; receptors were placed along the approach and departure links at spaced intervals. Receptors were placed at sidewalk or roadside locations near intersections with continuous public access. Receptors in the analysis models for predicting annual average neighborhood-scale $PM_{2.5}$ concentrations were placed at a distance of 15 meters from the nearest moving lane at each analysis location, based on the NYCDEP procedure for neighborhood-scale corridor $PM_{2.5}$ modeling of mobile sources.

PARKING FACILITIES

Accessory parking would be provided to meet demand generated by the proposed uses. It is anticipated that parking would be provided as above-grade parking facilities located in the bases of the proposed buildings and concealed by residential and retail uses, which would wrap around the perimeter of the garages. Emissions from vehicles using the parking areas could potentially

[1] Environmental Assessment for Proposed Crossing Change Increases. Prepared for: Triborough Bridge and Tunnel Authority, November 30, 2004.

3.28.08



Mobile Source Analysis
Intersection Locations

HUNTER'S POINT SOUTH REZONING AND RELATED ACTIONS

Figure 18-1

affect ambient levels of CO at the sites analyzed for the future with the proposed actions condition. **Table 18-3** shows the location and the capacity of each of the parking facilities that would be developed under the RWCDS. At this time, there are no specific design plans for any of the proposed parking facilities. Therefore, the parking facility at Parcel C on Site A was analyzed since it would have the greatest capacity and therefore the greatest potential for local air quality impact. It was conservatively assumed that the parking facility at Parcel C would be a mechanically ventilated enclosed garage and that there would be only one vent location. The exhaust from all enclosed parking facilities would be vented at rooftops. The restriction for parking garage vent location placement would be enforced through zoning regulation. The analysis was undertaken using the methodology in the *CEQR Technical Manual*, applying modeling techniques to the vent structures and calculating pollutant levels at various distances from the vents.

Table 18-3
Proposed Parking Locations and Capacities

Parking Site	Number of Spaces
Site A Parcel A	154
Site A Parcel B	0
Site A Parcel C	779
Site A Parcel D	196
Site A Parcel E	215
Site A Parcel F	656
Site A Parcel G	0
Site B (north parcel)	371
Site B (south parcel)	289

Note: Based on the RWCDS.

Emissions from vehicles entering, parking, and exiting the garages were estimated using the EPA MOBILE6.2 mobile source emission model and an ambient temperature of 43°F, as referenced in the *CEQR Technical Manual*. For all arriving and departing vehicles, an average speed of 5 miles per hour was conservatively assumed for travel within the parking garage. 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 and the *de minimis* criteria, CO concentrations were determined for the maximum 8-hour average period.

To determine pollutant levels near the vents, the exhaust from the parking 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 exhaust, and determining the appropriate initial horizontal and vertical dispersion coefficients at the vent faces. Background concentrations were then added to the modeling results to obtain the total ambient levels at each receptor location. The on-street traffic concentrations were not included because the receptor locations that could potentially be affected by the rooftop garage exhaust would not be affected by on-street traffic exhaust.

Since there are no specific garage designs for the proposed actions at this time, worst-case assumptions for air quality modeling were made regarding the design of the garage's mechanical ventilation systems. The exhaust from the parking garage was assumed to be vented through a single outlet vent at a height of 105 feet, which would be the height of the shortest building on Parcel C of Site A under the RWCDS. Receptors were considered at the height of the assumed vent on nearby windows or air intake vents, on a building directly across 2nd Street, and on a building directly across 54th Avenue from the assumed vent location. A persistence factor of 0.7 was used to convert the calculated 1-hour average maximum concentrations to 8-hour averages, accounting for meteorological variability over the average 8-hour period.

STATIONARY SOURCES

A stationary source analysis was conducted to evaluate potential air quality impacts from fossil fuel-fired equipment systems at the project sites under the RWCDS. In addition, an assessment was conducted to determine the potential for impacts due to industrial uses near the proposed project sites and potential impacts from an accidental chemical spill at the proposed school's laboratories.

HVAC SCREENING ANALYSIS

A screening analysis was performed to assess air quality impacts associated with emissions from heating, ventilation, and air conditioning (HVAC) systems associated with the proposed actions. Each development parcel (Parcels A through G on Site A and the north and south parcels on Site B) would include fossil fuel-fired heating and hot water systems. The methodology described in the *CEQR Technical Manual* was used for the analysis of the HVAC systems and considered impacts on sensitive uses (existing residential development, other residential developments under construction independent of the proposed actions, and the project sites). The *CEQR* methodology determines the threshold of development size below which the action would not have a significant adverse impact. The screening procedures use information regarding the type of fuel to be used, the maximum development size, and the boiler 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.

The potential for impacts from proposed tower elements of the new buildings (elements with a height greater than 125 feet) was analyzed using information on the gross floor area, building heights, and building-to-building distances of the RWCDS. For mid-rise portions of project buildings, worst-case assumptions were made regarding the floor area and height of a generic mid-rise building. The potential for impacts from the HVAC system for the proposed school was also analyzed. It was assumed that any building shorter than 85 feet would not have a potential for significant adverse impact, provided that No. 2 oil or natural gas would be used as the HVAC fuel and that the HVAC exhaust stack would be located in accordance with the applicable New York City building code; therefore, no screening analysis was performed for these developments. The potential for impacts from the proposed tower located on Parcel A of Site A on the existing Avalon Riverview building (which is located to the north of Site A) was also assessed, as it would be the nearest taller use to the proposed tower on Parcel A of Site A.

INDUSTRIAL SOURCES

Pollutants emitted from the exhaust vents of existing permitted industrial facilities were examined to identify potential adverse impacts on future residents of the proposed actions. All industrial air pollutant emission sources within 400 feet of Sites A and B were considered for inclusion in the air quality impact analyses.

A request was made to NYCDEP's Bureau of Environmental Compliance (BEC) and NYSDEC to obtain the most current information regarding the release of air pollutants from all existing manufacturing or industrial sources within the entire study area. The NYCDEP and NYSDEC air permit data provided were compiled into a database of source locations, air emission rates, and other data pertinent to determining source impacts. A comprehensive search was also performed to identify NYSDEC Title V permits and permits listed in the EPA Envirofacts database.[1] Facilities that appeared in the Envirofacts database but did not also possess a NYCDEP certificate to operate were cross-referenced against NYSDEC's Air Guide-1 software emissions database, which presents a statewide compilation of permit data for toxic air pollutants, to obtain emissions data and stack parameters.

A field survey was conducted to determine the operating status of permitted industries and identify any potential industrial sites not included in the permit databases. The results of the field survey were compared against NYCDEP data sources.

After compiling the information on facilities with manufacturing or process operations in the study area, maximum potential pollutant concentrations from different sources, at various distances from the proposed development parcels, were estimated based on the screening database in the *CEQR Technical Manual*. The database provides factors for estimating maximum concentrations based on emissions levels at the source, which were derived from generic ISCST3 dispersion modeling for the New York City area. Impact distances selected for each source were the minimum distances between the property boundary of the development parcels and the source sites. Predicted worst-case impacts on the proposed development parcels were compared with the short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs) recommended in NYSDEC's DAR-1 AGC/SGC tables. These guidelines present the airborne concentrations that are applied as a screening threshold to determine if the future residents of the projected development sites could be significantly impacted by 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 Sites A and B were combined and compared to the guideline concentrations discussed above.

CHEMICAL SPILL ANALYSIS

Introduction

Emissions from the proposed school's fume hood exhaust system, in the event of an accidental chemical spill in a laboratory, were analyzed. Impacts were evaluated using information, procedures, and methodologies contained in the *CEQR Technical Manual*. Maximum concentrations were compared to the short-term exposure levels (STELs) or to the ceiling levels

[1] EPA, Envirofacts Data Warehouse, http://oaspub.epa.gov/enviro/ef_home2.air

recommended by the U.S. Occupational Safety and Health Administration (OSHA) for the chemicals examined. It is assumed that the types and quantities of materials that are to be used in the proposed school are those typically used in school science laboratories at New York City Department of Education schools.

The following section details the expected usage of potentially hazardous chemicals, as well as the systems that would be employed at the proposed school to ensure the safety of the students, staff, and the surrounding community in the event of an accidental chemical spill in the science laboratories. A quantitative analysis employing mathematical modeling was performed to determine potential impacts on nearby places of public access (dispersion modeling) and potential impacts due to recirculation into the school's air intake systems (recirculation modeling).

Laboratory Fume Hood Exhausts

All school laboratories in which potentially hazardous chemicals would be used would be equipped with fume hoods. Fume hoods are enclosures that are maintained under negative pressure and continuously vented to the outside. Their function is to protect teachers, staff, and students from potentially harmful fumes. By providing a continuous exhaust from laboratory rooms, they also prevent any fumes released within the laboratory from escaping into other areas of the building or through windows to the outside. The dilution that takes place in the hood ensures that receptors on buildings neighboring the school would not be affected in the event of an accidental chemical spill at the school.

Since specific design plans for the proposed school are not available at this time, conservative assumptions were made regarding the fume hood exhausts. It was assumed that there would be a single fume hood exhaust located along the lower, 70-foot portion of the proposed school building. The fume hood exhaust height was conservatively assumed to be 3 feet above the rooftop of the shortest roof of the proposed school building, at 73 feet, based on the RWCDS. An exhaust fan sufficient to maintain a minimum exit velocity of 1,500 feet per minute through a 12-inch diameter stack discharge was assumed, as was a 1.11 square meter lab spill area.

Planned Operations

An inventory of chemicals that may be present in a typical laboratory in the proposed school was examined. From the chemical inventory, 10 chemicals were selected for further examination, based on their toxicity and potential for air quality impacts. Common buffers, salts, enzymes, nucleotides, peptides, and other biochemicals were not considered in the analysis since they are not typically categorized as air pollutants. Nonvolatile chemicals (having a vapor pressure of less than 10 mm Hg) were excluded as well. **Table 18-4** shows the chemicals selected. The vapor pressure shown for each chemical is a measure of the material's volatility—its tendency to evaporate, or to form fumes or vapors, which is a critical parameter in determining potential impacts from chemical spills. The exposure standards (OSHA permissible exposure limit [PEL], National Institute for Occupational Safety and Health [NIOSH], immediately dangerous to life or health [IDLH], and OSHA and/or NIOSH short-term exposure level [STEL] and ceiling values) are measures of the material's toxicity—more toxic substances have lower exposure standards.

Table 18-4
Chemicals that Would be Used in the Proposed School Laboratories

Chemical [CAS]	Vapor Pressure mm Hg	PEL PPM	STEL PPM	IDLH PPM	Ceiling PPM
Acetic Acid [64-19-7]	11	10	15	50	10
Acetone [67-64-1]	180	1,000	-	2,500	250
Cyclohexene [110-83-8]	67	300	-	2000	300
Ether [60-29-7]	440	400	-	1,900	-
Ethyl Alcohol [64-17-5]	44	1,000	-	3,300	1,000
Hydrofluoric Acid [7664-39-3]	25	3	-	30	6
Methyl Alcohol [67-56-1]	96	200	250	6,000	200
Nitric Acid [7697-37-2]	48	2	4	25	2
Petroleum distillates (Naphtha) [80002-05-9]	40	500	-	1,100	1,800
Toluene [108-88-3]	21	200	150	500	300

Notes:
PEL—Permissible Exposure Limit; Time Weighted Average (TWA) for up to a 10-hour workday during a 40-hour work week.
STEL—Short-Term Exposure Limit is a 15-minute TWA exposure that should not be exceeded at any time during a workday.
IDLH—Immediately Dangerous to Life or Health.
Ceiling—Level set by NIOSH or OSHA not to be exceeded in any working exposure.
PPM = parts per million.
Where a hyphen (-) appears there is no recommended corresponding guideline value.

Estimates of Worst-Case Emission Rates

The dispersion of chemicals from a spill within a proposed laboratory was analyzed to assess the potential for exposure of the general public and of students and staff in the school to chemical fumes in the event of an accident. Evaporation rates for volatile chemicals expected to be used in the proposed laboratories were estimated using the model developed by the Shell Development Company[1]. The Shell model, which was developed specifically to assess air quality impacts from chemical spills, calculates evaporation rates based on physical properties of the material, temperature, and rate of air flow over the spill surface. Room temperature conditions (20° C) and an air-flow rate of 0.5 meters/second were assumed for calculating evaporation rates.

Based on relative STELs and the vapor pressures of the chemicals listed in **Table 18-4**, the most potentially hazardous chemical, shown in **Table 18-5**, was selected for the worst-case spill analysis. Besides the relative toxicities, other factors, such as molecular weight, container size, and frequency of use, were also considered. Chemicals with high vapor pressures evaporate most rapidly. The chemical selected also has the lowest STEL. Since the chemical selected for detailed analysis is most likely to have a relatively higher emission rate and the lowest exposure standards, if the analysis of this chemical resulted in no significant impacts, it would indicate that the other chemicals listed in **Table 18-4** would also not present any significant potential impacts.

Table 18-5
Chemical Selected for Worst-Case Spill Analysis

Chemical	Quantity (liters)	Evaporation Rate (gram/meter^2/sec)	Emission Rate* (gram/sec)
Nitric Acid	0.01	0.266	0.296

Note: * Average emission rate.

[1] Fleischer, M.T., *An Evaporation/Air Dispersion Model for Chemical Spills on Land,* Shell Development Company, December 1980.

The analysis conservatively assumes that a full container of the chemical would be spilled in a fume hood. For a spill area of approximately 1.1 square meters, the emission rates were determined using the evaporation rates. For modeling purposes, the emission rate shown in **Table 18-4** is calculated for a 15-minute time period. The vapor from the spill would be drawn into the fume hood exhaust system and released into the atmosphere via the roof exhaust fans. The high volume of air drawn through this system provides a high degree of dilution for chemical fumes before they are released above the roof.

Recirculation Modeling

The potential for recirculation of the fume hood emissions back into the building air intakes was assessed using the Wilson method.[1] This empirical procedure, which has been verified by both wind-tunnel and full-scale testing, is a refinement of the 1981 ASHRAE Handbook procedure, and takes into account such factors as plume momentum, stack-tip downwash, and cavity recirculation effects. The procedure determines the worst-case, absolute minimum dilution between exhaust vent and air intake. Three separate effects determine the eventual dilution: internal system dilution, obtained by combining exhaust streams (i.e., mixing in plenum chambers of multiple exhaust streams, introduction of fresh air supplied from roof intakes); wind dilution, dependent on the distance from vent to intake and the exit velocity; and dilution from the stack, caused by stack height and plume rise from vertical exhaust velocity. The critical wind speed for worst-case dilution is dependent on the exit velocity, the distance from vent to intake, and the cross-sectional area of the exhaust stack.

Dispersion Modeling

The study performed also considered the impact of an accidental spill on nearby receptors, such as open windows on nearby buildings. Maximum concentrations at elevated receptors downwind of the fume exhausts were estimated using the EPA INPUFF model, version 2.0.[2] This is the only EPA model designed to estimate impacts from short-term releases and was used to develop the EPA guidelines.[3] INPUFF assumes a Gaussian dispersion of a pollutant "puff" (a brief release, as opposed to a continuous one) as it is transported downwind of a release point. Stable atmospheric conditions and a 1-meter/second wind speed were assumed.

E. EXISTING CONDITIONS

AMBIENT CONCENTRATIONS

Ambient concentrations of SO_2, NO_2, CO, ozone, lead, PM_{10}, and $PM_{2.5}$ measured at monitoring stations closest to the project sites are shown in **Table 18-6**. These values represent the maximum concentrations recorded during 2006 at the specified representative monitoring stations. In the case of the 8-hour ozone and 24-hour $PM_{2.5}$, concentrations reflect the most recent three years of data, consistent with the basis for these standards. There were no monitored violations of NAAQS at

[1] D.J. Wilson, *A Design Procedure for Estimating Air Intake Contamination from Nearby Exhaust Vents*, ASHRAE TRAS 89, Part 2A, pp. 136-152, 1983.

[2] Peterson, W.B., *A Multiple Source Gaussian Puff Dispersion Algorithm—Users Guide*, EPA, 600/8-86-024, August 1986.

[3] EPA, *Chemical Emergency Preparedness Program, Interim Guidance*, November 1985.

these monitoring sites at the time the concentrations were recorded. The 8-hour ozone concentration slightly exceeds the recently revised ozone NAAQS, which is not yet in effect.

Table 18-6
Maximum Criteria Pollutant Concentrations Recorded at Representative Monitoring Stations in 2006

Pollutant	Monitoring Station	Units	Averaging Period	Concentration
CO	Queens College 2, Queens	ppm	8-hour	1.8
			1-hour	2.5
SO_2	Queens College 2, Queens	$\mu g/m^3$	Annual	13
			24-hour	66
			3-hour	121
PM_{10}	P.S. 219, Queens	$\mu g/m^3$	24-hour[1]	57
$PM_{2.5}$	P.S. 219, Queens	$\mu g/m^3$	Annual	13
			24-hour	34
NO_2	Queens College 2, Queens	$\mu g/m^3$	Annual	43
Lead	J.H.S. 126, Brooklyn	$\mu g/m^3$	3-month	0.02
Ozone	Queens College 2, Queens	ppm	8-hour	0.079
			1-hour[2]	0.11

Notes:
[1] The annual PM_{10} standard was revoked by EPA.
[2] The 1-hour ozone NAAQS has been replaced with the 8-hour standard; however, the maximum monitored concentration is provided for informational purposes. EPA has reduced the 8-hour standard to 0.075 down from 0.08 ppm, effective May 2008.
Source: NYSDEC, 2006 New York State Ambient Air Quality Data.

MODELED CO CONCENTRATIONS FOR EXISTING TRAFFIC CONDITIONS

As noted previously, receptors were placed at multiple sidewalk locations next to the intersections selected for the 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 analyzed.

Table 18-7 shows the maximum modeled existing (2007) CO 8-hour average concentrations at the receptor sites. (No 1-hour values are shown since predicted values are much lower than the 1-hour standard of 35 ppm.) At all receptor sites, the maximum predicted 8-hour average concentrations are well below the national standard of 9 ppm.

Table 18-7
Modeled Existing 8-Hour Average CO Concentrations (2007)

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	49th Avenue and Jackson Avenue/11th Street	AM	3.4
		PM	3.4
2	Borden Avenue and Vernon Boulevard	AM	2.4
		PM	2.4
3	Borden Avenue and 2nd Street	AM	1.9
		PM	1.9
4	Borden Avenue and Van Dam Street	AM	5.4
		PM	5.4

Note: 8-hour standard (NAAQS) is 9 ppm.

F. THE FUTURE WITHOUT THE PROPOSED ACTIONS

MOBILE SOURCES

CARBON MONOXIDE

CO concentrations in the future without the proposed actions were determined for the 2017 Build year using the methodology previously described. **Table 18-8** shows future maximum predicted 8-hour average CO concentrations at the analyzed intersections in 2017 without the proposed actions. The values shown are the highest predicted concentrations for the receptor locations for any of the time periods analyzed.

As shown in **Table 18-8**, 2017 CO concentrations without the proposed actions are predicted to be well below the 8-hour CO standard of 9 ppm and lower than modeled existing average concentrations (shown in **Table 18-7**).

PARTICULATE MATTER

PM concentrations without the proposed actions were determined for the 2017 Build year using the methodology previously described. **Table 18-9** presents the future maximum predicted 24-hour average PM_{10} concentrations at the analyzed intersections in 2017 without the proposed actions. The values shown are the highest predicted concentrations for the receptor locations. $PM_{2.5}$ concentrations without the proposed actions are assessed on an incremental basis. Therefore the results of the $PM_{2.5}$ analysis are shown in section G, "Probable Impacts of the Proposed Actions."

Table 18-8
Future Modeled 8-Hour Average CO
Concentrations Without the Proposed Actions (2017)

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)
1	49th Avenue and Jackson Avenue/11th Street	AM	3.4
		PM	3.3
2	Borden Avenue and Vernon Boulevard	AM	2.5
		PM	2.6
3	Borden Avenue and 2nd Street	AM	2.0
		PM	1.9
4	Borden Avenue and Van Dam Street	AM	5.2
		PM	5.6

Note: 8-hour standard (NAAQS) is 9 ppm.

Table 18-9
Future Modeled 24-Hour PM_{10}
Concentrations Without the Proposed Actions (2017)

Receptor Site	Location	Concentration ($\mu g/m^3$)
3	Borden Avenue and 2nd Street	52.79

Note: NAAQS—24-hour average 150 µg/m3. The annual average standard was revoked in 2006.

STATIONARY SOURCES

In the future without the proposed actions by 2017, it is assumed that the project sites would remain in their current condition. On Site A, Tennisport, the New York Water Taxi landing, and Water Taxi Beach would continue their operations, and the vacant land would remain undeveloped. On Site B, NBC would remain on site, and another tenant with similar manufacturing and warehouse operations as Anheuser-Busch would likely occupy the existing building on Site B, as discussed in Chapter 1, "Project Description." Therefore, emissions from HVAC sources would likely be similar to existing conditions. The sources of industrial emissions would also not change significantly within and around the project sites.

G. PROBABLE IMPACTS OF THE PROPOSED ACTIONS

The proposed actions would result in increased emissions from mobile sources in the immediate vicinity of the project sites, emissions from proposed parking facility exhausts, and emissions from fuel combustion in HVAC equipment that would be required to heat and cool the proposed actions' future uses. The results of the studies performed to analyze the potential impacts from these sources for the 2017 Build year are described below. In addition, existing industrial facilities were assessed for their potential to cause adverse impacts on the proposed actions. Changes in traffic data as a result of the additional traffic analysis to be conducted between completion of the Draft and Final EIS, as described in Chapter 16, "Traffic and Parking," will be reflected in the air quality analysis and presented in the Final EIS.

MOBILE SOURCE ANALYSIS

CARBON MONOXIDE

CO concentrations with the proposed actions were determined for the 2017 Build year at traffic intersections using the methodology previously described. **Table 18-10** 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 NAAQS 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 receptors analyzed. The results indicate that the proposed actions would not result in any violations of the 8-hour CO standard. In addition, the incremental increases in 8-hour average CO concentrations would be very small and consequently would not exceed the CEQR *de minimis* CO criteria. (The *de minimis* criteria are described above in section C, "Air Quality Regulations, Standards, and Benchmarks.")

Table 18-10
Future Modeled 8-Hour Average CO Concentrations
With and Without the Proposed Actions

Receptor Site	Location	Time Period	8-Hour Concentration (ppm)	
			Without the Actions	With the Actions
1	49th Avenue and Jackson Avenue/11th Street	AM	3.4	3.6
		PM	3.3	3.5
2	Borden Avenue and Vernon Boulevard	AM	2.5	3.1
		PM	2.6	3.2
3	Borden Avenue and 2nd Street	AM	2.0	2.7
		PM	1.9	2.9
4	Borden Avenue and Van Dam Street	AM	5.2	5.9
		PM	5.6	6.3

Note: 8-hour standard (NAAQS) is 9 ppm.

The potential for combined impacts from the Queens Midtown Tunnel toll plaza and tunnel portals were analyzed at Site 2. As discussed in the methodology section, the CO concentration associated with the toll plaza and the tunnel portal was obtained from a recent report prepared for the environmental assessment of proposed toll crossing change increases. The analysis used EPA's MOBILE6.2 emissions model and included vehicle emissions on the Long Island Expressway in the east- and west-bound directions, portal emissions from the Queens Midtown Tunnel vehicles and idle emissions from vehicles queuing at the toll plaza in both directions. In addition, vehicle emissions on Borden Avenue and the Pulaski Bridge were modeled for inclusion as background in the dispersion model. The 8-hour average modeled CO concentration reported in the toll plaza study, excluding the monitoring station background, is 3.3 ppm. Adding this concentration to the maximum modeled CO concentration at Site 2 of 3.2 ppm (see **Table 18-10**) results in a maximum cumulative impact of 6.5 ppm. This is a very conservative approach, because it assumes that the maximum impacts from the two analyses would occur at the same receptor, and double-counts a portion of the on-street emissions along Borden Avenue. Since there are no predicted violations of the CO 8-hour standard, no significant adverse air quality impacts are predicted at Site 2 with the inclusion of emissions from the Queens Midtown Tunnel toll plaza and tunnel portals.

PARTICULATE MATTER

PM concentrations with the proposed actions were determined for the 2017 Build year using the methodology previously described. **Table 18-11** shows the future maximum predicted 24-hour average PM_{10} concentrations without and with the proposed actions.

Table 18-11
Future Modeled 24-Hour Average PM_{10} Concentrations (2017)

Receptor Site	Location	24-Hour Concentration ($\mu g/m^3$)[1]	
		Without the Actions	With the Actions
3	Borden Avenue and 2nd Street	52.79	56.45

Note: [1] NAAQS—24-hour average 150 $\mu g/m^3$.

The values shown are the highest predicted concentrations for any of the receptors analyzed. The results indicate that the proposed actions would not result in any violations of the PM_{10} standard at any of the receptor locations analyzed.

Future maximum predicted 24-hour and annual average $PM_{2.5}$ concentration increments with the proposed actions were determined so that they could be compared with the interim guidance criteria and the potential significance of the impacts of the proposed actions could be assessed. Based on this analysis, the maximum predicted localized 24-hour average and neighborhood-scale annual average $PM_{2.5}$ concentration increments are presented in **Tables 18-12** and **18-13**, respectively. The results show that the annual and daily (24-hour) $PM_{2.5}$ increments are predicted to be well below the updated NYCDEP interim guidance criteria and, therefore, the proposed actions would not result in significant adverse $PM_{2.5}$ impacts at the analyzed receptor locations.

Table 18-12
Future (2017) Modeled 24-Hour Average $PM_{2.5}$ Concentration Increments

Receptor Site	Location	Increment
3	Borden Avenue and 2nd Street	0.12

Notes:
EPA has lowered the NAAQS to 35 µg/m^3, effective December 18, 2006.
$PM_{2.5}$ interim guidance criteria—24-hour average, > 2 µg/m^3 (5 µg/m^3 not-to-exceed value), based on the magnitude, frequency duration, location, and size of the area of the predicted concentrations.

Table 18-13
Future (2017) Neighborhood-Scale Annual Average $PM_{2.5}$ Concentration Increments

Receptor Site	Location	Increment
3	Borden Avenue and 2nd Street	0.02

Notes:
NAAQS—annual average 15 µg/m^3.
$PM_{2.5}$ interim guidance criteria—annual average (neighborhood scale) 0.1 µg/m3.

PARKING FACILITIES

Using the methodology in the *CEQR Technical Manual*, the maximum predicted future CO concentrations (with ambient background levels) at sensitive receptors closest to the exhaust for the proposed garage on Site A, Parcel C would be 2.6 ppm for the 8-hour period. Maximum predicted total CO concentrations near the garage ventilation exhaust across 2nd Street and across 54th Avenue are presented in **Table 18-14**. The total concentrations include the maximum background concentration of 1.8 ppm. These maximum predicted CO levels would be in compliance with the applicable CO national ambient air quality standards and the CO *de minimis* criteria. Since the proposed garage on Parcel C would not result in significant adverse air quality impacts under worst-case assumptions, it is concluded that other garages that would be constructed with the proposed actions, with smaller capacities and fewer peak hour trips, would similarly not result in any significant adverse air quality impacts.

Table 18-14
Total 8-Hour CO Concentrations Near Garage Ventilation Outlets (ppm)

Garage Site	Peak Period	Across 2nd Street	Across 54th Avenue	On Nearby Window or Air Intake
Site A, Parcel C	AM	2.1	2.1	2.3
	PM	2.2	2.3	2.6

Notes: The concentrations include the background concentration of 1.8 ppm.

STATIONARY SOURCES

HVAC SYSTEMS

As described previously, the HVAC analysis for the proposed actions was performed using the *CEQR Technical Manual* screening procedure and the information on the RWCDS. Since information on the type of fuel(s) to be used for HVAC equipment is not known at this time, an initial assumption of No. 4 oil was used for potential tower and mid-rise developments, in accordance with the *CEQR Technical Manual*.

The results of the screening analyses determined that there would be no significant adverse air quality impacts from the proposed actions' HVAC systems. However, at certain locations restrictions would be required to ensure that no significant adverse air quality impacts would occur, as follows:

- To avoid the potential impacts from Site A, Parcel E, the proposed tower buildings above a total height of 125 feet on Site A, Parcel E must ensure that the HVAC stack(s) is located at least 100 feet from any taller building windows, open spaces, or air intakes when firing No. 2 oil, and at least 80 feet from any taller building windows, open spaces, or air intakes when firing natural gas. No. 4 oil and No. 6 oil would be prohibited.
- To avoid the potential for impact on the proposed tower which would be on Site A, Parcel B, the proposed school on Site A, Parcel B must use natural gas as the fuel for the HVAC system and locate the HVAC exhaust stack at least 70 feet from any taller building windows, open spaces, or air intakes. No. 2 oil, No. 4 oil, and No. 6 oil would be prohibited.
- To account for the range of possible mid-rise development sizes (85 feet to 125 feet) and stack locations, very conservative assumptions were made regarding the gross square foot area and stack heights analyzed. The mid-rise building with the greatest gross floor area and the shortest building height was assumed in the analysis. The results of the analysis determined that to avoid the potential for adverse significant impacts on air quality, proposed mid-rise buildings must locate the HVAC exhaust stack at least 120 feet from any taller building windows, open spaces, or air intakes if using No. 2 oil or at least 100 if using natural gas. No. 4 oil and No. 6 oil would be prohibited.
- All low-rise buildings in the entire rezoning area would be restricted to using No. 2 oil or natural gas as fuel for HVAC systems, and No. 4 oil and No. 6 oil would be prohibited.

A Memorandum of Understanding (MOU) between the New York City entity in control of Site A and NYCDEP will restrict fuel type and stack locations as specified above to ensure that no significant adverse air quality impacts would occur. If a portion of Site A is disposed of to a private entity, the MOU will require the private entity to record a Restrictive Declaration against the property to ensure that these required measures are implemented.

An (E) Designation would set forth requirements for fuel type on Site B to ensure that no significant adverse air quality impacts for the buildings' heating, ventilation, and air conditioning systems would occur.

Since very conservative assumptions were made regarding the proposed mid-rise and low-rise buildings, in some cases the restrictions may be overly stringent. Further detailed dispersion air quality modeling could be used when more precise building and site plans are available to modify or remove the restrictions that are found to be overly conservative. The technical details of the HVAC system analyses are provided in **Appendix 18**.

INDUSTRIAL SOURCE ANALYSIS

Shown in **Table 18-15** are the maximum predicted short-term and annual concentrations of pollutants emitted by industrial sources, and the short-term (1-hour) and annual guideline concentrations for these pollutants.

Table 18-15
Contaminant Concentrations Resulting From Businesses With BEC Permits

Potential Contaminants	Estimated Short-term Impact ($\mu g/m^3$)	SGC ($\mu g/m^3$)	Estimated Annual Impact ($\mu g/m^3$)	AGC ($\mu g/m^3$)
Ethyl Alcohol	40	N/A	0.02	45,000
Methanol	824	33,000	1.2	4,000
Isopropanol	930	98,000	1.8	7,000
Acetone	328	180,000	0.9	28,000
Methyl Chloroform	638	68,000	0.6	1,000
Methyl Ethyl Ketone	906	13,000	1.5	5,000
Propylene Glycol Monomethyl Ether	40	55,000	0.02	2,000
Methyl Isobutyl Ketone	1,038	31,000	0.8	3,000
Isopropyl Acetate	32	84,000	0.001	1,000
Toluene	583.6	37,000	1.2	5,000
Isobutyl Acetate	77	N/A	0.1	17,000
Ethylen Glycol Monbutyl Ether	44	14,000	0.2	13,000
Dioctyl Phthalate	184	N/A	0.2	0.42
Di(2-Ethylhexyl)phthalate	95	N/A	0.3	0.42
Butyl Acetate	474	95,000	0.4	17,000
Ethyl Acetate	32	N/A	0.001	3,400
Xylene, M, O&P Mixture	1,320	4,300	1.6	100
Naptha	365	N/A	0.5	3,800
Nitrocellulose	4.7	N/A	0.003	N/A
Mineral spirits	77	N/A	0.1	N/A
Hydrocarbons	540	N/A	1.7	N/A
Particulates	293	380	0.8	45

Notes:
[a] NYS DEC DAR-1 (Air Guide-1) AGC/SGC Tables, September 2007.
AGC-Annual Guideline Concentrations
SGC-Short-term Guideline Concentrations

CHEMICAL SPILL ANALYSIS

Recirculation Analysis

Assuming a 3-foot-high, 12-inch-diameter stack and an exhaust velocity of 1,500 feet per minute, the recirculation analysis indicates that the minimum potential dilution factor between the fan exhaust and the nearest air intake allowable by the building code is over 330 (i.e., pollutant concentrations at the nearest intake to the exhaust fan would be 1/330th the concentration at the fan). Additional dilution would occur within the stack, so that the concentration at the stack exhaust would be significantly lower than concentrations at the location of the spill. Thus, a nitric acid spill in a fume hood as described above would produce a maximum concentration at the nearest intake location of about 0.6 parts per million (ppm).

Therefore, a spill in a fume hood as described above would produce a maximum concentration at the nearest intake location well below the corresponding STELs set by OSHA and/or NIOSH for any of the chemicals in **Table 18-4**.

Dispersion Analysis

The results of the analysis of emissions from the proposed school's fume hood exhaust system are shown below in **Table 18-16**. The maximum concentration at elevated receptors downwind of the fume exhausts was estimated using the methodology previously described. The maximum concentration found at a sensitive receptor would be below the STEL level.

Table 18-16
Maximum Predicted Recirculation Concentration (ppm)

Chemical	STEL	15-Minute Average
Nitric Acid	2	0.0115

Because the maximum concentrations at the receptor of highest impact would be much lower than the corresponding impact thresholds, there would be no significant impact on air quality from potential spills in the school laboratory hoods.

CONSISTENCY WITH NEW YORK STATE AIR QUALITY IMPLEMENTATION PLAN

As addressed above, maximum predicted CO concentrations with the proposed actions would be less than the applicable ambient air standards. Therefore, the proposed actions would be consistent with the New York SIP for the control of CO. ✷