Chapter 14: Air Quality

A. INTRODUCTION

The potential for air quality impacts from the Proposed Project is examined in this chapter. Air quality impacts can be either direct or indirect. Direct impacts result from emissions generated by stationary sources at a development site, such as emissions from on-site fuel combustion for heating and hot water systems. Indirect impacts are caused by off-site emissions associated with a project such as emissions from nearby existing stationary sources or by emissions from on-road vehicle trips generated by the Proposed Project or other changes to future traffic conditions due to a project.

The maximum projected hourly incremental traffic volumes generated by the Proposed Actions would exceed the 2020 *City Environmental Quality Review (CEQR) Technical Manual* carbon monoxide (CO) screening threshold of 170 peak-hour vehicle trips at a number of intersections in the study area, as well as the particulate matter (PM) emission screening threshold discussed in Chapter 17, Sections 210 and 311, of the *CEQR Technical Manual*. Therefore, a quantified assessment of emissions from traffic generated by the Proposed Actions was performed for CO and PM.

For analysis purposes only, it is assumed that the Proposed Project would include fossil fuel-burning heating and hot water systems. Therefore, a stationary source analysis was conducted to evaluate potential future pollutant concentrations from the proposed heating and hot water systems.

The Proposed Project would include below-grade parking on each of the project blocks. Therefore, an analysis was conducted to evaluate potential future pollutant concentrations in the vicinity of the ventilation outlets with the proposed parking garages. The predicted pollutant increments from the garages were also added, where appropriate, to the predicted concentrations from the mobile source analysis, to assess the cumulative impact of both sources.

In addition, the Proposed Project is located in a manufacturing district; therefore, potential effects of stationary source emissions from existing nearby industrial facilities on the Proposed Project were assessed.

PRINCIPAL CONCLUSIONS

In terms of industrial sources, no businesses were found to have a New York State Department of Environmental Conservation (NYSDEC) air permit or New York City Department of Environmental Protection (DEP) certificate of operation within the study area, and no other potential sources of concern were identified. Therefore, no analysis was required.

Based on a detailed dispersion modeling analysis, there would be no potential significant adverse air quality impacts from emissions of nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM), from the proposed heating and hot water systems for the Proposed Project. An (E) Designation (E-675) would be mapped in connection with the Proposed Actions to ensure that

future developments would not result in any significant adverse air quality impacts from fossil fuel-fired heat and hot water systems emissions.

The mobile source analyses determined that concentrations of CO and fine particulate matter less than ten microns in diameter (PM_{10}) 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) $PM_{2.5}$ increments are predicted to be below the *de minimis* criteria. At the two intersection sites analyzed for $PM_{2.5}$, the maximum annual incremental $PM_{2.5}$ concentration is predicted to exceed the *de minimis* criteria. This would be considered a significant adverse air quality impact in the absence of traffic mitigation measures. Therefore, traffic mitigation measures were examined to avoid any potential significant impacts at these intersection locations. Mitigation measures are discussed in Chapter 20, "Mitigation."

Between the Draft and Final EIS, additional review and evaluation will be performed which is expected to determine that the identified impacts related to mobile source Annual $PM_{2.5}$ increments will be avoided. This may include use of updated travel demand factors reflecting the 2021 *CEQR Technical Manual* guidance, the use of newer vehicle registration data provided by NYSDEC or other updated information or guidance, as applicable. If warranted by the guidance in the *CEQR Technical Manual* following these revisions, additional modeling of $PM_{2.5}$ concentrations (Grid Analysis) will be performed using more refined or comprehensive analysis procedures to determine the magnitude and extent of neighborhood-scale $PM_{2.5}$ impacts from mobile sources. It is anticipated that these additional measures will reduce $PM_{2.5}$ concentrations below the Annual *de minimis* Criterion threshold.

The parking facilities assumed to be developed as a result of the Proposed Project were analyzed for potential air quality effects. The analysis found that these parking facilities would not be expected to result in any significant adverse air quality impacts.

B. POLLUTANTS FOR ANALYSIS

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 [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 some sources utilizing non-road diesel such as large international marine 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. Ambient concentrations of CO, PM, NO_2, SO_2, ozone, 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 from certain source categories 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 analyzed on a local (microscale) basis.

For the Proposed Project, CO was included explicitly in the mobile-source and parking facility analyses, and is addressed indirectly in the heating and hot water screening analysis. The Proposed Project would result in an increase in vehicle trips greater than the *CEQR Technical Manual* screening threshold of 170 trips at certain intersections. Therefore, a mobile source analysis was conducted to evaluate future CO concentrations with and without the Proposed Actions. In addition, the Proposed Actions would include parking facilities at certain development sites. Therefore, an analysis was conducted to evaluate future CO concentrations with the operation of the proposed parking facilities.

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 travel in the metropolitan area; therefore, no measurable impact on regional NO_x emissions or on ozone levels is predicted. An analysis of Proposed Project-related emissions of these pollutants from mobile sources was therefore not warranted.

In addition to being a precursor to the formation of ozone, NO_2 (one component of NO_x) is also a regulated pollutant. Since NO_2 is mostly formed from the transformation of NO in the atmosphere, it has mostly been of concern further downwind from large stationary sources. (NO_x emissions from fuel combustion consist of approximately 90 percent NO and 10 percent NO_2 at the source.) With the promulgation of the 1-hour average standard for NO_2, local sources such as vehicular emissions may be of greater concern. However, any increase in NO_2 associated with the Proposed Project would be relatively small, due to the very small increases in the number of vehicles. This increase would not be expected to significantly affect levels of NO_2 experienced near roadways.

Potential impacts on local NO_2 concentrations from the fuel combustion for the Proposed Project's heating and hot water systems were evaluated. The Proposed Project would involve the addition of any new stationary emission sources. Therefore, an analysis of potential local impacts on NO_2 concentrations was not warranted.

LEAD

Airborne lead emissions are currently associated principally with industrial sources. Lead in gasoline has been banned under the CAA and would not be emitted from any other component of the Proposed Project. Therefore, an analysis of this pollutant 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 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 (PM_{10}, which includes $PM_{2.5}$). $PM_{2.5}$ has the ability to reach the lower regions of the respiratory tract, delivering with it other compounds that adsorb to the surfaces of the particles, and is also extremely persistent in the atmosphere. $PM_{2.5}$ is mainly derived from combustion material that has volatilized and then condensed to form primary PM (often soon after the release from a source) or from precursor gases reacting in the atmosphere to form secondary PM.

Gasoline-powered and diesel-powered vehicles, especially heavy-duty trucks and buses operating on diesel fuel, are a significant source of respirable PM, most of which is $PM_{2.5}$; PM concentrations may, consequently, be locally elevated near roadways. Since the traffic generated by the Proposed Project would exceed the PM emission screening threshold discussed in Chapter 17, Sections 210 and 311 of the *CEQR Technical Manual*, a quantified assessment of emissions from traffic generated by the Proposed Project was performed for PM and an analysis was conducted to evaluate future PM concentrations with the operation of the parking facilities assumed to be developed with the Proposed Project.

An assessment of PM emissions from heating and hot water systems at the Proposed Project was conducted, following the *CEQR Technical Manual* and EPA guidance.

SULFUR DIOXIDE

SO_2 emissions are primarily associated with the combustion of sulfur-containing fuels (oil and coal). SO_2 is also of concern as a precursor to $PM_{2.5}$ and is regulated as a $PM_{2.5}$ precursor under the New Source Review permitting program for large sources. Due to the federal restrictions on the sulfur content in diesel fuel for on-road and non-road vehicles, no significant quantities are emitted from vehicular sources. Vehicular sources of SO_2 are not significant and therefore analysis of SO_2 from mobile sources was not warranted.

It is assumed for analysis purposes only that natural gas would be burned in the proposed heating and hot water systems. The sulfur content of natural gas is negligible; therefore, no analysis was undertaken to estimate the future levels of SO_2 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[1] 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 standards are generally either the same as the secondary standards or more restrictive. The NAAQS are presented in **Table 12-1**. The NAAQS for 3-hour SO_2 has also been adopted as the ambient air quality standard for New York State, but is defined on a running 12-month basis rather than for calendar years only. New York State also has standards for total suspended particles, settleable particles and 24-hour and annual SO_2, which correspond to federal standards that have since been revoked or replaced, and for the noncriteria pollutants fluoride and hydrogen sulfide.

Table 14-1
National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary		Secondary	
	ppm	µg/m3	ppm	µg/m3
Carbon Monoxide (CO)				
8-Hour Average	9(1)	10,000	None	
1-Hour Average	35(1)	40,000		
Lead				
Rolling 3-Month Average	NA	0.15	NA	0.15
Nitrogen Dioxide (NO_2)				
1-Hour Average(2)	0.100	188	None	
Annual Average	0.053	100	0.053	100
Ozone (O_3)				
8-Hour Average(3)	0.070	140	0.070	140
Respirable Particulate Matter (PM_{10})				
24-Hour Average(1)	NA	150	NA	150
Fine Respirable Particulate Matter ($PM_{2.5}$)				
Annual Mean(4)	NA	12	NA	15
24-Hour Average(5)	NA	35	NA	35
Sulfur Dioxide (SO_2)				
1-Hour Average(6)	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/m3 – 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/m3 are presented.
(1) Not to be exceeded more than once a year.
(2) 3-year average of the annual 98th percentile daily maximum 1-hr average concentration.
(3) 3-year average of the annual fourth highest daily maximum 8-hr average concentration.
(4) 3-year average of annual mean.
(5) Not to be exceeded by the annual 98th percentile when averaged over 3 years.
(6) 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.

[1] EPA. National Ambient Air Quality Standards. 40 CFR Part 50.

Effective December 2015, EPA lowered the 2008 ozone NAAQS from 0.075 ppm to 0.070. EPA issued final area designations for the revised standard on April 30, 2018.

Federal ambient air quality standards do not exist for noncriteria pollutants; however, as previously mentioned, NYSDEC has issued standards for two noncriteria compounds. NYSDEC has also developed a guidance document DAR-1[2] (February 2021), which contains a compilation of annual and short term (1-hour) guideline concentrations for numerous other noncriteria compounds. The NYSDEC 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 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.

Manhattan had been designated as a moderate NAA for PM_{10}. EPA clarified on July 29, 2015 that the designation only applied to the revoked annual standard.

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) since 2004 under the CAA due to exceedance of the 1997 annual average standard, and were also nonattainment with the 2006 24-hour $PM_{2.5}$ NAAQS since November 2009. The area was redesignated as in attainment for that standard effective April 18, 2014 and is now under a maintenance plan. EPA lowered the annual average primary standard to 12 $\mu g/m^3$ effective March 2013. EPA designated the area as in attainment for the 12 $\mu g/m^3$ 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. In March 2008 EPA strengthened the 8-hour ozone standards, but certain requirements remain in areas that were either nonattainment or maintenance areas for the 1997 ozone standard ('anti-backsliding'). EPA designated the same NAA as a marginal NAA for the 2008 ozone NAAQS, effective July 20, 2012. On April 11, 2016, as requested by New York State, EPA reclassified the area as a "moderate" NAA. On July 19, 2017 NYSDEC announced that the New York Metro Area (NYMA) is not projected to meet the July 20, 2018 attainment deadline and NYSDEC therefore requested that EPA reclassify the NYMA to "serious" nonattainment. EPA reclassified the NYMA from "moderate" to "serious" NAA, effective September 23, 2019, which imposed a new

[2] NYSDEC. DAR-1: Guidelines for the Evaluation and Control of Ambient Air Contaminants Under Part 212. February 2021.

attainment deadline of July 20, 2021 (based on 2018–2020 monitored data). NYSDEC's proposed draft revisions to the SIP (June 2021) state that based on monitoring data, New York State has not demonstrated compliance with the 2008 ozone NAAQS. On April 30, 2018, EPA designated the same area as a moderate NAA for the revised 2015 ozone standard. EPA is currently reviewing revisions to New York's SIP plan.

New York City is currently in attainment of the annual-average NO_2 standard. EPA has designated the entire state of New York as "unclassifiable/attainment" of the 1-hour NO_2 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.

EPA has established a 1-hour SO_2 standard, replacing the former 24-hour and annual standards, effective August 23, 2010. EPA has designated the entire State of New York as in attainment for this standard, with the exception of Monroe County which was designated "unclassifiable" and a portion of St. Lawrence County as "nonattainment."

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The State Environmental Quality Review Act (SEQRA) regulations and *CEQR Technical Manual* state that the significance of a predicted consequence of a project (i.e., whether it is material, substantial, large or important) should be assessed in connection with its setting (e.g., urban or rural), its probability of occurrence, its duration, its irreversibility, its geographic scope, its magnitude, and the number of people affected.[3] 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 14-1**) 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 would 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 ppm.

$PM_{2.5}$ DE MINIMIS CRITERIA

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

[3] New York City. *CEQR Technical Manual*. Chapter 1, Section 222. November 2020; and SEQR Regulations. 6 NYCRR § 617.7

- Predicted increase of more than half the difference between the background concentration and the 24-hour standard;
- Annual average $PM_{2.5}$ concentration increments that are predicted to be greater than 0.1 $\mu g/m^3$ at ground level on a neighborhood scale (i.e., the annual increase in concentration representing the average over an area of approximately 1 square kilometer, centered on the location where the maximum ground-level impact is predicted for stationary sources; or at a distance from a roadway corridor similar to the minimum distance defined for locating neighborhood scale monitoring stations); or
- Annual average $PM_{2.5}$ concentration increments which are predicted to be greater than 0.3 $\mu g/m^3$ at a discrete receptor location (elevated or ground level).

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

The above *de minimis* criteria have been used to evaluate the significance of predicted impacts of the Proposed Actions 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, it is important to note that most dispersion analyses predict conservatively high concentrations of pollutants, particularly under adverse meteorological conditions.

The mobile source analyses for the Proposed Project employ models approved by EPA that have been 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.

INTERSECTION ANALYSIS

Vehicle Emissions

Engine Emissions

Vehicular CO and PM engine emission factors were computed using the EPA mobile source emissions model, Motor Vehicle Emission Simulator (MOVES3).[4] This emissions model is capable of calculating engine, break wear, and tire wear emission factors for various vehicle types,

[4] EPA. Motor Vehicle Emission Simulator (MOVES): User Guide for MOVES2014a. EPA420B15095. November 2015.

based on the fuel type (e.g., gasoline, diesel, or natural gas), meteorological conditions, vehicle speeds, vehicle age, roadway type and grade, 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 data. Appropriate credits were used to accurately reflect the inspection and maintenance program.[5] County-specific hourly temperature and relative humidity data obtained from NYSDEC were used.

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. $PM_{2.5}$ emission rates were determined with fugitive road dust to account for their impacts in local microscale analyses. However, fugitive road dust was not included in the neighborhood scale $PM_{2.5}$ microscale analyses, since the New York City Department of Environmental Protection (DEP) considers it to have an insignificant contribution on that scale. Road dust emission factors were calculated according to the latest procedure delineated by EPA[6] and the *CEQR Technical Manual*.

TRAFFIC DATA

Traffic data for the intersection 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 13, "Transportation"). Traffic data for the future without the project (the No Action condition) and the With Action condition were employed in the respective air quality modeling condition. The weekday morning (7:45 to 8:45 a.m.), midday (1:00 to 2:00 p.m.), evening (4:00 to 5:00 p.m.), and Saturday midday (2:00 to 3:00 p.m.) peak periods were analyzed.

The peak morning, midday, evening, and Saturday midday period traffic volumes were used as a baseline for determining off-peak volumes. Off-peak traffic volumes in the No Action condition were determined by adjusting the peak period volumes by the 24-hour distributions of actual vehicle counts collected at appropriate locations, and off-peak increments from the Proposed Project site were estimated based on the parking demand as a result of the Proposed Project. For annual impacts, average weekday and weekend 24-hour distributions were used to more accurately simulate traffic patterns over longer periods.

Dispersion Models for Microscale Analyses

The CO and PM concentrations due to vehicular emissions adjacent to the analysis sites were predicted using the American Meteorological Society/Environmental Protection Agency Regulated Model (AERMOD) Version 21112.[7] AERMOD is a state-of-the-art dispersion model, applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and

[5] 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.

[6] 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.

[7] EPA. *User's Guide for the AMS/EPA Regulatory Model (AERMOD)*. Office of Air Quality Planning and Standards. EPA-454/B-21-001. Research Triangle Park, North Carolina. April 2021.

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 terrain interactions. AERMOD has been a recommended model for transportation air quality analyses for several years and EPA mandated its use for transportation conformity purposes after a three-year transition period.[8] Following EPA guidelines, the analysis was performed using an area source representation of emission sources in order to simulate traffic-related air pollutant dispersion.[9] In addition, the weighted average release height and initial vertical source parameters were calculated for each modeled roadway. Hourly traffic volumes and associated emission factors were used to estimate hourly emission rates from each modeled roadway segment and predict traffic-related air pollutant concentrations at receptor locations.

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).

The AERMOD 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 2016–2020. The meteorological data provide hour-by-hour wind speeds and directions, stability states, and temperature inversion elevation over the five-year period. These data are 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.

ANALYSIS YEAR

The microscale analyses were performed for 2032, the year by which the Proposed Project is anticipated to be completed. The future analysis was performed for both the No Action condition and 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 an analysis site. Background concentrations must be added to modeling results to obtain total pollutant concentrations at an analysis site.

The background concentrations for the nearest monitored location are presented in **Table 12-2**. PM and CO concentrations are based on the latest available three years of monitored data (2018–2020)

[8] EPA. Revisions to the Guideline on Air Quality Models: Final rule. Federal Register, Vol. 82, No. 10, January 2017.

[9] EPA. *Project-Level Conformity and Hot-Spot Analyses*, available at: https://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses#pmguidance.

consistent with the statistical format of the NAAQS. These values were used as the background concentrations for the mobile source analysis.

Table 14-2
Maximum Background Pollutant Concentrations for Mobile Source Analysis

Pollutant	Average Period	Location	Concentration	NAAQS
CO	1-hour	CCNY, Manhattan	2.52 ppm	35 ppm
	8-hour		1.4 ppm	9 ppm
PM_{10}	24-hour	IS 52, Bronx	35 µg/m^3	150 µg/m^3
$PM_{2.5}$	24-hour	JHS 45, Manhattan	18.5 µg/m^3	35 µg/m^3
	Annual		7.5 µg/m^3	12 µg/m^3

Notes:
(1) CO concentrations represent the maximum second-highest monitored concentrations from the most recent three years of data.
(2) PM_{10} concentration represents the maximum monitored concentration from the most-recent three years of data.
(3) $PM_{2.5}$ concentration represents the average of the 98th percentile day from most recent three years of data.
Source: New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2018–2020.

Analysis Sites

Intersections in the study area were reviewed for microscale analysis based on the *CEQR Technical Manual* guidance. Of those intersections, three were selected for microscale analysis (see **Table 14-3**): Site 1 was selected because it is projected to have the largest incremental traffic volume; Site 2 was selected because it is projected to have the largest incremental traffic volume of the sites that exceeded the $PM_{2.5}$ mobile source analysis screening thresholds, and Site 3 was chosen because the projected speeds were low and the project-generated truck traffic was high. The potential impact from vehicle emissions of CO was analyzed at Sites 1 and 2 while PM concentrations were modeled at Sites 2 and 3.

Table 14-3
Mobile Source Analysis Sites

Analysis Site	Location	Pollutant
1	Northern Boulevard and Steinway Street	CO
2	35th Avenue and 41st Street	PM and CO
3	Northern Boulevard and 43rd Street/42nd Place	PM

RECEPTOR PLACEMENT

Multiple receptors (i.e., precise locations at which concentrations are evaluated) were modeled at the selected sites; receptors were placed along the approach and departure links and roadway segments at regularly 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. 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 *CEQR Technical Manual* procedure for neighborhood-scale corridor $PM_{2.5}$ modeling.

PARKING ANALYSIS

The Proposed Actions would include approximately 1,710 accessory parking spaces. The Proposed Development would include five parking accessory parking facilities with a total of 1,467 spaces, and the additional Projected Development Sites would include 243 spaces. The parking facilities would consist of the following:

- Projected Development Site A—A below-grade garage with a capacity of 489 spaces and a surface parking lot with a capacity of 77 spaces;
- Projected Development Site B—A below-grade garage with a capacity of 237 spaces;
- Projected Development Site C—A below-grade garage with a capacity of 288 spaces;
- Projected Development Site D—A below-grade garage with a capacity of 241 spaces;
- Projected Development Site E—A below-grade garage with a capacity of 135 spaces;
- Projected Development Site F: A below-grade garage with a capacity of 29 spaces;
- Projected Development Site G: A below-grade garage with a capacity of 36 spaces;
- Projected Development Site H: A below-grade garage with a capacity of 79 spaces;
- Projected Development Site I: A below-grade garage with a capacity of 34 spaces;
- Projected Development Site J: A below-grade garage with a capacity of 43 spaces; and
- Projected Development Site K: A below-grade garage with a capacity of 22 spaces.

Emissions from vehicles using the parking facilities could potentially affect levels of CO and PM concentrations in the immediate vicinity of the ventilation outlets. Since the parking garage under Projected Development Site A has the largest capacity as well as the largest projected number of vehicle ins/outs, this facility was analyzed. Additionally, analyses were conducted for the parking garage under Projected Development Site B, due to the proximity of these sites to each other, to assess the potential cumulative effects.

For the parking garages, the emissions from the outlet vent and their dispersion were analyzed using the methodology defined in the *CEQR Technical Manual*. Maximum CO concentrations were determined for the time periods when overall garage usage would be the greatest, considering the hours when the greatest number of vehicles would exit the facility. PM increments were determined for peak daily (24-hour) use. The number of vehicles entering and exiting the garage were derived from the trip generation analysis described in Chapter 13 "Transportation."

Emissions from vehicles entering, parking, and exiting the garage were determined using the EPA MOVES3 mobile source emission model as described in detail above for the analysis of emissions at intersections. For all arriving and departing vehicles, an average speed of five miles per hour was conservatively assumed for travel within the parking garages. In addition, all departing vehicles were assumed to idle for 60 seconds before proceeding to the exit. Although the project is still in the preliminary stage of design and details on the ventilation system have not yet been defined, the concentrations within the system were conservatively calculated assuming a minimum ventilation rate, based on New York City Building Code requirements of one cubic foot per minute of fresh air per gross square foot of garage area.

For the parking garages, to determine pollutant concentrations, the outlet vents were analyzed as a "virtual point source" using the methodology in EPA's *Workbook of Atmospheric Dispersion Estimates, AP-26*. This methodology estimates concentrations at various distances from an outlet vent by assuming that the concentration at the vent represents the emission rate divided by the fresh

air ventilation rate, and determining the appropriate initial horizontal and vertical dispersion coefficients at the vent faces.

The air from each of the analyzed parking garages was conservatively assumed to be vented through a single outlet at a height of approximately 10 feet. For the individual analysis of the parking garage below Projected Development A, the closest receptors to the potential vent location were assumed to be on the sidewalk receptors along 38th Street; therefore, "near" and "far" receptors were placed along the sidewalks at a pedestrian height of 6 feet and at distances of 5 feet and 47 feet. For the cumulative analysis of parking garages at Projected Development A and B, the proposed vent location for both garages was conservatively assumed to be facing each other along 38th Street; therefore, "near" and "far" receptors were placed along sidewalks at a pedestrian height of 6 feet at distances of 5 feet and 47 feet, respectively, from the vent. feet, respectively, from the vent. A receptor was also modeled at the vent height, 10 feet from the vent, to conservatively assess the air quality impacts on the Proposed Project building window or other air intake location. A persistence factor of 0.70 was used to convert the maximum 1-hour average CO concentrations to 8–hour averages, per *CEQR Technical Manual* guidance, and factors of 0.6 and 0.1 to convert maximum 1-hour $PM_{2.5}$ concentrations to 24-hour and annual averages, respectively, per EPA guidance,[10] accounting for meteorological variability over the longer averaging periods.

Background and on-street concentrations were added to the modeling results to obtain the total ambient levels. The on-street pollutant concentrations were determined using the methodology in the Air Quality Appendix of the *CEQR Technical Manual*, utilizing No Build and Build traffic volumes from the traffic survey conducted in the study area.

Emissions from vehicles entering, parking, and exiting the garages were estimated using the EPA MOVES3 mobile source emission model based on county-specific hourly temperature and relative humidity data obtained from DEC. For all arriving and departing vehicles, an average speed of five 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 conservatively calculated assuming a minimum ventilation rate, based on New York City Building Code requirements, of 1 cubic foot per minute of fresh air per gross square foot of garage area. To determine compliance with the NAAQS, CO concentrations were determined for the maximum 8-hour average period.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

Stationary source analyses were conducted using the methodology described in the *CEQR Technical Manual* to assess air quality impacts associated with emissions from the Proposed Development's heat and hot water systems. 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 and source types. AERMOD is a steady-state plume model that incorporates current concepts about flow and dispersion in complex terrain, including updated treatment of the boundary layer theory and understanding of turbulence and dispersion, and includes handling of the plume interaction with terrain. AERMOD is EPA's preferred regulatory stationary source model.

[10] EPA. *AERSCREEN User's Guide*. EPA-454/B-21-005. April 2021.

AERMOD calculates pollutant concentrations from simulated sources (e.g., exhaust stacks) based on hourly meteorological data and surface characteristics, and has the capability to calculate pollutant concentrations at locations where the plume from the exhaust stack is affected by the aerodynamic wakes and eddies (downwash) produced by nearby structures. The analysis of potential impacts from exhaust stacks assumed stack tip downwash, urban dispersion and surface roughness length, and elimination of calms.

AERMOD incorporates the Plume Rise Model Enhancements (PRIME) downwash algorithm, which is designed to predict concentrations in the "cavity region" (i.e., the area around a structure which under certain conditions may affect an exhaust plume, causing a portion of the plume to become entrained in a recirculation region). AERMOD also uses the Building Profile Input Program for PRIME (BPIPPRM) to provide a detailed analysis of downwash influences on a direction-specific basis. BPIPPRM determines the projected building dimensions for modeling with the building downwash algorithm enabled. The modeling of plume downwash accounts for all obstructions within a radius equal to five obstruction heights of the stack.

The analysis was prepared both with and without downwash in order to assess the worst-case impacts at elevated locations close to the height of the source, 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 *CEQR Technical Manual* guidance.

Potential 1-hour average NO_2 concentrations, added to representative background concentrations in the area, were compared with the NAAQS. Potential 24-hour and annual average incremental concentrations of $PM_{2.5}$ were compared with the $PM_{2.5}$ *de minimis* criteria defined in the *CEQR Technical Manual*. For the analysis of the 1-hour average NO_2 concentration from the building's heating and hot water systems, AERMOD's Plume Volume Molar Ratio Method (PVMRM) module was used to analyze chemical transformation within the model. PVMRM incorporates hourly background ozone concentrations to estimate NO_x transformation within the source plume. The model applied ozone concentrations measured in 2015–2019 at the nearest available New York State Department of Environmental Conservation (NYSDEC) ozone monitoring station—the IS 52 monitoring station in the Bronx. An initial NO_2 to NO_x ratio of 10 percent at the source exhaust stack was assumed for boilers, which is considered representative.

Five years of surface meteorological data collected at LaGuardia Airport for $PM_{2.5}$ from 2016–2020 and for NO_2 from 2015–2019 as well as concurrent upper air data collected at Brookhaven, New York were used in the analysis.[11] For NO_2, data from 2015–2019 was used due to uncertainties in the representativeness of background concentrations in 2020 due to effects of COVID-19.

Emission Rates and Stack Parameters

For analysis purposes only, the Proposed Project is assumed to utilize fossil-fuel fired heating and hot water systems.

Annual emission rates for heating and hot water systems were calculated based on fuel consumption estimates, using energy intensity estimates based on type of development and size of the building as recommended in the *CEQR Technical Manual*, and applying emission factors for natural gas-fired boilers.[12] Annual NO_2 concentrations from heating and hot water sources

[11] For the 1-hour and annual NO_2 analyses, meteorological data from 2015–2019 was used.

[12] EPA. Compilation of Air Pollutant Emission Factors AP-42. 5th Ed., V. I, Ch. 1.4. September, 1998.

were estimated using a NO_2 to NO_x ratio of 0.75.[13] $PM_{2.5}$ emissions include both the filterable and condensable components. The short-term emission rates (24-hour and shorter) were calculated by scaling the annual emissions to account for a 100-day heating season. The exhaust from the heating and hot water systems was assumed to be vented through a single stack located three feet above the roof of each of the buildings.

To calculate exhaust velocity, the fuel consumption of the Proposed Project was multiplied by EPA's fuel factor for natural gas,[14] providing the exhaust flow rate at standard temperature; the flow rate was then corrected for the exhaust temperature, and exhaust velocity was calculated based on the stack diameter. Assumptions for stack diameter and exhaust temperature for the proposed systems were obtained from a survey of boiler exhaust data provided by New York City Department of Environmental Protection (DEP),[15] and were used to calculate the exhaust velocity.

The emission rates and exhaust stack parameters used in the modeling analyses are presented in **Table 14-4**.

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

[14] EPA. *Standards of Performance for New Stationary Sources.* 40 CFR Chapter I Subchapter C Part 60. Appendix A-7, Table 19-2. 2013.

[15] DEP. *Boiler Database*. August 11, 2017.

Table 14-4
Exhaust Stack Parameters and Emission Rates – Applicant-Controlled Lots

Stack Parameter	A1	A2	A3	B1	B2	C1	C2	D1	D2	D3	E1	E2
Building Floor Area (gross square feet)	143,450	243,180	250,670	287,860	366,050	306,557	124,090	132,030	309,880	253,790	98,310	466,300
Building Height (feet)	155	140	120	230	200	295	160	200	160	280	100	290
Stack Height Above Building (feet)	3	23	30	3	35	3	25	3	35	3	3	3
Stack Height (feet)	158	163	150	233	235	298	185	203	195	283	103	293
Stack Diameter (feet)[(1)]	2	3.2	3.2	3.2	3.2	3.2	2	2	3.2	3.2	2	3.2
Exhaust Velocity (feet/minute)[(1)]	235	198	207	236	302	240	271	288	236	209	210	359
Exhaust Temperature (degrees Fahrenheit)[(1)]	307.8	307.8	307.8	307.8	307.8	307.8	307.8	307.8	307.8	307.8	307.8	307.8
Emission Rate (grams/second)												
NO_2 (1-hour average)	0.033	0.027	0.029	0.033	0.042	0.089	0.014	0.041	0.033	0.078	0.011	0.13
NO_2 (Annual average)	0.0091	0.0075	0.0078	0.0089	0.011	0.024	0.0039	0.011	0.0089	0.021	0.0030	0.037
$PM_{2.5}$ (24-hour average)	0.0025	0.0056	0.0059	0.0067	0.0085	0.0068	0.0029	0.0031	0.0067	0.0059	0.0023	0.010
$PM_{2.5}$ (Annual average)	0.00069	0.0015	0.0016	0.0018	0.0023	0.0019	0.00080	0.00085	0.0018	0.0016	0.00062	0.0028

Note:
[(1)] Stack parameter assumptions were obtained from a survey of boiler exhaust data provided by DEP.
See **Figure 14-1** for the building distribution on the Applicant-controlled lots.



Source: ODA

INNOVATION QNS
ASTORIA, QUEENS
COMMUNITY DISTRICT 1

Building Distribution Diagram

Figure 14-1

Table 14-5
Exhaust Stack Parameters and Emission Rates – Additional Affected Sites

Stack Parameter	F	G	H	I	J	K
Building Floor Area (gsf)	90,200	115,570	250,800	107,362	136,313	72,600
Building Height (ft)	220	140	130	160	160	80
Stack Height Above Building (ft)	3	25	40	10	10	30
Stack Height (ft)	223	165	170	170	170	110
Stack Diameter (ft)(1)	2	2	2	2	2	2
Exhaust Velocity (ft/min)(1)	193	246	425	228	290	153
Exhaust Temperature (degrees Fahrenheit)(1)	307.8	307.8	307.8	307.8	307.8	307.8
Emission Rate (grams/second)						
NO_2 (1-hour average)	0.027	0.013	0.022	0.012	0.015	0.0081
NO_2 (Annual average)	0.0075	0.0035	0.061	0.0033	0.0042	0.0022
$PM_{2.5}$ (24-hour average)	0.0021	0.0026	0.0046	0.0025	0.0031	0.0016
$PM_{2.5}$ (Annual average)	0.00057	0.00073	0.0013	0.00067	0.00086	0.00045

Note:
(1) Stack parameter assumptions were obtained from a survey of boiler exhaust data provided by DEP.

Background Concentrations

Total 1-hour NO_2 concentrations were refined following a more detailed approach (EPA "Tier 3"). The methodology used to determine the total 1-hour NO_2 concentrations from the facility was based on adding the monitored background to modeled concentrations, as follows: hourly modeled concentrations from the boilers were first added to the seasonal hourly background monitored concentrations; then the highest combined daily 1-hour NO_2 concentration was determined at each 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.

The latest version of AERMOD (Version 21112) has been identified as producing an error when using the Tier 3 PVMRM module for NO_x to NO_2 conversion. The seasonal hourly background concentrations of NO_2 are added twice to the modeled concentrations, resulting in excessively high modeled concentrations. EPA recommended to input background concentrations of NO_2 that are one-half of the actual background concentrations. This approach was also confirmed in a communication with NYSDEC.[16] Therefore, per EPA and NYSDEC recommendations, the seasonal hourly background concentrations provided by NYSDEC were divided by a factor of two for the AERMOD model input.

$PM_{2.5}$ 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 based on the 98th percentile concentration, averaged over the years 2018–2020 was used to establish the *de minimis* value of 8.3 ug/m^3. $PM_{2.5}$ annual average impacts are assessed on an incremental basis and compared to 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. NO_2 background data is averaged over the years

[16] Per email conversation with John Kent, Division of Air Resources, NYSDEC, June 16, 2021.

2017–2019 because of uncertainties in the representativeness of NO_2 background concentrations in 2020 due to effects of COVID-19.

Table 14-6
Maximum Background Pollutant Concentrations

Pollutant	Average Period	Location	Concentration (µg/m³)	NAAQS (µg/m³)
NO_2	1-hour	IS 52, Bronx	110.6	188
	Annual		32.8	100
$PM_{2.5}$	24-hour	JHS 45	18.5	35
Source: New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2017–2020.				

Receptor Placement

Discrete receptors were modeled along existing and proposed-building façades to represent potentially sensitive locations such as operable windows and intake vents. Rows of receptors at spaced intervals on the modeled buildings were analyzed at multiple elevations. A broad ground-level grid was also included to identify potential concentrations at publicly accessible locations in the surrounding area.

INDUSTRIAL SOURCE ANALYSIS

The potential impacts of existing industrial operations on pollutant concentrations at the development site were evaluated. Potential industrial air pollutant emission sources within 400 feet of the proposed development sites were surveyed for inclusion in the air quality impact analyses, as recommended in the *CEQR Technical Manual*.

Land use maps were reviewed to identify potential sources of emissions from manufacturing/industrial operations. A field survey was conducted on July 8, 2021 to identify buildings within 400 feet of the development sites that have the potential for emitting air pollutants. A search of federal- and state-permitted facilities within the study area was conducted using EPA's Envirofacts database.[17] DEP's online permit database was also searched to identify any permitted industrial uses in the study area.[18]

No current permitted activities were identified within the study area, and no other sources of emissions were identified in the land use and field surveys. Therefore, no potential for significant impacts on the Proposed Project are anticipated from industrial source emissions.

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 existing sources on the Proposed Project, a review of existing permitted facilities was conducted. Sources of information

[17] EPA. Envirofacts. https://www3.epa.gov/enviro/. Accessed June 17, 2021.

[18] DEP. *NYC DEP CATS Information.* https://a826-web01.nyc.gov/dep.boilerinformationext. New York City Open Data https://data.cityofnewyork.us/Environment/CATS-Permits/f4rp-2kvy. Accessed June 28, 2021.

reviewed included EPA's Envirofacts database, the NYSDEC Title V and State Facility Permit websites, the New York City Department of Buildings website, and DEP permit data.

No facilities with a State Facility, Title V, or PSD Permit within the 1,000-foot study area around the Project Area were identified. Therefore, no analysis of the potential impacts of large or major sources of emissions on the Proposed Project was required.

E. EXISTING CONDITIONS

The representative criteria pollutant concentrations measured in recent years at NYSDEC air quality monitoring stations nearest to the Project Area are presented in **Table 14-7**. The values presented are consistent with the form of the NAAQS. As shown in the table, the recently monitored levels did not exceed the NAAQS. It should be noted that these values are somewhat different from the background concentrations used in the stationary source and mobile source analyses, since these are the most recent reported monitored values, rather than more conservative values used for dispersion modeling. The concentrations presented in **Table 14-7** provide a comparison of the air quality in the rezoning area with the NAAQS, while background concentrations are obtained from several years of monitoring data, and represent a conservative estimate of the highest concentrations for future ambient conditions.

Table 14-7
Representative Monitored Ambient Air Quality Data

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	Botanical Garden	ppm	1-hour	1.8	35
			8-hour	1.4	9
SO_2	IS 52[(1)]	µg/m^3	1-hour	14.2	196
PM_{10}	IS 52	µg/m^3	24-hour	35	150
$PM_{2.5}$	JHS 45[(2,3)]	µg/m^3	Annual	7.4	12
			24-hour	18.5	35
NO_2	IS 52[(4,5)]	µg/m^3	1-hour	110.6	188
			Annual	32.8	100
Lead	IS 52[(6)]	µg/m^3	3-month	0.0033	0.15
Ozone	Queens College[(7)]	ppm	8-hour	0.068	0.075

Notes:
(1) The 1-hour value is based on a three-year average (2018–2020) of the 99th percentile of daily maximum 1-hour average concentrations.
(2) Annual value is based on a three-year average (2018–2020) of annual concentrations.
(3) The 24-hour value is based on the three-year average of the 98th percentile of 24-hour average concentrations.
(4) The 1-hour value is based on a three-year average (2017–2019) of the 98th percentile of daily maximum 1-hour average concentrations.
(5) Annual value based on a three-year maximum (2017–2019) of annual concentrations.
(6) Based on the highest quarterly average concentration measured during 2018 to 2020.
7 Based on the three-year average (2018–2020) of the 4th highest daily maximum 8-hour average concentrations.
Source: New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2017–2020.

F. THE FUTURE WITHOUT THE PROPOSED PROJECT

MOBILE SOURCES

INTERSECTION ANALYSIS

CO concentrations in the No Action condition were determined using the methodology previously described. **Table 14-8** shows the future maximum predicted 8-hour CO concentration, including background concentration, at the analysis intersection in the No Action condition. The value shown is the highest predicted concentration for the receptor locations for any of the time periods analyzed.

Table 14-8
Maximum Predicted 8-Hour Average
CO No Action Concentration

Analysis Site	Location	Concentration (ppm)
1	Northern Boulevard and Steinway Street	1.45
2	35th Avenue and 41st Street	1.51

Notes:
8-hour NAAQS is 9 ppm.
Concentration includes a background concentration of 1.4 ppm.

PM_{10} concentrations in the No Action condition were determined by using the methodology previously described. Predicted future PM_{10} 24-hour concentrations, including background concentrations, at the analyzed intersections in the No Action condition are presented in **Table 14-9**. The values shown are the highest predicted concentrations for the receptor locations. As shown in the table, No Action condition concentrations are predicted to be well below the PM_{10} NAAQS.

Table 14-9
Maximum Predicted 24-Hour Average
PM_{10} No Action Concentrations ($\mu g/m^3$)

Analysis Site	Location	Concentration
2	35th Avenue and 41st Street	46.1
3	Northern Boulevard and 43rd Street/42nd Place	76.4

Notes:
NAAQS—24-hour average 150 $\mu g/m^3$.
Concentration includes a background concentration of 35 $\mu g/m^3$.

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

STATIONARY SOURCES

In the No Action condition, the identified projected development sites are assumed to either remain unchanged from existing conditions, or become occupied by uses that are as-of-right under existing zoning and reflect current trends that are deemed likely to support more active uses. The Proposed Actions would likely result in more development, and therefore, the emissions from heat and hot water systems associated with the Proposed Actions would cumulatively be greater than the emissions from heat and hot water systems under the No Action condition.

G. THE FUTURE WITH THE PROPOSED PROJECT

MOBILE SOURCES

INTERSECTION ANALYSIS

CO concentrations for the Proposed Project were predicted using the methodology previously described. **Table 14-10** shows the future maximum predicted 8-hour average CO concentration at the intersection studied. The value shown is the highest predicted concentration. The results indicate that the Proposed Project would not result in any violations of the 8-hour CO NAAQS. In addition, the incremental increase in 8-hour average CO concentrations are 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 air quality impact.

Table 14-10
Maximum Predicted 8-Hour CO
With Action Concentrations (ppm)

Analysis Site	Location	No Action	With Action	*De Minimis*
1	Northern Boulevard and Steinway Street	1.45	1.47	4.5
2	35th Avenue and 41st Street	1.51	1.70	4.6

Notes:
8-hour NAAQS is 9 ppm.
Concentration includes a background concentration of 1.4 ppm.

PM_{10} concentrations with the Proposed Project were determined using the methodology previously described and used in the No Action condition. **Table 14-11** presents the predicted PM_{10} 24-hour concentrations at the analyzed intersections in the With Action condition. The value shown is the highest predicted concentration for the modeled receptor locations and includes background concentration. The results demonstrate that mobile source PM_{10} emissions from the Proposed Project would not result in a significant adverse air quality impact.

Table 14-11
Maximum Predicted 24-Hour Average PM_{10}
With Action Concentration ($\mu g/m^3$)

Analysis Site	Location	No Action	With Action
2	35th Avenue and 41st Street	46.1	56.4
3	Northern Boulevard and 43rd Street/42nd Place	76.4	90.8

Notes:
NAAQS—24-hour average 150 $\mu g/m^3$.
Concentrations presented include a background concentration of 35 $\mu g/m^3$.

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 NAAQS and 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 14-12 and 14-13**, respectively. **Tables 14-12 and 14-13** also present the maximum predicted concentrations in the No Action and With Action condition. The No Action and With Action concentrations shown are the highest predicted concentrations for the modeled receptor locations and include background concentrations.

The results in **Table 14-12** show that the 24-hour $PM_{2.5}$ increments are predicted to be below the *de minimis* criterion and total concentrations are below the NAAQS at each of the analysis sites. As shown in **Table 14-13**, the maximum annual incremental $PM_{2.5}$ concentration is predicted to exceed the *de minimis* criteria at each of the analysis sites. This would be considered a significant adverse air quality impact in the absence of traffic mitigation measures. Therefore, traffic mitigation measures were examined to avoid any potential significant impacts at these intersection locations. Mitigation measures are discussed in Chapter 20, "Mitigation."

Between the Draft and Final EIS, additional review and evaluation will be performed which is expected to determine that the identified impacts related to mobile source Annual $PM_{2.5}$ increments will be avoided. This may include use of updated travel demand factors reflecting 2021 *CEQR Technical Manual* guidance, the use of newer vehicle registration data provided by NYSDEC or other updated information or guidance, as applicable. If warranted by the guidance in the *CEQR*

Technical Manual following these revisions, additional modeling of $PM_{2.5}$ concentrations (Grid Analysis) will be performed using more refined or comprehensive analysis procedures to determine the magnitude and extent of neighborhood-scale $PM_{2.5}$ impacts from mobile sources. It is anticipated that these additional measures will reduce $PM_{2.5}$ concentrations below the Annual *de minimis* Criterion threshold.

Table 14-12
Maximum Predicted 24-Hour Average $PM_{2.5}$
With Action and Incremental Concentration (µg/m³)

Analysis Site	Location	No Action	With Action	Maximum Increment	Criterion
2	35th Avenue and 41st Street	-	-	3.3	8.3(1)
		20.4(2)	21.8(2)	-	35(3)
3	Northern Boulevard and 43rd Street/42nd Place	-	-	3.1	8.3(1)
		26.9(2)	28.2(2)	-	35(3)

Notes:
(1) $PM_{2.5}$ *de minimis* criterion—24-hour average, not to exceed more than half the difference between the background concentration (18.5 µg/m³) and the 24-hour standard of 35 µg/m³.
(2) The 24-hour $PM_{2.5}$ concentration presented represents the maximum of the total 98th percentile. Concentrations presented include a background concentration of 18.5 µg/m³.
(3) NAAQS.

Table 14-13
Maximum Predicted Annual Average $PM_{2.5}$
With Action Incremental Concentration (µg/m³)

Analysis Site	Location	No Action	With Action	Maximum Increment	Criterion
2	35th Avenue and 41st Street	-	-	0.15	0.1(1)
		7.6(2)	7.7(2)	-	12(3)
3	Northern Boulevard and 43rd Street/42nd Place	-	-	0.33	0.1(1)
		8.0(2)	8.4(2)	-	12(3)

Notes:
(1) $PM_{2.5}$ *de minimis* criterion—annual (neighborhood scale), 0.1 µg/m³.
(2) Concentrations presented include a background concentration of 7.5 µg/m³.
(3) NAAQS.

PARKING ANALYSIS

Based on the methodology previously described, the maximum predicted CO and PM concentrations from the proposed parking facilities at Projected Development A and B were analyzed assuming a near side sidewalk receptor on the same side of the street (5 feet) as the parking facility, and a far side sidewalk receptor on the opposite side of the street from the parking facility. Due to the proximity of these parking garages, the cumulative effect of these garages was also analyzed. For the parking garages, the near side receptor of each facility was added to the far side receptor of the other facility.

The maximum predicted 1-hour average CO concentration is 2.6 ppm, based on the cumulative impacts of parking garages at Projected Development Sites A and B. This value includes a predicted concentration of 0.08 ppm from emissions within the parking garage, on-street contribution of 0.003 ppm, and a background level of 2.5 ppm. The maximum predicted 8-hour

average CO concentration is 1.4 ppm, based on the cumulative impacts of the parking garages at Projected Development A and B. This value includes a predicted concentration of 0.032 ppm from emissions within the parking garage, on-street contribution of 0.002 ppm, and a background level of 1.4 ppm. The maximum predicted concentrations are substantially below the 1-hour and 8-hour standards of 35 ppm and 9 ppm, respectively, and the maximum predicted 8-hour concentration is below the *de minimis* CO criteria.

The maximum predicted 24-hour and annual average $PM_{2.5}$ increments are 0.42 µg/m^3 and 0.02 µg/m^3, respectively. The maximum predicted $PM_{2.5}$ increments are well below the respective $PM_{2.5}$ *de minimis* criteria of 8.3 µg/m^3 for the 24-hour average concentration and 0.3 µg/m^3 for the annual average concentration. Therefore, the proposed parking facilities would not result in any significant adverse air quality impacts.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

Tables 14-14 and 14-15 present the maximum predicted concentration from the heating and hot water systems on the proposed buildings and existing buildings, respectively. As shown in the tables, all predicted pollutant concentrations are less than the applicable impact criteria. Therefore, there would be no potential for significant adverse air quality impacts from the Proposed Project's heating and hot water systems.

Table 14-14
Maximum Modeled Pollutant Concentrations
On the Proposed Development and the Additional Affected Area (µg/m^3)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	Criterion
NO_2	1-hour	166[(1)]	-	166	188[(2)]
	Annual	1.12	32.8	33.9	100
$PM_{2.5}$	24-hour	8.0	N/A	8.0	8.3 [(3)]
	Annual	0.299	N/A	0.299	0.3[(4)]

Notes:
N/A – Not Applicable
[(1)] The 1-hour NO_2 concentration presented represents the maximum of the total 98th percentile 1-hour NO_2 concentration predicted at any receptor using seasonal-hourly background concentrations.
[(2)] NAAQS
[(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/m^3
[(4)] $PM_{2.5}$ *de minimis* criteria—annual (discrete receptor)

Table 14-15
Maximum Modeled Pollutant Concentrations
On Existing Buildings (µg/m^3)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	Criterion
NO_2	1-hour	115(1)	-	115	188(2)
	Annual	0.80	32.8	33.6	100
$PM_{2.5}$	24-hour	1.7	N/A	1.7	8.3 (3)
	Annual	0.16	N/A	0.16	0.3(4)
	Annual – Neighborhood	0.018	N/A	0.018	0.1

Notes:
N/A – Not Applicable
(1) The 1-hour NO_2 concentration presented represents the maximum of the total 98th percentile 1-hour NO2 concentration predicted at any receptor using seasonal-hourly background concentrations.
(2) NAAQS
(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/m^3
(4) $PM_{2.5}$ *de minimis* criteria—annual (discrete receptor)

To ensure that there is no potential for significant adverse impacts of $PM_{2.5}$ or NO_2 from the Proposed Project's heating and hot water system emissions, certain restrictions would be required through an Air Quality (E) Designation (E-675) that would be placed on the projected development sites. These restrictions were assumed in the analysis results presented in **Tables 14-14 and 14-15**, and would avoid the potential for significant air quality impacts from stationary sources based on the conservative assumptions used in the analysis.

The restrictions would be as follows:

Projected Development Site A

Building A1 (Block 641, p/o Lot 9)
Any new development on Building A1 (Block 641, p/o Lot 9) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and locate heating and hot water exhaust stacks at least 158 feet above grade, to avoid potential significant air quality impacts.

Building A2 (Block 641, p/o Lots 9 and 4)
Any new development on Building A2 (Block 641, p/o Lots 9 and 4) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NOx (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 163 feet above grade and located at least 112 feet away from the lot line facing 38th Street, to avoid any potential significant air quality impacts.

Building A3 (Block 641, p/o Lots 1, 4)
Any new development on Building A3 (Block 641, p/o Lots 1, 4) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NOx (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 150 feet above grade and located at least 38 feet away from the lot line facing 35th Avenue on Lot 4 and at least 91 feet from the lot line facing 38th Street, to avoid any potential significant air quality impacts.

Projected Development Site B

Building B1 (Block 668, p/o Lot 5)

Any new development on Building B1 (Block 641, p/o Lot 5) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NOx (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 233 feet above grade and located at least 45 feet away from the lot line facing Steinway Street and no more than 80 feet from the lot line facing 35th Avenue, to avoid any potential significant air quality impacts.

Building B2 (Block 668, p/o Lot 5)

Any new development on Building B2 (Block 668, p/o Lot 5) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NOx (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 235 feet above grade and located at least 163 feet away from the tallest tiers of Building C1 on Lots 13 and p/o 16.

Projected Development Site C

Building C1 (Block 669, Lot 13, p/o Lot 16)

Any new development on Building C1 (Block 669, Lot 13, p/o Lot 16) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and locate heating and hot water exhaust stacks at least 298 feet above grade, to avoid potential significant air quality impacts.

Building C2 (Block 669, Lot 36)

Any new development on Building C2 (Block 669, Lot 36) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NOx (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 185 feet above grade and located at least 125 feet away from the lot line facing 35th Avenue, to avoid potential significant air quality impacts.

Projected Development Site D

Building D1 (Block 670, p/o Lot 8)

Any new development on Building D1 (Block 670, Lot p/o 8) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and ensure that heating and hot water system stack(s) is located at least 203 feet above grade, to avoid potential significant air quality impacts.

Building D2 (Block 670, p/o Lot 8, Lots 4, 20, 27, 30)

Any new development on Building D2 (Block 670, p/o Lot 8, Lots 4, 20, 27, 30) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NOx (30 ppm), and ensure that heating and hot water system stack(s) is located at least 195 feet above grade and located at least 182 feet away from the lot line facing 42nd Street and no more than 160 feet from the lot line facing 36th Avenue, to avoid any potential significant air quality impacts.

Building D3 (Block 670, Lots 4, 47)

Any new development on Building D3 (Block 670, Lots 4, 47) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and locate heating and hot water exhaust stacks at least 283 feet above grade, to avoid potential significant air quality impacts.

Projected Development Site E

Building E1 (Block 671, Lot 12, p/o Lot 8)

Any new development on Building E1 (Block 671, Lot 12, p/o Lot 8) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NOx (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 103 feet above grade and

located no more than 75 feet away from the lot line facing 35th Avenue and no more than 18 feet from the lot line facing 42nd Street on Lot 12, to avoid any potential significant air quality impacts.

Building E2 (Block 671, Lots 1,20, 23)

Any new development on Building E2 (Block 671, Lots 1, 20, 23) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and ensure that heating and hot water system stack(s) is located at least 293 feet above grade, to avoid potential significant air quality impacts.

Projected Development Site F (Block 668, Lots 1, 2)

Any new development on Building F (Block 668, Lots 1, 2) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and ensure that heating and hot water system stack(s) is located at least 223 feet above grade, to avoid potential significant air quality impacts.

Projected Development Site G (Block 669, Lots 7, 8)

Any new development on Building G (Block 669, Lots 7, 8) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NO_x (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 168 feet above grade and located at least 84 feet away from the lot line facing 35th Avenue and at least 56 feet from the lot line facing 41st Street, to avoid any potential significant air quality impacts.

Projected Development Site H (Block 669, Lots 1, 3, 41)

Any new development on Building H (Block 669, Lots 1, 3, 41) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NO_x (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 170 feet above grade and located at least 98 feet away from the lot line facing 35th Avenue and at least 137 feet from the lot line facing 41st Street, to avoid any potential significant air quality impacts.

Projected Development Site I (Block 670, Lots 33, 36)

Any new development on Building I (Block 670, Lots 33, 36) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NOx (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 170 feet above grade and located no more than 57 feet away from the lot line facing 42nd Street, to avoid any potential significant air quality impacts.

Projected Development Site J (Block 670, Lot 39)

Any new development on Building J (Block 670, Lot 39) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NOx (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 170 feet above grade and located at least 57 feet away from the lot line facing 41st Street and at least 32 feet from the lot line facing 42nd Street, to avoid any potential significant air quality impacts.

Projected Development Site K (Block 671, Lots 16, 18)

Any new development on Building K (Block 671, Lots 16, 18) must utilize only natural gas for fossil fuel-fired heating and hot water equipment and be fitted with low NOx (30 ppm) burners, and ensure that heating and hot water system stack(s) is located at least 110 feet above grade and located no more than 48 feet away from the lot line facing 35th Avenue and at least 38 feet from the lot line on Lot 16 facing 42nd Street, to avoid any potential significant air quality impacts. ✷