

A. INTRODUCTION

This chapter examines the potential for direct and indirect air quality impacts associated with the Lambert Houses project. Direct impacts stem from emissions generated by stationary sources at a project site, such as emissions from on-site fuel combustion for heating and hot water systems. Indirect impacts include emissions from motor vehicle trips (“mobile sources”) generated by the project or other changes to future traffic conditions due to a project.

With respect to mobile sources, the maximum projected hourly incremental traffic with the proposed development would exceed the 2014 *City Environmental Quality Review (CEQR) Technical Manual* carbon monoxide (CO) screening threshold of 170 peak hour trips at one nearby intersection in the study area, and the fine particulate matter (PM_{2.5}) emission screening threshold discussed in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*. Therefore, a mobile source analysis for these pollutants was performed.

The proposed project would include natural gas-fired heat and hot water systems for the proposed buildings. Therefore, a stationary source analysis was conducted to evaluate the potential for an impact on air quality with the proposed heating and hot water systems. In addition, portions of the Development Site are located near a zoned industrial area; therefore, air quality impacts from nearby industrial sources of air pollution (e.g., from manufacturing or processing facilities) were examined. In addition, an analysis of nearby large and major sources of emissions on the proposed project was performed.

As described in this chapter, the mobile source analyses determined that concentrations of CO and fine particulate matter less than ten microns in diameter (PM₁₀) due to project-generated traffic at intersections would not result in any violations of National Ambient Air Quality Standards (NAAQS), and furthermore, CO concentrations were predicted to be below *CEQR de minimis* criteria. The results show that the daily (24-hour) and annual PM_{2.5} increments are predicted to be below the *de minimis* criteria.

Based on the stationary source analysis that considered the effect of nitrogen dioxide (NO₂) and particulate matter (PM) emissions from the proposed project’s fossil fuel-fired combustion sources, there would be no potential for significant adverse impacts on air quality. At certain project buildings restrictions would be required to ensure the proposed developments would not result in any significant air quality impacts from fossil fuel-fired heat and hot water systems emissions. In addition, there would be no significant adverse air quality impacts from industrial facilities on the proposed project. The analysis of nearby large and major sources of emissions determined that there would be no significant adverse air quality impact on the proposed project.

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 CO are predominantly influenced by mobile source emissions. PM, volatile organic compounds (VOCs), and nitrogen oxides (nitric oxide, or NO, and NO₂, 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 SO₂ are associated mainly with stationary sources, and some sources utilizing non-road diesel such as large international marine engines. On-road diesel vehicles currently contribute very little to SO₂ 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. Ambient concentrations of CO, PM, NO₂, SO₂, and lead are regulated by the U.S. Environmental Protection Agency (EPA) under the Clean Air Act (CAA), and are referred to as “criteria pollutants.” Emissions of VOCs, NO_x, and other precursors to criteria pollutants are also regulated by EPA.

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. CO concentrations can diminish rapidly 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 result in changes in traffic patterns and an increase in traffic volumes. Therefore, a mobile source analysis was conducted at critical intersection in the study area to evaluate future CO concentrations with and without the proposed project.

NITROGEN OXIDES, VOCs, AND OZONE

NO_x are of principal concern because of their role, together with VOCs, as precursors in the formation of ozone. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Because the reactions are slow, and occur as the pollutants are advected downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of NO_x and VOC emissions from all sources are therefore generally examined on a regional basis. The contribution of any action or project to regional emissions of these pollutants would include any added stationary or mobile source emissions.

The proposed project would not have a significant effect on the overall volume of vehicular miles traveled in the metropolitan area; thus, no measurable impact on regional NO_x emissions or on ozone levels is predicted. Consistent with *CEQR Technical Manual* guidelines, an analysis of emissions of these pollutants from mobile sources was therefore not warranted.

In addition to being a precursor to the formation of ozone, NO₂ (one component of NO_x) is also a regulated pollutant. Since NO₂ is mostly formed from the transformation of NO in the atmosphere, it has mostly been of concern further downwind from large stationary point sources, and not a local concern from mobile sources. (NO_x emissions from fuel combustion consist of approximately 90 percent NO and 10 percent NO₂ at the source.) However, with the promulgation of the 2010 1-hour average standard for NO₂, local sources such as vehicular emissions may become of greater concern for this pollutant.

In terms of emissions of NO₂ from mobile sources, the relatively small increase in the number of project vehicles as compared to existing or No Build traffic in the study area would not be expected to significantly affect levels of NO₂ experienced near roadways; therefore, no analysis is considered necessary.

Potential impacts on local NO₂ concentrations from the fuel combustion for the proposed project's heating and hot water systems were evaluated.

LEAD

Airborne lead emissions are currently associated principally with industrial sources. Lead in gasoline has been banned under the Clean Air Act, and therefore, lead is not a pollutant of concern for the proposed project. Therefore, an analysis of this pollutant was not warranted.

RESPIRABLE PARTICULATE MATTER—PM₁₀ 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 VOCs; salt particles resulting from the evaporation of sea spray; wind-borne pollen, fungi, molds, algae, yeasts, rusts, bacteria, and material from live and decaying plant and animal life; particles eroded from beaches, soil, and rock; and particles emitted from volcanic and geothermal eruptions and from forest fires. Naturally occurring PM is generally greater than 2.5 micrometers in diameter. Major anthropogenic sources include the combustion of fossil fuels (e.g., vehicular exhaust, power generation, boilers, engines, and home heating), chemical and manufacturing processes, all types of construction, agricultural activities, as well as wood-burning stoves and fireplaces. PM also acts as a substrate for the adsorption (accumulation of gases, liquids, or solutes on the surface of a solid or liquid) of other pollutants, often toxic, and some likely carcinogenic compounds.

As described below, PM is regulated in two size categories: particles with an aerodynamic diameter of less than or equal to 2.5 micrometers (PM_{2.5}), and particles with an aerodynamic diameter of less than or equal to 10 micrometers (PM₁₀, which includes PM_{2.5}). PM_{2.5} has the ability to reach the lower regions of the respiratory tract, delivering with it other compounds that adsorb to the surfaces of the particles, and is also extremely persistent in the atmosphere. PM_{2.5} is mainly derived from combustion material that has volatilized and then condensed to form primary PM (often soon after the release from a source exhaust) or from precursor gases reacting in the atmosphere to form secondary PM.

Diesel-powered vehicles, especially heavy duty trucks and buses, are a significant source of respirable PM, most of which is PM_{2.5}; PM concentrations may, consequently, be locally elevated near roadways with high volumes of heavy diesel powered vehicles.

An analysis was conducted to assess the worst case PM impacts due to the increased traffic associated with the proposed project.

The proposed project's combustion sources would result in emissions of PM; therefore, potential 24-hour and annual incremental impacts of PM_{2.5} from the fossil fuel-fired heating and hot water systems were evaluated.

SULFUR DIOXIDE

SO₂ emissions are primarily associated with the combustion of sulfur-containing fuels (oil and coal). SO₂ is also of concern as a precursor to PM_{2.5} and is regulated as a PM_{2.5} precursor under the New Source Review permitting program for large sources. Due to the federal restrictions on the sulfur content in diesel fuel for on-road and non-road vehicles, no significant quantities are emitted from vehicular sources. Vehicular sources of SO₂ are not significant and therefore, analysis of SO₂ from mobile sources was not warranted.

As part of the proposed project, natural gas would be burned in the proposed heat and hot water systems. The sulfur content of natural gas is negligible; therefore, no analysis was performed to estimate the future levels of SO₂ with the proposed project.

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, NO₂, ozone, respirable PM (both PM_{2.5} and PM₁₀), SO₂, and lead. The primary standards represent levels that are required 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 standards are generally either the same as the secondary standards or more restrictive. The NAAQS are presented in **Table 13-1**. The NAAQS for CO, annual NO₂, and 3-hour SO₂ 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 PM, settleable particles, non-methane hydrocarbons, 24-hour and annual SO₂, and ozone which correspond to federal standards that have since been revoked or replaced, and for the noncriteria pollutants beryllium, fluoride, and hydrogen sulfide.

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 µg/m³ to 35 µg/m³ and retaining the level of the annual standard at 15 µg/m³. The PM₁₀ 24-hour average standard was retained and the annual average PM₁₀ standard was revoked. EPA later lowered the primary annual PM_{2.5} average standard from 15 µg/m³ to 12 µg/m³, effective March 2013.

EPA has also revised the 8-hour ozone standard, lowering it from 0.08 to 0.075 parts per million (ppm), effective as of May 2008, and the previous 1997 ozone standard was fully revoked effective April 1, 2015. Effective December 2015, EPA further reduced the 2008 ozone NAAQS, lowering the primary NAAQS from the current 0.075 ppm to 0.070 ppm. EPA expects to issue final area designations by October 1, 2017; those designations likely would be based on 2014-2016 air quality data.

EPA lowered the primary and secondary standards for lead to 0.15 µg/m³, effective January 12, 2009. EPA revised the averaging time to a rolling 3-month average and the form of the standard to not-to-exceed across a 3-year span.

Table 13-1

National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary		Secondary	
	ppm	µg/m ³	ppm	µg/m ³
Carbon Monoxide (CO)				
8-Hour Average ⁽¹⁾	9	10,000	None	
1-Hour Average ⁽¹⁾	35	40,000		
Lead				
Rolling 3-Month Average ⁽²⁾	NA	0.15	NA	0.15
Nitrogen Dioxide (NO₂)				
1-Hour Average ⁽³⁾	0.100	189	None	
Annual Average	0.053	100	0.053	100
Ozone (O₃)				
8-Hour Average ^(4,5)	0.070	140	0.070	140
Respirable Particulate Matter (PM₁₀)				
24-Hour Average ⁽¹⁾	NA	150	NA	150
Fine Respirable Particulate Matter (PM_{2.5})				
Annual Mean ⁽⁶⁾	NA	12	NA	15
24-Hour Average ⁽⁷⁾	NA	35	NA	35
Sulfur Dioxide (SO₂) ⁽⁸⁾				
1-Hour Average ⁽⁹⁾	0.075	196	NA	NA
Maximum 3-Hour Average ⁽¹⁾	NA	NA	0.50	1,300
Notes: ppm – parts per million (unit of measure for gases only) µg/m ³ – micrograms per cubic meter (unit of measure for gases and particles, including lead) NA – not applicable All annual periods refer to calendar year. Standards are defined in ppm. Approximately equivalent concentrations in µg/m ³ are presented. (1) Not to be exceeded more than once a year. (2) EPA has lowered the NAAQS down from 1.5 µg/m ³ , effective January 12, 2009. (3) 3-year average of the annual 98th percentile daily maximum 1-hr average concentration. Effective April 12, 2010. (4) 3-year average of the annual fourth highest daily maximum 8-hr average concentration. (5) EPA has lowered the NAAQS down from 0.075 ppm, effective December 2015. (6) 3-year average of annual mean. EPA has lowered the primary standard from 15 µg/m ³ , effective March 2013. (7) Not to be exceeded by the annual 98th percentile when averaged over 3 years. (8) EPA revoked the 24-hour and annual primary standards, replacing them with a 1-hour average standard. Effective August 23, 2010. (9) 3-year average of the annual 99th percentile daily maximum 1-hr average concentration. Source: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards.				

EPA established a 1-hour average NO₂ standard of 0.100 ppm, effective April 12, 2010, in addition to the annual standard. The statistical form is the 3-year average of the 98th percentile of daily maximum 1-hour average concentration in a year.

EPA also established a 1-hour average SO₂ standard of 0.075 ppm, replacing the 24-hour and annual primary standards, effective August 23, 2010. The statistical form is the 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour concentrations (the 4th highest daily maximum corresponds approximately to 99th percentile for a year.)

Federal ambient air quality standards do not exist for noncriteria pollutants; however, as mentioned above, the New York State Department of Environmental Conservation (NYSDEC) has issued standards for three noncriteria compounds. NYSDEC has also developed a guidance document DAR-1 (February 2014), which contains a compilation of annual and short term (1-

hour) guideline concentrations for numerous other noncriteria compounds. The NYSDEC guidance thresholds represent ambient levels that are considered safe for public exposure.

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS

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

In 2002, EPA re-designated New York City as in attainment for CO. Under the resulting maintenance plans, New York City is 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. The second CO maintenance plan for the region was approved by EPA on May 30, 2014.

The five New York City counties and Nassau, Suffolk, Rockland, Westchester, and Orange Counties had been designated as a PM_{2.5} NAA (New York Portion of the New York–Northern New Jersey–Long Island, NY–NJ–CT NAA) in 2004 under the CAA due to exceedance of the 1997 annual average standard, and was also nonattainment with the 2006 24-hour PM_{2.5} NAAQS in 2009. The area was redesignated as in attainment for the 2006 24-hour PM_{2.5} NAAQS on April 18, 2014, and is now under a maintenance plan. In addition, EPA designated the area as in attainment for the new 12 µg/m³ annual NAAQS effective April 15, 2015.

Effective June 15, 2004, EPA designated Nassau, Rockland, Suffolk, Westchester and the five New York City counties (NY portion of the New York–Northern New Jersey–Long Island, NY–NJ–CT, NAA) as moderate non-attainment areas for the 1997 8-hour average ozone standard (0.08 ppm). Based on recent monitoring data, EPA determined that the NY–NJ–CT nonattainment area has attained the 1997 8-hour ozone NAAQS. Although not yet a redesignation to attainment status, this determination removes further requirements under the 1997 8-hour standard. In March 2008 EPA strengthened the 8-hour ozone standards. EPA designated the New York–Northern New Jersey–Long Island, NY–NJ–CT NAA as a marginal non-attainment area for the 2008 ozone NAAQS, effective July 20, 2012. In June, 2012 and again in March, 2015 New York State formally requested that the EPA reclassify the area as a moderate NAA. New York State began submitting SIP documents in December 2014.

New York City is currently in attainment of the annual average NO₂ standard. EPA has designated the entire state of New York as “unclassifiable/attainment” of the 1-hour NO₂ standard effective February 29, 2012. Since additional monitoring is required for the 1-hour standard, areas will be reclassified once three years of monitoring data are available (likely 2017).

EPA established a 1-hour SO₂ standard, replacing the former 24-hour and annual standards. Based on the available monitoring data, all New York State counties currently meet the 1-hour standard. Draft attainment designations were published by EPA in February 2013, indicating that EPA is deferring action to designate areas in New York State and expects to proceed with designations once additional monitoring data are gathered.

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The New York State Environmental Quality Review Act (SEQRA) regulations and *CEQR Technical Manual* indicate that the significance of a predicted consequence of a project (i.e., whether it is material, substantial, large or important) should be assessed in connection with its setting (e.g., urban or rural), its probability of occurrence, its duration, its irreversibility, its geographic scope, its magnitude, and the number of people affected.¹ In terms of the magnitude of air quality impacts, any action predicted to increase the concentration of a criteria air pollutant to a level that would exceed the concentrations defined by the NAAQS (see **Table 13-1**) 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.

CO DE MINIMIS CRITERIA

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

PM_{2.5} DE MINIMIS CRITERIA

New York City uses *de minimis* criteria to determine the potential for significant adverse PM_{2.5} impacts under CEQR are as follows:

- Predicted increase of more than half the difference between the background concentration and the 24-hour standard;
- Annual average PM_{2.5} concentration increments which are predicted to be greater than 0.1 µg/m³ at ground level on a neighborhood scale (i.e., the annual increase in concentration representing the average over an area of approximately 1 square kilometer, centered on the location where the maximum ground-level impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating neighborhood scale monitoring stations); or
- Annual average PM_{2.5} concentration increments which are predicted to be greater than 0.3 µg/m³ at a discrete receptor location (elevated or ground level).

Actions under CEQR predicted to increase PM_{2.5} concentrations by more than the above *de minimis* criteria will be considered to have a potential significant adverse impact.

¹ *CEQR Technical Manual*, Chapter 1, section 222, March 2014; and State Environmental Quality Review Regulations, 6 NYCRR § 617.7

The *de minimis* criteria have been used to evaluate the significance of predicted impacts of the proposed project on PM_{2.5} concentrations.

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 project 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 project.

VEHICLE EMISSIONS

Engine Emissions

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

Vehicle classification data were based on field studies. Appropriate credits were used to accurately reflect the inspection and maintenance program.³ County-specific hourly temperature and relative humidity data obtained from NYSDEC were used.

Road Dust

PM_{2.5} emission rates were determined with fugitive road dust to account for their impacts in local microscale analyses. However, fugitive road dust was not included in the neighborhood

² EPA, MOVES Model, User Guide for MOVES2014a, November 2015.

³ 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.

scale $PM_{2.5}$ microscale analyses, since it is considered to be an insignificant contribution on that scale. Road dust emission factors were calculated according to the latest procedure delineated by EPA⁴ and the *CEQR Technical Manual*.

TRAFFIC DATA

Traffic data for the air quality analysis were derived from existing traffic counts, projected future growth in traffic, and other information developed as part of the traffic analysis for the proposed project (see Chapter 12, “Transportation”). Traffic data for the future No Action and With-Action conditions were used for the respective air quality modeling scenarios. The weekday morning (7:30 to 8:30 AM), weekday midday (1 to 2 PM), and weekday evening (4:15 to 5:15 PM) peak periods were analyzed for $PM_{2.5}$. Only the weekday morning peak period was analyzed for CO. These time periods were selected for the mobile source analysis because they produce the maximum anticipated project-generated traffic and, therefore, have the greatest potential for significant air quality impacts.

For $PM_{2.5}$, the weekday morning (AM), weekday midday (MD), and weekday evening (PM), peak period traffic volumes were used as a baseline for determining off-peak volumes. Off-peak traffic volumes in the No Action condition and off-peak increments from the proposed project were determined by adjusting the peak period volumes by the 24-hour distributions of actual vehicle counts collected at appropriate locations.

DISPERSION MODEL FOR MICROSCALE ANALYSES

Particulate matter concentrations adjacent to streets within the surrounding area, resulting from vehicle emissions were predicted using the CAL3QHCR model, Version 2.0⁵, which is an extended module of the CAL3QHC model. The CAL3QHC model employs a Gaussian (normal distribution) dispersion assumption and includes an algorithm for estimating vehicular queue lengths at signalized intersections. CAL3QHC calculates dispersion of emissions from idling and moving vehicles. The queuing algorithm includes site-specific traffic parameters, such as signal timing and delay (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 project the number of idling vehicles. The CAL3QHCR module allows for the incorporation of hourly meteorological data into the modeling, instead of worst-case assumptions regarding meteorological parameters and is therefore more appropriate 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).

⁴ EPA, Compilations of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources, Ch. 13.2.1, NC, <http://www.epa.gov/ttn/chief/ap42>, January 2011.

⁵ 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.

Following EPA guidelines⁶, 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 consist of surface data collected at LaGuardia Airport and upper air data collected at Brookhaven, New York for the period 2010–2014. All hours were modeled, and the highest resulting concentration for each averaging period is presented.

ANALYSIS YEAR

The microscale analyses were performed for 2029, the year by which the proposed project is likely to be completed. The future analysis was performed both without the proposed project (the No Action condition) and with the proposed project (the With-Action condition).

BACKGROUND CONCENTRATIONS

Background concentrations are those pollutant concentrations originating from distant sources that are not directly included in the modeling analysis, which directly accounts for vehicular emissions on the streets within 1,000 feet and in the line of sight of the analysis site. Background concentrations are added to modeling results to obtain total pollutant concentrations at an analysis site.

The background concentrations for the area of the development site are presented in **Table 13-2**. PM_{2.5} annual average impacts are assessed on an incremental basis and compared with the PM_{2.5} *de minimis* criteria, without considering the annual background. Therefore the annual PM_{2.5} background is not presented in the table. PM_{2.5} 24-hour average background concentration of 25.7 µg/m³ (based on the 2012 to 2014 average of 98th percentile concentrations measured at the Botanical Garden monitoring station) was used to establish the *de minimis* value for the 24-hour increment, consistent with the guidance provided in the *CEQR Technical Manual*.

Table 13-2
Maximum Background Pollutant Concentrations
For Mobile Source Sites (µg/m³)

Pollutant	Average Period	Location	Concentration	NAAQS
CO	1-hour	Botanical Garden	3.0	35 ppm
	8-hour	Botanical Garden	1.7	9 ppm
PM _{2.5}	24-hour	Botanical Garden	25.7	35
PM ₁₀	24-hour	IS 52/ Morrisania	35	150
Notes: Consistent with the NAAQS, PM ₁₀ concentrations are the 2nd highest of the latest 3 years; CO is the 2nd highest of the latest 5 years.				
Sources: New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2010–2014.				

The 24-hour average background for PM₁₀ is based on the second highest annual concentration measured during the 2012 to 2014 period, consistent with the NAAQS. CO concentrations are based on the latest available five years of monitored data (2010–2014).

ANALYSIS SITES

Intersections in the study area were reviewed for microscale analysis based on the *CEQR Technical Manual* guidance. The incremental traffic volumes for the AM, MD, and PM periods

⁶ *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas*, EPA Office of Transportation and Air Quality, Publication EPA-420-B-10-040, December 2010.

were reviewed and intersections with increments exceeding the CO and PM screening thresholds were identified. Of those intersections, two were selected for microscale analysis (see **Table 13-3**): Site 1 was selected because the project-generated traffic exceeds the CO *CEQR Technical Manual* screening threshold in the AM period; Site 2 was selected because the project-generated traffic exceeds the PM_{2.5} *CEQR Technical Manual* screening threshold.

Table 13-3
Mobile Source Analysis Intersections

Analysis Site	Location	Pollutant Analyzed
1	East Tremont Avenue and Boston Road/ West Farms Road	CO
2	East Tremont Avenue and Devoe Avenue/ East 177th Street	PM ₁₀ , PM _{2.5}

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. Ground-level receptors were placed at sidewalk or roadside locations near intersections with continuous public access, at a pedestrian height of 1.8 meters. For predicting annual average neighborhood-scale PM_{2.5} concentrations, receptors were placed at a distance of 15 meters from the nearest moving lane at each analysis location, based on the DEP guidance for neighborhood-scale corridor PM_{2.5} modeling.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

A stationary source analysis was conducted to evaluate potential impacts from the proposed project's heating and hot water systems. The combustion equipment would use natural gas exclusively. A refined dispersion modeling was performed, as described in this section.

Since building specific design information was not yet available, conservative assumptions were used for boiler equipment which would be used to provide building space heating and domestic hot water. It was assumed that the combustion equipment would utilize natural gas exclusively.

It was assumed that each of the project buildings would have individual boiler installations, except for each of the contiguous buildings, Buildings 1C/1D (Parcel 1), 3B/3C (Parcel 3) and 5A/5B (Parcel 5), for which it was assumed there would be a central boiler installation with the exhaust stack located on the roof of the taller building. For the other buildings, the boiler stack was assumed to exhaust to a single location on the tallest portion of the building.

Annual emission rates for the heating and hot water systems were calculated based on fuel usage estimates, using energy consumption estimates based on type of development and buildings' size (in square feet) as recommended in the *CEQR Technical Manual*, and applying the EPA's *Compilations of Air Pollutant Emission Factors (AP-42)*⁷ emission factors for natural gas-fired boilers. The short-term emission rates were calculated by scaling the annual emissions to account for a 100-day heating season. To avoid potential significant adverse air quality impacts, the heating and hot water systems for Buildings 1B, 1C/1D, 3B/3C and the School building were

⁷ EPA, *Compilations of Air Pollutant Emission Factors AP-42*, Fifth Edition, Volume I: Stationary Point and Area Sources, <http://www.epa.gov/ttn/chief/ap42>

analyzed assuming the natural gas-fired boilers would also be equipped with low NO_x burners using the emission factor presented in *AP-42*.

Table 13-4 presents the stack parameters and emission rates used in the analysis for the proposed buildings.

Dispersion Modeling

Potential impacts from the proposed project's combustion system emissions were evaluated using the EPA AERMOD dispersion model. AERMOD is a state-of-the-art dispersion model, applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including point, area, and volume sources). AERMOD is a steady-state plume model that incorporates current concepts about flow and dispersion in complex terrain, including updated treatments of the boundary layer theory, understanding of turbulence and dispersion, and includes handling of the interaction between the plume and terrain.

The AERMOD model calculates pollutant concentrations from one or more points (e.g., exhaust stacks) based on hourly meteorological data, and has the capability to calculate 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 analyses of potential impacts from exhaust stacks were made assuming stack tip downwash, urban dispersion and surface roughness length, with and without building downwash, and elimination of calms.

The AERMOD model also incorporates the algorithms from the PRIME model, which is designed to predict impacts in the "cavity region" (i.e., the area around a structure that under certain conditions may affect an exhaust plume, causing a portion of the plume to become entrained in a recirculation region). The Building Profile Input Program (BPIP) for the PRIME model (BPIPRM) was used to determine the projected building dimensions modeling with the building downwash algorithm enabled. The modeling of downwash from sources accounts for all obstructions within a radius equal to five obstruction heights of the stack.

The analysis was performed both with and without downwash in order to assess the worst-case impacts at elevated receptors close to the height of the sources, which would occur without downwash, as well as the worst-case impacts at lower elevations and ground level, which would occur with downwash, consistent with the recommendations in the *CEQR Technical Manual*.

Annual NO₂ concentrations from emission sources were estimated using a NO₂ to NO_x ratio of 0.75, as described in EPA's *Guideline on Air Quality Models* at 40 CFR part 51 Appendix W, Section 5.2.4.⁸ 1-hour average NO₂ concentrations were estimated following guidance for assessing compliance with NAAQS.⁹ 1-Hour average NO₂ concentration increments from the HVAC systems were estimated using AERMOD model's Plume Volume Molar Ratio Method (PVMRM) module to analyze chemical transformation within the model. The PVMRM module incorporates hourly background ozone concentrations to estimate NO_x transformation within the source plume. Ozone concentrations were taken from the nearest available NYSDEC ozone monitoring stations, i.e., the Botanical Garden monitoring station in Bronx, for the years 2010-2014. An initial NO₂ to NO_x ratio of 10 percent was used for the boilers, which is considered representative for this source type.

⁸ http://www.epa.gov/scram001/guidance/guide/appw_05.pdf

⁹ EPA Memorandum, "Additional Clarification Regarding Application of Appendix W, Modeling Guidance for the 1-Hour NO₂ National Ambient Air Quality Standard," March 1, 2011.

Table 13-4
Boiler Stack Parameters and Emission Rates

Parameter		Building											
		1A	1B	1C/1D ⁽²⁾	3A	3B/3C ⁽²⁾	3D	3E	3F	5A/5B ⁽²⁾	10A	School (Parcel 10)	Retail and Supermarket (Parcel 10)
Building Size (gsf)		148,846	114,473	280,158	162,241	244,811	173,125	83,092	146,335	331,924	146,477	86,608	44,568
Base Elevation (ft)		37.6	35.5	35.5	46.9	34.3	34.0	38.3	38.3	31.1	17.3	17.3	27.2
Mechanical Roof Bulkhead (ft) ⁽³⁾		171.8	132.2	149.5	197.1	133.8 ⁽⁴⁾	161.7	99.4	101.6	180.9	159.1	59	20.3
Stack Exhaust Height (ft)		174.8	135.2	152.5	200.1	143.8	164.7	102.4	104.6	183.9	169.1	62	23.3
Height Above Mechanical Roof Bulkhead (ft)		3	3	3	3	10	3	3	3	3	10	3	3
Stack Exhaust Temp. (°F) ⁽⁶⁾		300	300	300	300	300	300	300	300	300	300	300	300
Stack Exhaust Diameter (ft) ⁽⁶⁾		1.0	1.0	1.5	1.0	1.5	1.0	1.0	1.0	1.5	1.0	1.0	1.0
Stack Exhaust Flow (ACFM) ⁽¹⁾⁽⁵⁾		950	731	1,788	1,035	1,562	1,105	530	934	2,118	935	553	284
Stack Exhaust Velocity (ft/s) ⁽⁵⁾		20.2	15.5	16.9	22.0	14.7	23.4	11.3	19.8	20.0	19.8	11.7	6.0
Fuel Type		Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas	Gas
Lb/hr	NO _x (1-hour)	0.363	0.139	0.341	0.395	0.298	0.422	0.202	0.357	0.809	0.357	0.106	0.109
	NO _x (Annual)	0.099	0.038	0.094	0.108	0.082	0.116	0.055	0.098	0.222	0.098	0.029	0.030
	PM (24-hour)	0.028	0.021	0.052	0.030	0.045	0.032	0.015	0.027	0.061	0.027	0.016	0.008
	PM ₂₅ (Annual)	0.008	0.006	0.014	0.008	0.012	0.009	0.004	0.007	0.017	0.007	0.004	0.002
Notes: (1) ACFM = actual cubic feet per minute. (2) Size (gsf) presented is the combined size of the two buildings. (3) Roof height presented is the height above the average curb level. (4) The stack is located on the roof; hence the height presented is the roof height and not the bulkhead height. (5) The stack exhaust flow rate and velocity are estimated based on the type of fuel and heat input rate. (6) The stack exhaust diameter and temperature are based on data obtained from a survey of New York City boilers from buildings of a similar size.													

The methodology used to determine the compliance of total 1-hour NO₂ concentrations from the proposed sources with the 1-hour NO₂ NAAQS¹⁰ was based on adding the monitored background to modeled concentrations, as follows: hourly modeled concentrations from proposed sources were first added to the seasonal hourly background monitored concentrations; then the highest combined daily 1-hour NO₂ concentration was determined at each receptor location and the 98th percentile daily 1-hour maximum concentration for each modeled year was calculated within the AERMOD model; finally the 98th percentile concentrations were averaged over the latest five years. This refined approach is recognized as being conservative by EPA and the City and is referenced in EPA modeling guidance.

Meteorological Data

The meteorological data set consisted of five consecutive years of meteorological data: surface data collected at La Guardia Airport (2010–2014) and concurrent upper air data collected at Brookhaven, New York. The meteorological data provide hour-by-hour wind speeds and directions, stability states, and temperature inversion elevation over the five-year period. These data were processed using the EPA AERMET program to develop data in a format which can be readily processed by the AERMOD model. The land uses around the site where meteorological surface data were available were classified using categories defined in digital United States Geological Survey (USGS) maps to determine surface parameters used by the AERMET program.

Receptor Placement

A comprehensive receptor network (i.e., locations with continuous public access) was developed for the modeling analyses. Discrete receptors were analyzed, including locations on the proposed project and other nearby buildings, to represent potentially sensitive locations such as operable windows, intakes, balconies etc.. The model also included sidewalk receptors in order to address more distant locations and to identify the highest ground-level impact.

Background Concentrations

To estimate the maximum expected total pollutant concentrations, the calculated impacts from the emission sources must be added to a background value that accounts for existing pollutant concentrations from other sources (see **Table 13-5**). The background levels are based on concentrations monitored at the nearest NYSDEC ambient air monitoring stations over a recent five-year period for which data are available (2010-2014), with the exception of PM₁₀, which is based on three years of data (2012-2014), consistent with current New York City Department of Environmental Protection (DEP) guidance. For the 24-hour PM₁₀ concentration the highest second-highest measured values over the specified period were used. The annual average background values are the highest measured average concentrations for these pollutants. The measured background concentration was added to the predicted contribution from the modeled source to determine the maximum predicted total pollutant concentration.

PM_{2.5} impacts are assessed on an incremental basis and compared with the PM_{2.5} *de minimis* criteria. The PM_{2.5} 24-hour average background concentration of 25.7 µg/m³ (based on the 98th percentile concentrations, averaged over 2012 to 2014) was used to establish the *de minimis* value, consistent with the *CEQR Technical Manual*.

¹⁰http://www.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf

Table 13-5

Maximum Background Pollutant Concentrations for Stationary Source Analysis

Pollutant	Average Period	Location	Concentration ($\mu\text{g}/\text{m}^3$)	NAAQS ($\mu\text{g}/\text{m}^3$)
NO ₂	1-Hour	Botanical Garden, Bronx	-- ⁽¹⁾	188
NO ₂	Annual	Botanical Garden, Bronx	39.2	100
PM ₁₀	24-hour	IS 52/ Morrisania, Bronx	35	150
PM _{2.5}	24-hour	Botanical Garden, Bronx	25.7	35
Note: (1) The 1-Hour NO ₂ background concentration is not presented in the table since the AERMOD model determines the total 98th percentile 1-Hour NO ₂ concentration at each receptor, so a single representative background concentration is not used. Source: New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2010–2014.				

INDUSTRIAL SOURCES

To assess air quality impacts on the proposed project due to emissions from nearby industrial sources, an investigation was conducted. Initially, land use and Sanborn maps were reviewed to identify potential sources of emissions from manufacturing/industrial operations. A search of the DEP's Bureau of Environmental Compliance (BEC) air permits was performed to determine whether manufacturing or industrial emissions occur. In addition, a search of federal and state-permitted facilities within a 400-foot study area was conducted using the U.S. Environmental Protection Agency's (EPA) Envirofacts database. A field survey was conducted to identify buildings within 400 feet of the Development Site that have the potential for emitting air pollutants. The survey was conducted on July 1, 2015.

A request was made to DEP-BEC to obtain the certificates of operation for identified locations of potential industrial source emissions, to determine whether manufacturing or industrial emissions occur. No businesses were found to have a DEP certificate of operation within the study area. Therefore, no analysis was required.

ADDITIONAL SOURCES

The *CEQR Technical Manual* requires an analysis of projects that may result in a significant adverse impact due to certain types of new uses located near a "large" or "major" emissions source. Major sources are defined as those located at facilities that have a Title V or Prevention of Significant Deterioration air permit, while large sources are defined as those located at facilities that require a State Facility Permit.

To assess the potential effects of these types of existing sources on the proposed project, a review of existing permitted facilities was conducted. Within a 1,000-foot study area boundary (the distance referenced in the *CEQR Technical Manual*), sources permitted under the NYSDEC Title V and State Facility Permit programs were considered. One facility with a State Facility Permit was identified: the NYCT West Farms Bus Depot, located at 1100 East 177th Street, which is approximately 800 feet from the Development Site. According to the permit, the facility operates two 12.55 million Btu/hr boilers, each capable of burning natural gas or No. 2 fuel oil and three 800 horsepower (hp) natural gas-fired compressor engines. The boilers and the compressor engines are ducted to individual stacks. The facility also operates two diesel generators rated at 350 hp and 670 hp which operate as part of New York Power Authority's (NYPA) Peak Load Management program for demand response. The two generators are limited to 50 hours per year operation as part of the permit condition. The facility NO_x emissions are capped at 24.9 tons per year as per the State Facility Permit.

Pollutant concentrations were estimated from this facility to evaluate its potential impact on the proposed project. The AERMOD dispersion model was used in the analysis. Based on the information provided by NYCT, short-term emissions from the NYCT West Farms Bus Depot were based on one boiler operating on No.2 fuel oil at 100 percent maximum operating load capacity and two compressor engines operating at 100 percent load capacity, while annual emissions were based on one boiler operating on No.2 fuel oil at 75 percent maximum operating load capacity and two compressor engines operating at 61 percent load capacity, based on the information provided by NYCT. The boiler assumptions are considered conservative since the second boiler is a stand-by unit, and based on the recent fuel usage estimates provided by NYCT, the boilers predominantly burn natural gas rather than No. 2 fuel oil.

Pollutant concentrations were estimated from this facility on the proposed project. The facility emissions were estimated using the information developed for the State Facility Permit application, and applying the EPA's *Compilations of Air Pollutant Emission Factors (AP-42)*¹¹ emission factors for No. 2 fuel oil fired boiler. For compressor engines, SO₂, and PM₁₀/PM_{2.5} emission rates were calculated from EPA emission factors while NO_x emission rate was based on stack test emission factor provided in the state facility permit. **Table 13-6** presents the emission rates and stack parameters used in the analysis of the NYCT facility.

Table 13-6

Stack Parameters and Emission Rates from the NYCT West Farms Bus Depot

Parameter	Boiler	Compressor Engine ⁽²⁾
Stack Height (ft) ⁽³⁾	45	6
Stack Diameter (ft) ⁽³⁾	1.83	0.83
Exhaust flow Rate (acfm) ⁽¹⁾	3,467.5 ⁽⁴⁾	4,790 ⁽⁵⁾
Exhaust Temperature (°F)	300	823 ⁽⁵⁾
Fuel Type	Fuel Oil No. 2	Natural Gas
NO ₂ Emission Rate (1-hour) (Lb/hr)	1.810	3.602
NO ₂ Emission Rate (Annual) (Lb/hr)	1.357	2.197
SO ₂ Emission Rate (1-hour) (Lb/hr)	0.019	0.003
SO ₂ Emission Rate (3-hour) (Lb/hr)	0.019	0.003
PM ₁₀ Emission Rate (24-hour) (Lb/hr)	0.215	0.059
PM _{2.5} Emission Rate (24-hour) (Lb/hr)	0.193	0.059
PM _{2.5} Emission Rate (Annual) (Lb/hr)	0.145	0.036
Notes: (1) ACFM = actual cubic feet per minute. (2) Information presented is per engine. (3) The stack exhaust diameter and height is from the State Facility Permit. (4) The stack exhaust flow rate is estimated based on the type of fuel and heat input rate. (5) The stack exhaust flow rate and temperature are based on similar sized equipment.		

E. EXISTING CONDITIONS

Monitored background concentrations of SO₂, NO₂, CO, ozone, lead, PM₁₀ and PM_{2.5} for the study area are shown in **Table 13-7**. These values are the most recent monitored data that have been made available by NYSDEC. All data statistical forms and averaging periods are consistent with the definitions of the NAAQS. It should be noted that these values are somewhat different than the background concentrations presented in **Table 13-5**, above.

¹¹ EPA, *Compilations of Air Pollutant Emission Factors AP-42*, Fifth Edition, Volume I: Stationary Point and Area Sources, <http://www.epa.gov/ttn/chief/ap42>

Table 13-7
Representative Monitored Ambient Air Quality Data

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	Botanical Garden, Bronx	ppm	8-hour	1.3	9
			1-hour	2.2	35
SO ₂	Botanical Garden, Bronx	µg/m ³	3-hour	67.3	1,300
			1-hour	58.1	196
PM ₁₀	IS 52, Bronx	µg/m ³	24-hour	29	150
PM _{2.5}	Botanical Garden, Bronx	µg/m ³	Annual	9.3	12
			24-hour	25.7	35
NO ₂	Botanical Garden, Bronx	µg/m ³	Annual	32.4	100
			1-hour	109	188
Lead	IS 52, Bronx	µg/m ³	3-month	0.004	0.15
Ozone	Botanical Garden, Bronx	ppm	8-hour	0.071	0.075
Notes: Based on the NAAQS definitions, the CO and 3-hour SO ₂ concentrations for short-term averages are the second-highest from the year. PM _{2.5} annual concentrations are the average of 2012, 2013, and 2014, and the 24-hour concentration is the average of the annual 98th percentiles in 2012, 2013 and 2014. 8-hour average ozone concentrations are the average of the 4th highest-daily values from 2012 to 2014. SO ₂ 1-hour and NO ₂ 1-hour concentrations are the average of the 99th percentile and 98th percentile, respectively, of the highest daily 1-hour maximum from 2012 to 2014. Source: NYSDEC, New York State Ambient Air Quality Data.					

These existing concentrations are based on recent published measurements, averaged according to the NAAQS (e.g., PM_{2.5} concentrations are averaged over the three years); the background concentrations are the highest values in past years, and are used as a conservative estimate of the highest background concentrations for future conditions.

There were no monitored violations of NAAQS at these monitoring sites in 2014.

F. FUTURE WITHOUT THE PROPOSED PROJECT

MOBILE SOURCES

CO and PM₁₀ concentrations No Action were determined for the 2029 No Action conditions using the methodology previously described. **Table 13-8** shows the maximum predicted 8-hour average total CO concentration, including background concentrations, at Site 1 for the No Action condition.

Table 13-8
Maximum Predicted 8-Hour Average
No Action CO Concentrations

Analysis Site	Location	Time Period	8-Hour Concentration (ppm)
1	East Tremont Avenue and Boston Road/ West Farms Road	AM	2.0
Notes: 8-hour standard (NAAQS) is 9 ppm. Concentration includes a background concentration of 1.7 ppm.			

As shown in **Table 13-8**, the maximum No Action concentration is predicted to be well below the 8-hour CO standard of 9 ppm.

Table 13-9 presents the maximum predicted total PM₁₀ 24-hour concentration, including background concentrations, at the analyzed intersection for the No Action condition. The value shown is the highest predicted concentration for the receptor locations.

Table 13-9
Maximum Predicted 24-Hour Average
PM₁₀ No Action Concentrations (µg/m³)

Analysis Site	Location	Concentration
2	East Tremont Avenue and Devoe Avenue/ East 177th Street	39.97
Notes: NAAQS—24-hour average 150 µg/m ³ . Concentration includes a background concentration of 35.0 µg/m ³ .		

PM_{2.5} concentrations for the No Action condition are not presented, since impacts are assessed on an incremental basis.

STATIONARY SOURCES

In the future without the proposed project, it is expected that no changes would occur, and the Development Site will continue in active use as in the existing condition. Therefore, in the future without the proposed project, heating and hot water emissions in the area will be similar to existing conditions.

G. PROBABLE IMPACTS OF THE PROPOSED PROJECT

MOBILE SOURCES

CO concentrations for future conditions with the proposed project were predicted using the methodology previously described. **Table 13-10** shows the maximum predicted 8-hour average CO concentrations at the intersection 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 concentrations. The results indicate that the proposed project would not result in any violations of the 8-hour CO standard. In addition, the incremental increase in 8-hour average CO concentrations is very small, and consequently would not result in a violation of the *CEQR de minimis* CO criteria. Therefore, mobile source CO emissions from the proposed project would not result in a significant adverse impact on air quality.

Table 13-10
Maximum Predicted 8-Hour Average
CO With-Action Concentrations (ppm)

Analysis Site	Location	Time Period	No Action	With Action	Increment	De Minimis
1	East Tremont Avenue and Boston Road/ West Farms Road	AM	2.0	2.2	0.2	5.5
Notes: 8-hour standard is 9 ppm. Concentration includes a background concentration of 1.7 ppm.						

PM₁₀ concentrations with the proposed project were also determined. **Table 13-11** presents the predicted PM₁₀ 24-hour concentrations at the analyzed intersection. The values shown are the highest predicted concentrations for the modeled receptor locations and include background concentrations.

Table 13-11
Maximum Predicted 24-Hour Average
PM₁₀ With-Action Concentrations (µg/m³)

Analysis Site	Location	No Action	With Action
2	East Tremont Avenue and Devoe Avenue/ East 177th Street	39.97	40.21
Notes: NAAQS—24-hour average 150 µg/m ³ . Concentration includes a background concentration of 35.0 µg/m ³ .			

Using the methodology previously described, maximum predicted 24-hour and annual average PM_{2.5} concentration increments were calculated so that they could be compared with the *de minimis* criteria. Based on this analysis, the maximum predicted localized 24-hour average and neighborhood-scale annual average incremental PM_{2.5} concentrations are presented in **Tables 13-12 and 13-13**, respectively.

Table 13-12
Maximum Predicted 24-Hour Average
PM_{2.5} Incremental Concentrations

Receptor Site	Location	Increment (µg/m ³)	De Minimis (µg/m ³)
2	East Tremont Avenue and Devoe Avenue/ East 177th Street	0.1	4.7
Note: PM _{2.5} <i>de minimis</i> criteria — 24-hour average, not to exceed more than half the difference between the background concentration and the 24-hour standard of 35 µg/m ³ .			

Table 13-13
Maximum Predicted Annual Average
PM_{2.5} Incremental Concentrations (µg/m³)

Receptor Site	Location	Increment
2	East Tremont Avenue and Devoe Avenue/ East 177th Street	0.01
Note: PM _{2.5} <i>de minimis</i> criteria—annual (neighborhood scale), 0.1 µg/m ³ .		

The results show that the annual and daily (24-hour) PM_{2.5} increments are predicted to be below the *de minimis* criteria. Therefore, there would be no potential for significant adverse impacts on air quality from vehicle trips generated by the proposed project.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

Table 13-14 shows maximum overall predicted concentrations for NO₂ and PM₁₀ from the proposed project's heating and hot water systems, which were predicted to occur on elevated receptor locations on the proposed project's buildings. Maximum predicted concentrations on other existing buildings as well as at ground level receptors were much lower. As shown in the table, the maximum predicted pollutant concentrations, when added to ambient background levels, are below the NAAQS for each of the pollutant time averaging periods.

Table 13-14
Future Maximum Modeled NO₂ and PM₁₀ Concentrations
from the Proposed Project (in µg/m³)

Pollutant	Averaging Period	Concentration Due to Stack Emission	Maximum Background Concentration	Total Concentration	Standard
NO ₂	Annual ⁽¹⁾	2.0	39.2	41.2	100
	1-hour ⁽²⁾	-	-	183.3	188
PM ₁₀	24-hour	4.6	35	39.6	150

Notes:

(1) Annual NO₂ impacts were estimated using a NO₂/NO_x ratio of 0.75.

(2) Reported concentration is the maximum total 98th percentile concentration at any receptor using seasonal-hourly background concentrations.

The air quality modeling analysis also determined the highest predicted increases in PM_{2.5} concentrations. The maximum predicted 24-hour and localized annual average incremental PM_{2.5} concentrations are presented in **Table 13-15**. Maximum PM_{2.5} concentrations were predicted at proposed Building 5A. As shown in the table, the maximum 24-hour incremental concentration at any discrete receptor location would be less than the applicable *de minimis* criteria. On an annual basis, the maximum projected PM_{2.5} increments would be less than the applicable *de minimis* criterion of 0.3 µg/m³ for local impacts and 0.1 µg/m³ for neighborhood scale impacts.

Table 13-15
Future Maximum Predicted PM_{2.5} Concentrations from the Proposed Project (in µg/m³)

Pollutant	Averaging Period	Maximum Concentration	De Minimis
PM _{2.5}	24-hour	4.63	4.7 ⁽¹⁾
	Annual (discrete)	0.23	0.3
	Annual (Neighborhood Scale)	0.01	0.1

Note:

(1) PM_{2.5} *de minimis* criteria — 24-hour average, not to exceed more than half the difference between the background concentration and the 24-hour standard of 35 µg/m³.

However, to ensure that there are no significant adverse impacts of PM_{2.5} and 1-hour NO₂ from the proposed project's heating and hot water emissions, certain restrictions would be required through the mapping of an "E" designation for air quality on each parcel. The requirements of the "E" designation would be as follows:

- **Parcel 1 (Block 3138, Lot 1), Parcel 3 (Block 3132, Lot 1), Parcel 5 (Block 3140, Lot 7) and Parcel 10 (Block 3139, Lots 1 and 19)**

Any new development on the above-referenced property must ensure that fossil fuel-fired heating and hot water equipment utilize only natural gas.

PARCEL 1 (BLOCK 3138, LOT 1)

- **Building 1B**
Any new development on the above-referenced property must ensure that heating and hot water equipment exhaust stack(s) are located at least 135 feet above grade, and located at least 144 feet away from any operable windows or air intakes on the tallest portion of the approved massing envelope for proposed Building 1A, and must be fitted with low NO_x burners with a maximum emission concentration of 41 ppm, to avoid any potential significant air quality impacts.
- **Building 1C and 1D**
Any new development on the above-referenced property must ensure that heating and hot water equipment exhaust stack(s) are located at least 153 feet above grade, and must be fitted with low NO_x burners with a maximum emission concentration of 41 ppm, to avoid any potential significant air quality impacts.

PARCEL 3 (BLOCK 3132, LOT 1)

- **Buildings 3B and 3C**
Any new development on the above-referenced property must ensure that heating and hot water equipment exhaust stack(s) are located at least 144 feet above grade, and located at least 200 feet away from any operable windows or air intakes on the tallest portion of the approved massing envelope for proposed Building 5A, and must be fitted with low NO_x burners with a maximum emission concentration of 41 ppm, to avoid any potential significant air quality impacts.

PARCEL 10 (BLOCK 3139, LOT 1)

- **School Building**
Any new development on the above-referenced property must ensure that heating and hot water equipment exhaust stack(s) are located at least 62 feet above grade, and located at least 117 feet away from any operable windows or air intakes on the approved massing envelope for proposed Building 10A, and must be fitted with low NO_x burners with a maximum emission concentration of 41 ppm, to avoid any potential significant air quality impacts.

PARCEL 10 (BLOCK 3139, LOT 1)

- **Supermarket and Retail**
Any new development on the above-referenced property must ensure that heating and hot water equipment exhaust stack(s) are located at least 150 feet away from any operable windows or air intakes on the approved massing envelope for proposed Building 10A, to avoid any potential significant air quality impacts.

With these restrictions in place, there would not be any significant adverse air quality impacts due to the proposed project's boiler systems.

To the extent permitted under Section 11-15 of the Zoning Resolution, the requirements of the “E” designations may be modified, or determined to be unnecessary, based on new information or technology, additional facts or updated standards that are relevant at the time each building is ultimately developed.

ADDITIONAL SOURCES

Potential stationary source impacts on the development site from the NYCT West Farms Bus Depot combustion sources were determined using the AERMOD model. The maximum predicted concentrations of NO₂, SO₂ and PM₁₀ were added to the background concentrations to estimate total air quality concentrations on the proposed project, while PM_{2.5} concentrations were compared with the PM_{2.5} *de minimis* criteria. The results of the AERMOD model analysis are presented in **Table 13-16**.

Table 13-16
Maximum Modeled Pollutant Concentrations
From the NYCT West Farms Bus Depot
on the Proposed Project (µg/m³)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	NAAQS / De Minimis
NO ₂	Annual ⁽²⁾	2.4	39.2	41.6	100
	1-hour ⁽¹⁾	-	-	176.1	188
SO ₂	3-Hour	0.4	108.4	108.8	1,300
	1-Hour	0.4	58.1	58.5	196
PM ₁₀	24-hour	1.7	35	36.7	150
PM _{2.5}	24-hour	1.57	-	1.57	4.7 ³
	Annual	0.15	-	0.15	0.3 ⁴

Notes:

¹ Reported concentration is the maximum total 98th percentile concentration at any receptor using seasonal-hourly background concentrations.

² Annual NO₂ impacts were estimated using a NO₂/NO_x ratio of 0.75.

³ PM_{2.5} *de minimis* criteria — 24-hour average, not to exceed more than half the difference between the background concentration and the 24-hour standard of 35 µg/m³.

⁴ PM_{2.5} *de minimis* criteria—annual (discrete receptor), 0.3 µg/m³.

As shown in the table, the predicted pollutant concentrations for all of the pollutant time averaging periods shown are below their respective standards. Therefore, no significant adverse air quality impacts on the proposed project from existing sources are predicted.

POTENTIAL CUMULATIVE 1-HOUR NO₂ IMPACTS FROM THE NYCT WEST FARMS BUS DEPOT AND PROPOSED PROJECT

The potential cumulative impacts associated with emissions the proposed project’s heating and hot water systems and the NYCT bus depot’s emission sources were evaluated. While the maximum modeled 1-hour NO₂ concentration from the NYCT bus depot, when added to background concentrations, was predicted to be 176.1 µg/m³, as shown in the **Table 13-8**, compared with the NAAQS of 188 µg/m³. The short-term impacts from the NYCT West Farms Bus Depot are based on the conservative assumption of one boiler operating at 100 percent load on No.2 fuel oil; however, recent fuel usage estimates provided by NYCT show that the boilers predominantly burn natural gas rather than No. 2 fuel oil. In addition, the stack exhaust locations for the NYCT boilers and compressor engines and the proposed project’s heating and hot water system sources are substantially different. Consequently, on a 1-hour basis, since winds are

assumed to be blowing in the same direction continuously, maximum NO₂ concentrations at project and off-site locations from the emission sources due to the bus depot and the proposed project would occur at different locations. Therefore, the potential for an exceedance of the 1-hour NO₂ NAAQS from the bus depot and the proposed project is considered to be unlikely, and no significant adverse impacts are predicted. *