Chapter 13: Air Quality

A. INTRODUCTION

This chapter examines the potential for the Proposed Actions to result in significant adverse air quality impacts. As described in Chapter 1, "Project Description," the Proposed Actions would facilitate the renovation and re-tenanting of Industry City with a mixed-use project including manufacturing, commercial, retail, hospitality, academic and community facility uses. Overall, the Proposed Actions would facilitate the re-tenanting of a substantial portion of the approximately 5.3 million square feet (sf) of existing structures, which already house Innovation Economy uses that would continue in the future, and the development of 1.27 million sf in new construction buildings or enlargements of existing structures. In total, the Proposed Actions could result in an approximately 6.57 million sf of development.

In order to assess the possible effects of the Proposed Actions, three Reasonable Worst-Case Development Scenarios (RWCDS) were composed for the future With Action condition: the Baseline Scenario, the Density-Dependent Scenario, and the Overbuild Scenario. The overall design and program of the new buildings proposed within Industry City are substantially the same under all three RWCDS.

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 heat and hot water systems. Indirect impacts are caused by off-site emissions associated with a project, such as emissions from nearby existing stationary sources (i.e., impacts on the buildings within Project Area) or by emissions from on-road vehicle trips (mobile sources) generated by a 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 2014 *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. In addition, the Proposed Project would include approximately 2,100 accessory parking spaces. Therefore, an analysis was conducted to evaluate potential future pollutant concentrations in the vicinity of the ventilation outlets of the proposed parking facilities. The Proposed Project also would introduce sensitive uses within 200 feet of the elevated section of the Gowanus Expressway. The effect of this existing roadway on the proposed uses was therefore analyzed, as recommended in the *CEQR Technical Manual*.

A number of boiler installations currently serve the Finger Buildings and the 39th Street Buildings, and new boiler plants would provide space heating and domestic hot water to the proposed buildings. Therefore, a stationary source analysis was conducted to evaluate potential future pollutant concentrations from the RWCDSs on both the surrounding neighborhood (project-on-existing) and the development sites (project-on-project).

The RWCDSs would include a mix of manufacturing, commercial, retail, hotel, academic, and community facility uses. Therefore, potential impacts from pollutant emissions from potential tenanting of manufacturing use groups in the Project Area that could be co-located within the same buildings with sensitive receptors were evaluated.

Since the Project Area is located in a manufacturing district, potential effects of stationary source emissions from existing nearby industrial facilities on the RWCDSs were assessed. Large and major sources of emissions within 1,000 feet of the Project Area also were examined, as per the guidance of the *CEQR Technical Manual*.

PRINCIPAL CONCLUSIONS

Analysis of the emissions and dispersion of nitrogen dioxide (NO_2) and PM less than 10 microns in diameter (PM_{10}) from the heating and hot water systems of the development under the Proposed Actions indicate that these emissions would not result in a violation of National Ambient Air Quality Standards (NAAQS). In addition, the maximum predicted $PM_{2.5}$ incremental concentrations from the Proposed Actions would be less than the applicable 24-hour and annual average criteria. To ensure that there are no significant adverse impacts resulting from the Proposed Actions due to heating and hot water system emissions, certain restrictions would be required, which would be included in a Restrictive Declaration.

The mobile source analyses determined that in the With Action condition, concentrations of CO and PM_{10} due to project-generated traffic at intersections would not result in any violations of NAAQS. However, at all three intersection sites analyzed, the maximum annual incremental $PM_{2.5}$ concentration at each site is predicted to exceed the *de minimis* criteria. Therefore, significant adverse air quality impacts are predicted at the intersections of 1st Avenue and 39th Street, 2nd Avenue and 39th Street, and 3rd Avenue and 39th Street. Traffic mitigation measures were examined to avoid a potential significant mobile source impact at the affected intersection locations. Mitigation measures are discussed in Chapter 20, "Mitigation."

The analysis of the proposed parking facilities determined that the emissions from vehicles using the parking facility would not result in any significant adverse air quality impacts. However, it should be noted the facility is adjacent to 1st Avenue and 39th Street, where on-street project-generated traffic resulted in predicted adverse air quality impacts.

The analysis of the elevated Gowanus Expressway determined that maximum annual $PM_{2.5}$ concentrations were predicted to exceed the *de minimis* criterion at a number of receptor locations near the Gowanus Expressway. To ensure that there are no potential significant adverse impacts of $PM_{2.5}$ from the elevated Gowanus Expressway, certain restrictions would be required that would apply to portions of existing Finger Buildings. The results of the analysis of the elevated section of the Gowanus Expressway on the proposed uses show that With Action CO concentrations at the buildings within the Project Area near the elevated roadway would be well below the 1-hour and 8-hour CO NAAQS.

The analysis of the industrial sources associated with the RWCDS determined that certain use group categories had the potential to result in a significant adverse air quality impact at receptor locations from one or more air toxic compounds. To ensure that there are no potential significant adverse impacts of air toxic compounds from specific use groups in the proposed SICD, certain restrictions would be required as part of the Proposed Actions. The analysis of existing manufacturing uses in the surrounding study area determined that emissions of air toxic compounds would not result in any potential significant adverse air quality impacts on the Proposed Project.

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 RWCDSs was required.

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 (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 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 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),[1] 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 Actions would result in an increase in vehicle trips higher 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. A parking analysis was also 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. Therefore, the effects of NO_x and VOC emissions from all sources are 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 Actions would not have a significant effect on the overall volume of vehicular travel in the metropolitan area; therefore, no measurable impact on regional NO_x emissions or on ozone

[1] The Clean Air Act of 1970, as amended 1990 (42 U.S.C. §7401 et seq.)

levels is predicted. An analysis of project-related emissions of these pollutants from mobile sources was therefore not warranted.

In addition to being a precursor to the formation of ozone, NO_2 (one component of NO_x) is a regulated pollutant. Since NO_2 is mostly formed from the transformation of NO in the atmosphere, it has primarily been of concern farther downwind from large stationary point sources, and is not a local concern from mobile sources. (NO_x emissions from fuel combustion are typically greater than 90 percent NO with the remaining fraction primarily NO_2 at the source.)[2] However, with the promulgation of the 2010 1-hour average standard for NO_2, local sources such as mobile sources have become of greater concern for this pollutant.

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

LEAD

Current airborne lead emissions are principally associated with industrial sources. Lead in gasoline has been banned under the CAA and would not be emitted from any other component of the Proposed Actions. 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 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: $PM_{2.5}$ and PM_{10}. $PM_{2.5}$ 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 directly emitted 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.

All 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.

[2] EPA Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: *Stationary Point and Area Sources*, Section 1.3, Table 1.3-1.

Since the traffic generated by the Proposed Actions 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 emissions at the proposed parking facilities were also assessed. The Proposed Project would include natural gas-fired heating and hot water systems; therefore, emissions of PM from the existing and proposed stationary sources were analyzed.

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 vehicles, no significant quantities of sulfur compounds (including SO_2) are emitted from vehicular sources. Therefore, an analysis of SO_2 from mobile sources is not warranted.

Natural gas would most likely be used in the heating and hot water systems of the buildings constructed pursuant to the Proposed Actions. The sulfur content of natural gas is negligible; therefore, no SO_2 analysis was required.

AIR TOXICS

In addition to the criteria pollutants discussed above, non-criteria air pollutants, also called air toxics, may be of concern. Air toxics are those pollutants that are known or suspected to cause serious health effects in small doses. Air toxics are emitted by a wide range of human-made and naturally occurring sources. Emissions of air toxics from industries are regulated by EPA.

As the Proposed Project includes sensitive uses and is located in a manufacturing district, an analysis to examine the potential for impacts from existing industrial emissions was performed. In addition, an analysis of air toxics emissions from potential industrial uses associated with the RWCDS was performed to assess their potential impacts on RWCDS sensitive uses.

C. AIR QUALITY STANDARDS, REGULATIONS, AND BENCHMARKS

NATIONAL AND STATE AIR QUALITY STANDARDS

As required by the CAA, primary and secondary NAAQS have been established[3] 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 13-1**. The NAAQS for CO, annual NO_2, and 3-hour SO_2 have also been adopted as the ambient air quality standards for New York State, but are defined on a running 12-month basis rather than for calendar years only. New York State also has standards for total suspended PM, settleable particles, non-methane hydrocarbons, 24-hour and annual SO_2 and ozone that correspond to federal standards that have since been revoked or replaced, and for beryllium, fluoride, and hydrogen sulfide.

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

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

Table 13-1
National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary		Secondary	
	Ppm	µg/m^3	ppm	µg/m^3
CO				
8-Hour Average	9(1)	10,000	None	
1-Hour Average	35(1)	40,000		
Lead				
Rolling 3-Month Average	N/A	0.15	N/A	0.15
NO_2				
1-Hour Average(2)	0.100	188	None	
Annual Average	0.053	100	0.053	100
Ozone (O_3)				
8-Hour Average(3,4)	0.070	140	0.070	140
PM_{10}				
24-Hour Average(1)	N/A	150	NA	150
$PM_{2.5}$				
Annual Mean(5)	N/A	12	N/A	15
24-Hour Average(6)	N/A	35	N/A	35
Sulfur Dioxide (SO_2)				
1-Hour Average(7)	0.075	196	N/A	N/A
Maximum 3-Hour Average(1)	N/A	N/A	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)
N/A – 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) 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) EPA has lowered the NAAQS down from 0.075 ppm, effective December 2015.
(5) 3-year average of annual mean.
(6) Not to be exceeded by the annual 98th percentile when averaged over 3 years.
(7) 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.

Federal ambient air quality standards do not exist for noncriteria pollutants; however, the New York State Department of Environmental Conservation (DEC) has issued standards for certain noncriteria compounds, including beryllium, gaseous fluorides, and hydrogen sulfide. NYSDEC has also developed guideline concentrations for numerous noncriteria pollutants. The DEC Division of Air Resources (DAR) guidance document DAR-1[4] contains a compilation of annual and short term (1-hour) guideline concentrations for these compounds. The DEC guidance thresholds represent ambient levels that are considered safe for public exposure. EPA has also

[4] DEC. DAR-1: Guidelines for the Evaluation and Control of Ambient Air Contaminants Under Part 212. August 2016.

developed guidelines for assessing exposure to noncriteria pollutants. These exposure guidelines are used in health risk assessments to determine the potential effects to the public.

NAAQS ATTAINMENT STATUS AND STATE IMPLEMENTATION PLANS

The CAA, as amended in 1990, defines nonattainment areas (NAA) as geographic regions that have been designated as not meeting one or more of the NAAQS. When an area is designated as NAA 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.

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

The five New York City counties and Nassau, Suffolk, Rockland, Westchester, and Orange Counties, which 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), were re-designated as in attainment for the standard on April 18, 2014, and are 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 new 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 as in moderate nonattainment for the 1997 8-hour average ozone standard. In March 2008, EPA strengthened the 8-hour ozone standards. EPA designated these same areas 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. New York State began submitting SIP documents in December 2014. On July 19, 2017, DEC announced that the New York Metropolitan Area (NYMA) is not projected to meet the July 20, 2018 attainment deadline, and DEC is therefore requesting that EPA reclassify the NYMA to "serious" nonattainment, which would impose a new attainment deadline of July 20, 2021 (based on 2018–2020 monitored data). On April 30, 2018, EPA designated the same area as a moderate NAA for the revised 2015 ozone standard.

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" for the new 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 new 1-hour SO_2 standard, replacing the former 24-hour and annual standards, effective August 23, 2010. Based on the available monitoring data, all New York State counties currently meet the 1-hour standard. In December 2017, EPA designated most of the State of New York, including New York City, as in attainment for this standard.

DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The State Environmental Quality Review Act (SEQRA) regulations and the *CEQR Technical Manual* state that the significance of a 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.[5] 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**) has the potential to have a significant adverse impact.

In addition, to maintain concentrations lower than the NAAQS in attainment areas, or to ensure that concentrations will not be significantly increased in NAAs, *de minimis* 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

For projects subject to CEQR, the *de minimis* criteria currently employed for determination of potential significant adverse $PM_{2.5}$ impacts 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 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 that are predicted to be greater than 0.3 $\mu g/m^3$ at a discrete or ground- level receptor location.

[5] *CEQR Technical Manual*. Chapter 1, section 222. March 2014; and New York State Environmental Quality Review Regulations, 6 NYCRR § 617.7.

The above *de minimis* criteria have been used to evaluate the significance of predicted impacts on $PM_{2.5}$ concentrations and determine the need to minimize PM emissions resulting from the Proposed Project.

D. METHODOLOGY FOR PREDICTING POLLUTANT CONCENTRATIONS

REASONABLE WORST-CASE DEVELOPMENT SCENARIOS

To fully assess air quality impacts of the Proposed Actions, three RWCDSs were formulated, as described in Chapter 1, "Project Description." For Transportation, the Density-Dependent Scenario was determined to result in the highest number of vehicle trips and was therefore analyzed to determine the traffic impacts with the Proposed Actions. Therefore, this scenario was used to evaluate mobile source air quality impacts with the Proposed Actions.

For the stationary source heating and hot water system analysis, the Density-Dependent Scenario was analyzed, since it maximizes sensitive uses and would be expected to result in higher fuel consumption for heating and hot water purposes used compared to the Baseline Scenario, which includes warehousing uses. The Baseline Scenario and the Density-Dependent Scenario would introduce three new structures, while the Overbuild Scenario would introduce only two new structures and would result in fewer sensitive uses. In the Overbuild Scenario, the bulk and mass from the reductions would be redistributed to bulk built above the Finger Buildings and the 39th Street.

For the assessment of potential effects from industrial sources, the Baseline Scenario and Density-Dependent Scenario was used to account for the range of potential source and receptor heights. In terms of locations of proposed sensitive uses, to conservatively assess air quality effects, it was assumed that the proposed Gateway Building would be developed and would include a hotel (which is part of the Baseline Scenario and the Density-Dependent Scenario). Building 10 was analyzed both as an emission source, as proposed under the Baseline Scenario and the Overbuild Scenario, and as a sensitive (academic) use, as proposed under the Density-Dependent Scenario.

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 models approved by EPA that have been widely used for evaluating air quality impacts of projects in New York City, other parts of New York State, and throughout the country. The modeling approach includes a series of conservative assumptions relating to meteorology, traffic, and background concentration levels resulting in a conservatively high estimate of expected pollutant concentrations that could ensue from the Proposed Project.

INTERSECTION ANALYSIS

Vehicle Emissions

Vehicle Emissions

Vehicular CO and PM engine emission factors were computed using the EPA mobile source emissions model, MOVES2014a.[6] This emissions model is capable of calculating engine as well as brakewear and tirewear emission factors for various vehicle types, 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 the DEC.

Vehicle classification data were based on field studies. Appropriate credits were used to accurately reflect the inspection and maintenance program.[7] County-specific hourly temperature and relative humidity data obtained from DEC 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[8] 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 Actions (see Chapter 11, "Transportation"). Traffic data for the future without the Proposed Actions (the No Action condition) and the With Action condition were employed in the respective air quality modeling scenarios. The peak morning, midday, and evening period traffic volumes were used as a baseline for determining off-peak volumes for weekdays, and the peak Saturday period was used for weekend days. 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. For annual impacts, average weekday and weekend 24-hour distributions were used to more accurately simulate traffic patterns over longer periods.

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[6] EPA, Motor Vehicle Emission Simulator (MOVES), User Guide for MOVES2014a, November 2015.

[7] The inspection and maintenance programs require inspections of automobiles and light trucks to determine if pollutant emissions from each vehicle's 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.

[8] 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.

Dispersion Models for Microscale Analyses

Maximum CO concentrations adjacent to streets within the surrounding area, resulting from vehicle emissions, were predicted using the Tier 1 CAL3QHC model Version 2.0.[9] The CAL3QHC model employs a Gaussian (normal distribution) dispersion assumption and includes an algorithm for estimating vehicular queue lengths at signalized intersections. CAL3QHC predicts emissions and dispersion of CO from idling and moving vehicles. The queuing algorithm includes site-specific traffic parameters, such as signal timing and delay calculations (from the 2000 *Highway Capacity Manual* traffic forecasting model), saturation flow rate, vehicle arrival type, and signal actuation (i.e., pre-timed or actuated signal) characteristics to accurately predict the number of idling vehicles.

Maximum contributions from vehicular emissions to PM concentrations adjacent to each analysis site were calculated using the CAL3QHCR model Version 2.0.[10] This refined version of the model can utilize hourly traffic and meteorology data, and is therefore more appropriate for calculating the 24-hour and annual average concentrations required to address the timescales of the PM NAAQS.

Meteorology

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

Tier I CO Analysis—CAL3QHC

In applying the CAL3QHC model, the wind angle was varied to determine the wind direction resulting in the maximum concentrations at each receptor. Following the EPA guidelines,[11] CAL3QHC computations were performed using a wind speed of 1 meter per second, and the neutral stability class D. The 8-hour average CO concentrations were estimated by multiplying the predicted 1-hour average CO concentrations by a factor of 0.7 to account for persistence of meteorological conditions and fluctuations in traffic volumes. A surface roughness of 3.21 meters was chosen. At each receptor location, concentrations were calculated for all wind directions, and the highest predicted concentration was reported, regardless of frequency of occurrence. These assumptions ensured that worst-case meteorology was used to estimate impacts.

Tier II $PM_{10}/PM_{2.5}$ Analysis—CAL3QHCR

For computation of PM concentrations, the CAL3QHCR model includes the modeling of hourly concentrations based on hourly traffic data and 5 years of monitored hourly meteorological data. The data consists of surface data collected at JFK Airport and upper air data collected at Brookhaven, New York for the period 2013–2017. All hours were modeled, and the highest predicted concentration for each averaging period is presented.

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[9] 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.

[10] EPA. User's Guide to CAL3QHC, A Modeling Methodology for Predicted Pollutant Concentrations Near Roadway Intersections. EPA454R92006.

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

Analysis Year

The microscale analyses were performed for 2027, the year by which the Proposed Project is likely 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 13-2**. PM concentrations are based on the latest available three years of monitored data (2015–2017) consistent with the statistical format of the NAAQS. CO concentrations are based on the latest available five years of monitored data (2013–2017). These values were used as the background concentrations for the mobile source analysis.

Table 13-2
Maximum Background Pollutant Concentration for Mobile Source Analysis

Pollutant	Average Period	Location	Concentration	NAAQS
CO[(1)]	1-hour	Queens College 2, Queens	1.9 ppm	35 ppm
	8-hour	Queens College 2, Queens	1.4 ppm	9 ppm
PM_{10}[(2)]	24-hour	Division Street, Manhattan	44 µg/m^3	150 µg/m^3
$PM_{2.5}$[(3)]	24-hour	J.H.S.126, Brooklyn	19.6 µg/m^3	35 µg/m^3

Notes:
[(1)] CO concentrations represent the maximum second-highest monitored concentrations from the most recent 5 years of data.
[(2)] PM_{10} concentration represents the maximum second-highest monitored concentration from the most recent 3 years of data.
[(3)] $PM_{2.5}$ concentration represents the average of the 98th percentile day from the most recent 3 years.
Source: New York State Air Quality Report Ambient Air Monitoring System, DEC, 2013–2017.

Analysis Sites

Intersections in the study area were reviewed for microscale analysis based on the *CEQR Technical Manual* guidance. Three intersections were selected for microscale analysis (see **Table 13-3**). These sites were selected because they are the locations in the study area projected to have the highest levels of project-generated traffic, and, therefore, where the greatest air quality impacts and maximum changes in concentrations would be expected. The potential impact from vehicle emissions of CO, PM_{10}, and $PM_{2.5}$ was analyzed for each of these intersections.

Table 13-3
Mobile Source Analysis Sites

Analysis Site	Location
1	1st Avenue and 39th Street
2	2nd Avenue and 39th Street
3	3rd Avenue and 39th Street

Receptor Placement

Multiple receptors (i.e., precise locations at which concentrations are evaluated) were modeled at the selected site; 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 FACILITIES

The Proposed Project would include approximately 471,100 gsf of street and structured accessory parking (approximately 2,100 spaces); therefore, the mobile source analysis must account for the additional impacts from these sources. Under the RWCDS, the largest parking facility would be at the Building 21 garage with a capacity of approximately 1,600 spaces. The sidewalks adjacent to 1st Avenue have the potential to be impacted from parking facilities; therefore, these sidewalk locations were selected for analysis. In addition, potential air quality impacts on residential receptors within the contemplated building on the site were evaluated.

Emissions from vehicles using the parking facility could potentially affect ambient levels of CO and PM at adjacent receptors. An analysis of the emissions from the outlet vents and their dispersion in the environment was performed, calculating pollutant levels in the surrounding area, using the methodology set forth in the *CEQR Technical Manual*. Emissions from vehicles entering, parking, and exiting the garages were estimated using the EPA MOVES mobile source emission model, as referenced in the *CEQR Technical Manual*. For all arriving and departing vehicles, an average speed of 5 miles per hour was conservatively assumed for travel within the parking garages. In addition, all departing vehicles were assumed to idle for 1 minute before proceeding to the exit. Although specific development plans for the project have not yet been defined, at the minimum, the garage would be designed for a minimum airflow of one cubic foot per minute of fresh air per gross square foot of garage area, based on New York City Building Code requirements.

To determine compliance with the NAAQS, CO concentrations were determined for the maximum 8-hour average period. A persistence factor of 0.70 was used to convert the calculated 1-hour average maximum concentrations to 8-hour averages, accounting for meteorological variability over the average 8-hour period, as referenced in the *CEQR Technical Manual*.

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 CO and PM concentrations at various distances from an outlet vent by assuming that the concentration in the garage is equal to the concentration leaving the vent, and determining the appropriate initial horizontal and vertical dispersion coefficients at the vent faces. It was assumed for the purpose of this analysis that all levels of the parking garage would be mechanically ventilated.

The CO concentrations were determined for the time periods when overall garage usage would be the greatest, considering the hours when the greatest number of vehicles would enter and exit the facility (PM concentrations were determined on a 24-hour and annual average basis). Traffic data for the parking garage analysis were derived from the trip generation analysis described in Chapter 11, "Transportation." Background and on-street concentrations were added to the modeling results

to obtain the total ambient levels for CO. The 24-hour average $PM_{2.5}$ background concentration was used to determine the *de minimis* criteria threshold.

Exhaust air from the analyzed parking garage was assumed to be vented through a single outlet at a height of approximately 10 feet above the sidewalk. Since there is no specific garage design at this time, the vent face was assumed to discharge towards the street that has the highest background levels of traffic, to be conservative. "Near" and "far" receptors were placed along the sidewalks at a pedestrian height of 6 feet. A receptor also was modeled at and above the assumed vent release height, 10 feet from the vent, to conservatively assess the air quality impacts from the proposed Building 21 garage on the adjacent academic use, representing windows or air intake locations.

ANALYSIS OF ELEVATED GOWANUS EXPRESSWAY

The Proposed Project would also introduce sensitive uses within 200 feet of the elevated section of the Gowanus Expressway. The effect of this existing roadway on the Proposed Project was therefore analyzed, as recommended in the *CEQR Technical Manual*.

Emission factors for CO and PM ($PM_{2.5}$ is the relevant pollutant for this analysis) were estimated using estimated speeds and volumes from information developed for the traffic analysis for the Proposed Actions (see Chapter 11, "Transportation") and vehicle classification data published by the New York State Department of Transportation (NYSDOT).[12] Receptors were placed at various locations and elevations on each of the buildings within the Project Area with sensitive uses adjacent to the Gowanus Expressway to predict concentrations from vehicles.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

A stationary source analysis was conducted to evaluate potential impacts from heating and hot water systems for the Proposed Project. A number of existing boiler installations currently serve the Finger Buildings and the 39th Street Buildings. Some of these boiler installations were recently upgraded with newer equipment or are planned to be upgraded. It was assumed that each of the proposed buildings constructed pursuant to the Proposed Actions would have a boiler installation that would generate hot water for building heating and domestic hot water, and would utilize natural gas exclusively. It was assumed that the exhaust stack(s) would be located on the tallest portion of the roof of the buildings.

To determine potential worst-case air quality impacts under the RWCDS, the Density-Dependent Scenario was analyzed, since it maximizes sensitive uses and would be expected to result in higher fuel consumption for heating and hot water purposes as compared to the Baseline Scenario, which includes warehousing uses. The Baseline and Density-Dependent Scenarios would introduce three new structures, while the Overbuild Scenario would introduce only two new structures and would result in less sensitive uses. The bulk and mass from the reductions would be redistributed to bulk built above the Finger Buildings and the 39th Street.

For proposed buildings, the exhaust stacks for the heat and hot water systems were assumed to be located at the edge of the development massing closest to the receptor. If a source could not meet

[12] The ratio between passenger cars and passenger trucks calculated from the county-specific vehicle population data used in the NYSDEC inventory projections for 2017 was applied as an additional breakdown of the fraction coded as autos in the data published by NYSDOT.

the NAAQS or $PM_{2.5}$ *de minimis* criteria, the stack was then set back in five-foot increments, until the source met the respective criteria. If necessary, further restrictive measures were considered, including use of low NO_x burners, increasing stack heights, or a combination of these measures.

Since the existing buildings are currently underutilized, actual fuel usage data was not used in the modeling analysis. Annual emissions rates for the heating and hot water systems of the existing and proposed buildings were calculated based on fuel consumption estimates, using energy use estimates based on type of development and size of the building as recommended in the *CEQR Technical Manual.* Short-term emissions for both existing and proposed buildings were conservatively estimated assuming a 100-day heating season.

The exhaust velocity for each proposed new boiler installation were calculated based on the exhaust flowrate for the boiler capacity, estimated using the energy use of the proposed building and EPA's fuel factors. Assumptions for stack diameter and exhaust temperature for the proposed systems were obtained from a survey of boiler exhaust data undertaken and provided by DEP. For the existing boiler installations, the actual stack exhaust parameters were used.

Emissions rates for the boilers were calculated based on emissions factors obtained from the EPA *Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources*. PM_{10} and $PM_{2.5}$ emissions include both the filterable and condensable fractions. **Tables 13-4 and 13-5** present the stack parameters and emission rates used in the heating and hot water system analysis for the existing (Finger Buildings and 39th Street Buildings) and the proposed buildings, respectively.

Table 13-4
Boiler Stack Parameters and Emission Rates
Finger Buildings and 39th Street Buildings

Parameter		Finger Buildings						39th Street Buildings	
		Buildings 1–2	Buildings 3–4[7][8]	Buildings 5–6	Building 7[9]	Building 8[9]	Buildings 9–10[9]	Buildings 19–20[6]	Buildings 22–26
Building Size (gsf)		491,598	579,128	609,216	248,298	361,776	452,048	1,054,172	963,035
Number of boilers		2	2	2	1	1	2	2	2
Number of stacks		1	1	1	1	1	1	2	1
Building Height (ft)		85	85	85	85	85	85	115	115
Stack Exhaust Height (ft)		91	91	91	91	91	117	24	117
Stack Exhaust Temp. (°F)[2]		223	182	159	307.8	307.8	307.8	220	210
Stack Exhaust Diameter (ft)[2]		2.5	3.0	3.0	2.0	2.0	3.3	2.0	3.3
Stack Exhaust Flow (ACFM)[1][3]		2,222	2,461	2,496	1,262	1,839	2,973	2,372	4,271
Stack Exhaust Velocity (ft/s)		7.5	5.8	5.9	6.7	9.8	6.0	12.6	8.6
Fuel Type		Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Short-Term Emission Rates									
g/s	NO_x[5]	0.043	0.051	0.054	0.022	0.032	0.052	0.046	0.085
	PM_{10}[4]	0.009	0.010	0.011	0.004	0.007	0.011	0.010	0.017
	PM_{25}[4]	0.009	0.010	0.011	0.004	0.007	0.011	0.010	0.017
Annual Emission Rates									
g/s	NO_x[5]	0.0118	0.0140	0.0147	0.0060	0.0087	0.0142	0.0127	0.0232
	PM_{25}[4]	0.0024	0.0029	0.0030	0.0012	0.0018	0.0029	0.0026	0.0048

Notes:
[1] ACFM = actual cubic feet per minute.
[2] The stack diameter, and exhaust temperature provided by the team.
[3] The stack exhaust flow rate was estimated based on the type of fuel and heat input rates.
[4] Emission rates are based on EPA AP-42 data.
[5] NO_x emission rates based on 30 ppm low NO_x burners. Based on discussions with the team, the existing boilers will be replaced with new and low NO_x boilers.
[6] Each boiler exhausts through individual stack. Emission rates and exhaust parameters provided are per stack.
[7] The boiler plant serving Buildings 3–4 was upgraded in 2015 with new and low NO_x (30 ppm) boilers.
[8] The stack location used in the modeling analysis assumes that the stack would relocated at least 90 feet west from the existing stack location.
[9] The existing central boiler plant currently serving buildings 7–10 is being replaced with individual boilers for buildings 7 and 8, and a combined system serving buildings 9–10. The boilers would be located on the roof.

Table 13-5
Boiler Stack Parameters and Emission Rates
Proposed Buildings

Parameter		Building		
		Building 11	**Gateway Building**	**Building 21**
Building Size (gsf)		465,753	166,400	744,444
Building Height (ft)		170	170	150
Stack Exhaust Height (ft)		173	173	153
Stack Exhaust Temp. (°F)[(2)]		307.8	307.8	307.8
Stack Exhaust Diameter (ft)[(3)]		3.0	2.0	3.3
Stack Exhaust Flow (ACFM)[(1,4)]		3,063	1,094	4,896
Stack Exhaust Velocity (ft/s)		7.2	5.8	9.8
Fuel Type		Natural Gas	Natural Gas	Natural Gas
Short-Term Emission Rates				
g/s[(5)]	NO_x	0.145	0.052	0.231
	PM_{10}	0.011	0.004	0.018
	$PM_{2.5}$	0.011	0.004	0.018
Annual Emission Rates				
g/s[(5)]	NO_x	0.0396	0.0141	0.0633
	$PM_{2.5}$	0.0030	0.0011	0.0048

Notes:
(1) ACFM = actual cubic feet per minute.
(2) The exhaust temperature is based on boiler specifications from DEP Boiler Permit Database.
(3) The stack diameter is based on similar sized equipment.
(4) The stack exhaust flow rate was estimated based on the type of fuel and heat input rates.
(5) Emission rates are based on EPA AP-42 data.

Dispersion Modeling

Potential impacts were evaluated using the EPA/AMS AERMOD dispersion model.[13] 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 terrain interactions. 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 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 was performed 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, which, 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) program for the PRIME model (BPIPRM) was used to determine the projected building dimensions modeling with the building downwash

[13] EPA. *AERMOD Implementation Guide*. 454/B-18-003. April 2018; EPA. AERMOD Model Formulation and Evaluation. 454/R-18-003. April 2018; EPA. User's Guide for the AMS/EPA Regulatory Model (AERMOD). 454/B-18-001. April 2018.

algorithm enabled. The modeling of downwash from sources accounts for all obstructions within a radius equal to five obstruction heights of the stack.

Methodology Utilized for Estimating NO_2 Concentrations

Annual NO_2 concentrations from stationary sources were estimated using a NO_2 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.

The 1-hour average NO_2 concentration increments from the Proposed Action's stationary combustion sources were estimated using the 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 DEC Queens College monitoring station that is the nearest ozone monitoring station and had complete five years of hourly data available. An initial NO_2 to NO_x ratio of 10 percent at the source exhaust stack was assumed, which is considered representative.

The results represent the 5-year average of the annual 98th percentile of the maximum daily 1-hour average, added to background concentrations (see below).

Meteorological Data

The meteorological data set consisted of five consecutive years of meteorological data: surface data collected at JFK Airport (2013–2017), 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 (i.e., locations at which concentrations are calculated) were modeled along the existing and proposed buildings' façades (including No Action developments) to represent potentially sensitive locations such as operable windows and intake vents. For the Proposed Project buildings, receptors were conservatively placed on the façades of the maximum development envelope. Rows of receptors at spaced intervals on the modeled buildings were analyzed at multiple elevations. Receptors were also placed at publicly accessible ground-level locations.

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 13-6**). The background levels are based on concentrations monitored at the nearest DEC ambient air monitoring stations over the most recent 5-year period for which data are available (2013–2017), with the exception of PM_{10}, which is based on 3 years of data, consistent with current DEP guidance (2015–2017). For the 24-hour PM_{10} concentration, the highest second-highest measured value over the specified period was used.

Table 13-6
Maximum Background Pollutant Concentrations for Heating and Hot Water System Analysis

Pollutant	Average Period	Location	Concentration (µg/m³)	NAAQS (µg/m³)
NO_2	1-hour	Queens College, Queens	(1)	188
	Annual	Queens College, Queens	32.9	100
$PM_{2.5}$	24-hour	JHS 126, Brooklyn	19.6	35
PM_{10}	24-hour	Division Street, Manhattan	44	150

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.
Source: New York State Air Quality Report Ambient Air Monitoring System, DEC, 2013–2017.

Total 1-hour NO_2 concentrations were calculated following methodologies that are accepted by the EPA and are considered appropriate and conservative. The methodology used to determine the compliance of total 1-hour NO_2 concentrations from the proposed sources with the 1-hour NO_2 NAAQS[14] 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 NO_2 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 5 years.

INDUSTRIAL SOURCES

Impacts of Existing Industrial Uses on the Proposed Project

Potential process and manufacturing sources located within a radius of 400 feet of the Proposed Project were evaluated. DEP's Bureau of Environmental Compliance (BEC) files were examined to determine if there are permits for any industrial facilities that are identified. A review of federal and state permits also was conducted. A request was made to BEC and NYSDEC for information regarding the release of air pollutants from these potential sources within the entire study area. The DEP and NYSDEC air permit data provided was compiled into a database of source locations, air emission rates, and other data pertinent to determining source impacts. A comprehensive search was also performed to identify NYSDEC Title V permits and permits listed in the EPA Envirofacts database.

A field survey was performed on December 14, 2018 to confirm the operational status of the sites identified in the permit search, and to identify any additional sites have sources of emissions that would warrant an analysis. Overall, five autobody facilities were identified as having emissions. Of these, three of the facilities have DEP air permits, while the other two facilities are unpermitted.

Since information was not available for two businesses regarding the quantities of coatings used to estimate the individual air toxic emissions in these cases, information from a representative source[15] was used for these businesses, which provides maximum percentage by weight and usage for individual air toxics that are commonly found in coatings used in paint spraying operations. **Table 13-7** summarizes weight percentages of volatile organic compounds (VOCs) for

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

[15] DEP. *List of Typical VOCs assumed to be found in spray paint.* October 27, 2005.

representative automotive coatings. The highest weight percentage associated with each VOC was used, to be conservative. The solvent usage from the source permit was multiplied by the weight percentage for each air toxic to estimate the maximum emission rate for the air toxics, by source.

Table 13-7
Typical Composition of VOC Emissions from Auto Spray Paint Booths

			Sherwin William Paints	
		Rust-Oleum Primer	Twilight Blue	Black Sunfire
Chemical Name	CAS #	Weight % Less Than	% by Weight	% by Weight
1,2,4-Trimethylbenzene	95-63-6			
Acetone*	67-64-1	10	42	43
Aliphatic Hydrocarbon	64742-89-8	10		
Aromatic Petroleum distillates	64742-94-5	5		
Butane	106-97-8		10	11
Ethanol	64-17-5		1	2
Ethyl 3-Ethoxyproprioanate	763-69-9		9	9
Ethylbenzene	100-41-4	5		
Methyl Ethyl Ketone	78-93-3		8	7
N-Butyl Acetate	123-86-4	5		
Propane	74-98-6		10	11
Stoddard Solvents	8052-41-3	10		
Toluene	108-88-3	10	9	8
Xylene	1330-20-7	10		

Source:
DEP. *List of Typical VOCs assumed to be found in spray paint.* October 27, 2005.

The screening procedure used to estimate the pollutant concentrations from the facility with industrial emissions is based on information contained in the certificate to operate obtained from DEP-BEC. The information describes potential contaminants emitted by the permitted processes, hours per day, and days per year in which there may be emissions (which is related to the hours of business operation), and the characteristics of the emission exhaust systems (temperature, exhaust velocity, height, and dimensions of exhaust).

For the permitted facilities, the solvent emissions were not speciated into individual air toxic compounds in the permit. To estimate the individual air toxic emissions from this the unpermitted facility, the highest VOC weight percentages summarized in **Table 13-7** were used, which provides maximum percentage by weight and usage for individual air toxics that are commonly found in coatings used in paint spraying operations.

For the unpermitted facilities, the solvent usage was estimated. Based on data compiled from the other, permitted automotive coating operations, solvent usage was assumed to be 0.5 gallons per day for each of these facilities.[16] These solvent usages were then multiplied by the weight percentage for each air toxic to estimate the maximum emission rate for each air toxic.

[16] DEP. *List of Typical VOCs assumed to be found in spray paint.* October 27, 2005.The size of the property that was estimated in this report to have a solvent usage of 0.5 gallons per day is larger than any of the permitted autobody facilities analyzed. Therefore, a solvent usage estimate of 0.5 gallons per day is considered to be conservative, for analysis purposes.

Refined Dispersion Analysis

After compiling the information on facilities with manufacturing or process operations in the study area, maximum potential pollutant concentrations from different sources, at various distances from the projected and potential development sites, were evaluated with a refined modeling analysis using the EPA/AMS AERMOD dispersion model. The AERMOD model calculates pollutant concentrations from one or more points (e.g., exhaust stacks) based on emission rates, source parameters and hourly meteorological data. The analysis of potential impacts from exhaust stacks was performed assuming stack tip downwash, urban dispersion and surface roughness length, with and without building downwash, and elimination of calms. The meteorological data set consisted of five years of meteorological data: surface data collected at JFK Airport (2013–2017) and concurrent upper air data collected at Brookhaven, Suffolk County, New York.

Predicted worst-case impacts on the Proposed Project were compared with the short-term guideline concentrations (SGCs) and annual guideline concentrations (AGCs) recommended in NYSDEC's DAR-1 AGC/SGC Tables. These guidelines present the airborne concentrations that are applied as a screening threshold to determine if the Proposed Project could be significantly impacted by nearby sources of air pollution.

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

Discrete receptors were modeled along the existing and proposed Project buildings' façades to represent potentially sensitive locations such as operable windows and intake vents.

Impacts of Existing/Future Processes at Industry City

Air emissions were analyzed from existing process uses at Industry City, as well as proposed "Innovation Economy" uses, to assess their potential impacts on the potential sensitive uses at Industry City (hotel, colleges/universities, retail spaces on the lower floors, and ground-level gathering space).

Existing Uses with Air Emissions Permits.

Industry City is currently leased to approximately 450 firms, including a variety of designers, innovators, start-ups, manufacturers, and artists, alongside traditional manufacturing, artisanal craft, and technology sectors. Approximately 25 percent of Industry City's floor area is vacant, and 26 percent is occupied by storage and warehousing uses. The remaining 49 percent of Industry City complex is broken into component parts, which include 19 percent manufacturing uses (Use Group [UG] 16A, 17B, 17C, and 18 Equivalent), 10 percent light manufacturing and creative uses (UG 10A Studio Equivalent, UG 11A and 9A Equivalent), 10 percent office/tech space (UG 6B Equivalent), 1.4 percent retail uses (UG 6 Equivalent), 1.4 percent Brooklyn Nets training facility (UG 9), and 0.2 percent event space primarily located in Building 2 of the Finger Buildings and in the courtyard space along 2nd Avenue (UG 9), with the remaining 7 percent composed of vertical circulation and mechanical space. Existing manufacturing tenants at Industry City include food producers, garment producers, and specialty goods producers of goods such as guitars and paint for artists. Light manufacturing tenants include, among others, artists, home decor designers, and fashion workshops. Office and tech tenants include private firms and nonprofits.

A summary of existing uses that were included in the analysis that have active or expired permits for air emissions from DEP are shown in **Table 13-8**.[17]

Table 13-8
Existing Industry City Businesses, UGs, and Air Permit Information

Business	Use Category	UG	Pollutants Emitted
Utrecht Paint	Paint manufacture	18A	Particulates
Fodera Guitars	Guitar manufacturing (musical instruments manufacture, excluding pianos and organs)	11	Particulates, Acetone, VOCs, acrylic coating, lacquer thinner, vinyl sealer, dye stain concentrate
Baobab Frames & Art Services	Art frames	6	Particulates, MEK, MIBK, Isopropyl Alcohol, VOCs
Rag & Bone	Clothing/woodworking	16	Particulates, VOCs
Hercules Corrugated Box	Paper and print processing	17	Particulates
Absolute Woodward	Custom millwork and finishing	16	2-butoxy-ethanol
Rainbow Silk Screen	Silk screening / textiles printing	17	Particulates, VOCs
AM Cosmetics	Cosmetics	17	Acetone, Toluene
Interdynamics	Silk screening / textiles printing	17	4-Hydroxy-4-Methyl-Pentanone; 3-Methoxy Butylacetate; 2-Butoxyethyl; Acetate; Naphtha; Butylglycolate; Benzyl Alcohol; Cyclohexanone
W&M Headwear Co.	Headwear manufacture / hat manufacture	17	Water mist
Delta Packaging Special	Printing (assume unlimited)	17	Particulates
Crystal Ellis	Custom woodworking	16	Particulates; various solvents and VOCs
Milidak USA Inc.	Leather belts (leather tanning, curing, finishing or dyeing)	18	Particulates, Alcohol, Toluene
Williamsburg Furniture & Assoc.	Furniture manufacture	17	Particulates; Toluene; 2-Propanol; MEK; N-Butyl Acetate; VOCs
The Building Block	Custom woodworking	16	Particulates; N-Butyl Acetate; Acetone; Ethanol; VOCs
Woodcraft Design Inc.	Custom woodworking	16	Particulates; Xylene; N-Butyl Acetate; Butanone; Ethoxy Propyl Acetate
Atomic Woodworking	Custom woodworking	16	Particulates; Med. Aliph. Hyd. Solvent; Acetone; VOCs
Heritage Christmas	Christmas decorations manufacturing / products manufacture, custom	11	Particulates, water mist
Domanti, Egidio	Furniture manufacture	17	Particulates; Toluene; Isopropyl Alcohol; Acetic Acid; Butyl Ester; Acetone; Naphtha
Artemis Studios	Lamp shade manufacturing / products manufacture, custom	11	Particulates, Toluol
American Furniture	furniture manufacture	17	Particulates; various solvents and other VOCs
Artisan Frameworks	Art frames	6	Particulates, VOCs

Note: Most of the current buildings do not have certificates of occupancy detailing UGs for existing uses, thus the listed UGs are approximations of UG categories existing uses may fall into.
Source: DEP permit information obtained in response to the request regarding existing uses in Industry City, April 2016.

Potential Future Uses that May Have Air Emission Sources.

The Proposed Actions would include zoning amendments that would establish the Special Industry City District (SICD). The Density-Dependent Scenario would include 1,873,828 sf of manufacturing (UG 16A, 16B, 17B, 17C, and 18 equivalent) and approximately 936,914 sf of artisanal manufacturing and art/design studio (selected UG 9A and 10A, and UG 11A equivalent), as well as office, academic, and hotel uses. Representative uses from these manufacturing UGs are already present in the existing condition. With the Proposed Actions, UG18A uses could be expected to locate on-site but would need to comply with M1 performance standards rather than

[17] Additional permitted sources of air emissions have been identified that will be analyzed. The modeling results will be included in the FEIS.

M3 performance standards pursuant to current zoning regulations applicable to the site. However, based on the size and layout of available enclosed space for manufacturing/light industrial uses, UG18B uses would not be expected to be located at Industry City under the RWCDS, and were therefore not analyzed.

For the industrial source analysis, the existing and potential uses that would be allowed under the Proposed Actions were reviewed to identify industrial use categories that would foreseeably operate within the proposed SICD. A table summarizing the use categories that the zoning text would permit is presented in **Table 13-9**.

Table 13-9
Proposed SICD
Industrial Use Categories Analyzed

Use Group
Art Frames[(1)]
Beverages, alcoholic, or breweries
Christmas decorations manufacturing / products manufacture, custom[(1)]
Clothing/woodworking[(1)]
Cosmetics[(1)]
Custom millwork and finishing[(1)]
Custom woodworking[(1)]
Furniture manufacture[(1)]
Glass or large glass products, including structural or plate glass or similar products
Graphite or graphite products
Hair, felt, or feathers, bulk processing, washing, curing or dyeing
Lamp shade manufacturing / products manufacture, custom[(1)]
Leather or fur tanning, curing, finishing, or dyeing
Linoleum or oil cloth
Meat or fish products or preparation of fish for packing
Metal or metal ores, reduction, refining, smelting, or alloying
Metal alloys or foil, miscellaneous, including solder, pewter, brass, bronze, or tin, lead or gold foil, or similar products
Metal or metal products, treatment or processing, including enameling, japanning, lacquering, galvanizing, or similar processes
Metal casting or foundry products, heavy, including ornamental iron work, or similar products
Monument works, with no limitation on processing
Paint, varnishes, or turpentine
Paint manufacture[(1)]
Paper and print processing[(1)]
Plastic, raw
Porcelain products, including bathroom or kitchen equipment or similar products
Printing or publishing, with no limitation on floor area[(1)]
Rubber, natural or synthetic, including tires, tubes, or similar products
Silk screening/textiles printing[(1)]
Soaps or detergents
Steel, structural products, including bars, girders, rails, wire rope, or similar products
Stone processing or stone products, including abrasives, asbestos, stone screenings, stone cutting, stone work, sand or lime products, or similar processes or products
Textile bleaching
Wood or lumber processing including sawmills or planning mills, excelsior, plywood, or veneer, wood-preserving treatment, or similar products or processes
Note: [(1)] Use Groups for existing Industry City business

The Proposed Actions would allow hotel uses, colleges/universities, as well as retail uses. One hotel is planned to be located in the proposed new Building 21, while the second hotel, to be developed at a later point in time, would be located at the proposed new Gateway Building. It is anticipated that academic uses would locate in a new, purpose-built structures at Building 11 and

in existing Building 9 and potentially Building 10 (in the Density-Dependent Scenario). Certain types of retail and service establishments would be permitted, mostly in the lower floors of buildings, with certain exceptions allowed elsewhere.

For the assessment of potential effects from industrial sources, the Baseline Scenario was used to account for the range of potential source heights. In terms of locations of proposed sensitive uses, the three RWCDSs vary only slightly. To conservatively assess air quality effects, it was assumed that the proposed Gateway Building would be developed and would include a hotel, as per the Baseline Scenario and Density-Dependent Scenario, while the Density-Dependent Scenario also assumes that Building 10 would be occupied by academic and retail uses. Overall, the following buildings were analyzed as sensitive receptors: Building 9, Building 10, Building 11, Building 21, the Gateway Building, and potential retail and service establishment uses in the lower floors of buildings. A range of receptor heights was modeled for each of these buildings, up to the maximum permitted over-build envelope height. Ground-level receptors were also modeled to represent pedestrian level accessible locations.

As described in Chapter 1, "Project Description," the Special Permit under the Proposed Actions goes beyond what is typically allowed in an M2-4 district by restricting hotel use (UG 5) and academic uses (UG 3) from locating in the same building as, or sharing a common wall with heavy industrial uses (UG 18); uses having a New York City or New York State environmental rating for process equipment of "A," "B," or "C"; or uses required to file a Risk Management Plan for Extremely Hazardous Substances. These measures will buffer sensitive uses from more noxious and potentially harmful uses.

Emissions Profile

To estimate emissions from industrial sources in the proposed SICD, a detailed review of permitted emissions was performed. First, emission data was compiled from the permitted businesses. A summary of the permitted businesses identified is shown in **Table 13-8**.

Next, DEP air permit records were reviewed and permitted facilities representing uses considered as consistent with the allowed uses in the proposed SICD were identified. From these permits, processes that were considered consistent with the use group (i.e., not atypical of the use group itself) were included in the emissions profile. Pollutants listed in air permits associated with these facilities were included in the analysis. After compiling and sorting the emission data for each use group, the 93rd percentile value was determined. This value was determined following the approach that EPA used to evaluate data on the ratio of NO_2/NO_x emissions measured in exhaust stacks of fossil fuel fired equipment (the in-stack ratio).[18] In reviewing the data, EPA determined that 93 percent of the data entries were below a default value, which had been previously used in lieu of project-specific data. Based on this finding, the use of the default value was determined by EPA to be conservative "for most sources" and "a reasonable default" for assessing impacts in the immediate vicinity of the source. This value has been accepted by DEP to be reasonably conservative for estimating air toxic emissions from industrial uses with the Proposed Project. In addition, the analysis accounted for facilities that have multiple air permits. For these facilities, the emission sources from the permitted emission sources were assumed to be co-located, and for processes that have the same pollutant, potential air quality impacts were determined on an additive (cumulative) basis by facility.

[18] Technical Support Document (TSD) for NO_2 – Related AERMOD Modifications, USEPA, July 2015.

A summary of emissions profiles developed for the industrial source analysis is presented in **Table 13-10**. The table presents a summary of air toxics emissions for processes in the identified use categories, using the overall highest 93rd percentile emission rate determined for each pollutant from the use groups that were identified as having DEP air permits. For some uses that are foreseeable within the district and identified for analysis, no DEP air permits were identified. It is therefore reasonable to conclude that these uses do not typically include processes requiring permits, and any associated emissions would be less than other uses for which permit information was available, and therefore that any impacts from the uses without permits are encompassed by the processes analyzed. A complete summary of the emission values used in the analysis for each of the analyzed use groups is presented in **Appendix F**, "Air Quality."

Table 13-10
Industrial Source Analysis Emissions Profile

Pollutant	Maximum Modeled Emissions	
	(lb/hr)	(lb/yr)
Formaldehyde	0.465	256.0
Glycerin	0.371	712.0
Cyanides	0.272	407.0
Ethanol	9.460	14,377.6
Formic acid	0.001	0.4
Acetic acid	0.083	166.0
Methanol	1.000	465.3
Isopropyl alcohol	8.292	9,095.5
Acetone	5.689	6,312.0
Propanol	0.001	1.0
Butyl alcohol, n-	3.496	3,918.2
Methyl chloroform	8.070	2,017.5
Methane	0.019	9.0
Chloromethane	0.060	36.0
Hydrogen cyanide	0.029	67.0
Chlorobromomethane	0.001	1.4
Vinyl chloride	0.016	91.2
Acetonitrile	0.010	4.0
Dichloromethane	0.010	16.0
Formamide	0.248	476.0
Ethylene oxide	0.002	0.5
Isophorone	0.050	100.0
Isobutyl alcohol	6.093	9,763.2
Methyl ethyl ketone	4.588	8,636.0
Trichloroethane, 1, 1, 2	0.530	53.0
Trichloroethylene	4.945	7,421.6
Dibutyl phalate	0.004	30.9
Butyl benzyl phthala	0.470	1,880.0
Naphthalene	1.000	624.0
Benzidine	0.001	2.0
Ethyl benzene	7.200	84.0
Styrene	1.000	1,600.0
Benzyl alcohol	0.064	51.7
Acrylonitrile	0.020	33.0
Propylene glycol methyl et	0.074	530.4
Methyl isobutyl ketone	4.898	9,224.0
Isopropyl acetate	0.240	383.0
Toluene	10.842	11,024.9
Cyclohexone	0.024	18.8
Phenol	0.220	369.6
Propyl acetate	0.001	0.1

Table 13-10 (cont'd)
Industrial Source Analysis Emissions Profile

Pollutant	Maximum Modeled Emissions (lb/hr)	(lb/yr)
Tetrahydrofuran	0.015	52.8
Isobutyl acetate	0.080	153.0
Hexane	2.470	1,976.0
Glycol monoethylether	0.004	8.8
Cyclohexane	0.001	6.2
Glycol ethers	14.518	23,244.2
Ethylenglycolmonbuty	1.046	1,756.8
Butoxyethyl acetate	0.006	4.7
Butyl carbitol	0.605	968.3
Dioctyl phthalate	0.283	1,630.0
Triethylamine	0.650	1,040.0
Hydroquinone	0.001	0.0
Diacetone alcohol	0.004	2.9
Butyl acetate	1.877	2,366.0
Carbon dioxide	558.000	8,760.0
Tetrachloroethylene	13.903	400.0
Sodium nitrobenzsulfate	0.013	21.0
Monoethanolamine	0.001	2.0
Ethyl acetate	2.600	2,991.7
N-heptane	0.600	2,400.0
Sodium cyanide	0.091	80.0
Potassium cyanide	0.141	246.4
Sodium carbonate	0.383	918.5
Butyl acetate, tert-	0.120	192.0
Copper cyanide	0.014	24.4
Zinc stearate	0.001	1.2
Zinc cyanide	0.013	22.6
Cyanic acid (potassium salt)	0.001	0.1
Amyl acetate, n-	0.011	81.7
Carbon monoxide	5.546	9,643.6
Cadmium oxide	0.042	2.3
Iron oxide	0.245	490.0
Potassium hydroxide	0.133	232.5
Sodium hydroxide	0.151	298.4
Nickel oxide	0.001	1.6
Zinc oxide	0.034	8.3
Xylene,m,o&p mixt.	13.705	13,429.7
Kaolin (clay)	0.008	58.1
Lead oxide	0.006	3.7
Aluminum oxide	0.040	64.0
Ethyleneglycol monopropyl ether	0.293	470.6
Lead stearate	0.001	0.6
Aluminum	0.050	80.0
Lead	0.121	381.5
Lead	0.001	5.4
Nickel	0.004	1.0
Tin	0.018	35.0
Antimony	0.005	10.2
Arsenic	0.020	50.0
Cadmium	0.001	1.2
Copper	0.001	1.7
Zinc	0.067	107.0
Sulfur dioxide	0.700	1,400.0
Sodium bisulfite	0.001	2.0
Sodium nitrite	0.080	192.0
Zinc chloride (fume)	0.032	91.0

Table 13-10 (cont'd)
Industrial Source Analysis Emissions Profile

Pollutant	Maximum Modeled Emissions (lb/hr)	(lb/yr)
Hydrogen chloride	1.337	1,302.2
Phosphoric acid	4.870	737.8
Hydrogen fluoride	0.010	1.6
Ammonia	8.663	6,012.5
Sulfuric acid	0.290	241.6
Nitric acid	0.073	125.7
Nickel chloride	0.024	0.3
Bromine	0.005	3.2
Barium sulfate	0.001	0.0
Hydrogen sulfide	1.690	18.8
Nickel (+2) sulfate	0.014	7.1
Naphtha	27.779	2,557.5
Ligroine	5.504	3,725.5
Polyvinyl chloride	0.001	0.2
Borate	0.001	2.0
Nickel sulfate	0.010	19.2
Nitrogen oxide	0.056	6,284.8
Nitrogen dioxide	0.409	684.4
Sodium dichromate	0.019	36.0
Chromic acid	0.703	656.6
Ammonium chloride	0.024	46.1
Titanium dioxide	0.021	153.0
Talc	0.279	145.2
Dipropylene glycol methyl ether	0.028	7.0
Naphtha light aliphatic	3.930	7,860.0
Naphtha light aromatic	0.038	30.4
Particulate Matter	22.000	7,748.3

Note:
Maximum emission rates represents the highest 93rd percentile emission rates determined across all use group categories.

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 projected development sites, a review of existing permitted facilities was conducted. Sources of information reviewed included the EPA's Envirofacts database,[19] and the DEC Title V and State Facility Permit websites.[20] 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 RWCDS was required.

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

[20] NYSDEC Title V and State Facility permit websites: http://www.dec.ny.gov/dardata/boss/afs/issued_atv.html; http://www.dec.ny.gov/dardata/boss/afs/issued_asf.html

E. EXISTING CONDITIONS

Concentrations of all criteria pollutants at DEC air quality monitoring stations nearest the study area are presented in **Table 13-11**. 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 **Tables 13-2 and 13-6**, above, since the data presented in **Table 13-11** are based on the most current data, compared with background concentrations used for modeling purposes, which are based on several years of monitoring data.

Table 13-11
Representative Monitored Ambient Air Quality Data

Pollutant	Location	Units	Averaging Period	Concentration	NAAQS
CO	Queens College, Queens	ppm	1-hour	1.4	35
			8-hour	0.9	9
SO_2	Queens College, Queens	µg/m^3	3-hour	42.1	1,300
			1-hour	18.1	196
PM_{10}	Division Street, Manhattan	µg/m^3	24-hour	28	150
$PM_{2.5}$	JHS 126, Brooklyn	µg/m^3	Annual	8.2	12
			24-hour	19.6	35
NO_2	Queens College, Queens	µg/m^3	Annual	28.7	100
			1-hour	112.3	188
Lead	IS 52, Bronx	µg/m^3	3-month	0.0041	0.15
Ozone	Queens College, Queens	ppm	8-hour	0.074	0.070

Notes:
The CO, PM_{10}, and 3-hour SO_2 concentrations for short-term averages are the second-highest from the most recent year with available data.
$PM_{2.5}$ annual concentrations are the average of 2015–2017 annual concentrations, and the 24-hour concentration is the average of the annual 98th percentiles in the same period.
8-Hour average ozone concentrations are the average of the fourth-highest-daily values from 2015 to 2017.
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 2015 to 2017.
Source: New York State Air Quality Report Ambient Air Monitoring System, DEC, 2013–2017.

These existing concentrations are based on recent published measurements, averaged according to the NAAQS (e.g., $PM_{2.5}$ concentrations are averaged over the 3 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 the NAAQS for the pollutants at these sites in 2017, with the exception of ozone.

F. THE FUTURE WITHOUT THE PROPOSED ACTIONS

MOBILE SOURCES

CO concentrations in the 2027 No Action condition were determined using the methodology previously described. **Table 13-12** shows future maximum predicted 8-hour CO concentrations, including background concentrations, at the analysis intersections in the No Action condition. The values shown are the highest predicted concentrations for the receptor locations for any of the time periods analyzed.

Table 13-12
Maximum Predicted 8-Hour Average CO No Action Concentrations

Analysis Site	Location	Time Period	8-Hour Concentration (ppm)
1	1st Avenue and 39th Street	AM	1.5
2	2nd Avenue and 39th Street	AM	1.5
3	3rd Avenue and 39th Street	AM	1.7

Notes:
8-hour standard (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 13-13**. 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 13-13
Maximum Predicted 24-Hour Average
PM_{10} No Action Concentrations ($\mu g/m^3$)

Analysis Site	Location	Concentration
1	1st Avenue and 39th Street	51.3
2	2nd Avenue and 39th Street	62.9
3	3rd Avenue and 39th Street	70.6

Notes:
NAAQS—24-hour average 150 $\mu g/m^3$.
Concentration includes a background concentration of 44.0 $\mu g/m^3$.

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

STATIONARY SOURCES

Absent the approvals, there would be no change on the buildings within the Project Area, and the existing buildings on those sites would remain as in existing conditions. Accordingly, in the No Action condition, emissions in the area from heating and hot water systems, and industrial uses, would be similar to existing conditions.

G. THE FUTURE WITH THE PROPOSED ACTIONS

The Proposed Actions would result in increased mobile source emissions in the immediate vicinity of the Project Area, and they have the potential to affect the surrounding community with emissions from the proposed buildings' heating and hot water systems. The following sections describe the results of the studies performed to analyze the potential impacts on the surrounding community from these sources for the 2027 analysis year.

MOBILE SOURCES

INTERSECTION ANALYSIS

CO concentrations for the Proposed Actions were predicted using the methodology previously described. **Table 13-14** shows the future maximum predicted 8-hour average CO concentrations

at the intersections studied. 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 increases 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 13-14
Maximum Predicted 8-Hour CO
With Action Concentrations (ppm)

Analysis Site	Location	Time Period	No Action	With Action	*De Minimis*
1	1st Avenue and 39th Street	PM	1.5	1.9	5.2
2	2nd Avenue and 39th Street	MD	1.5	2.0	5.3
3	3rd Avenue and 39th Street	AM/MD	1.7	2.3	5.3

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

PM_{10} concentrations with the Proposed Actions were determined using the methodology previously described and used in the No Action condition. **Table 13-15** presents the predicted PM_{10} 24-hour concentrations at the analyzed intersections in the With Action condition. The values shown are the highest predicted concentrations for the modeled receptor locations and include background concentrations.

Table 13-15
Maximum Predicted 24-Hour Average PM_{10}
With Action Concentration ($\mu g/m^3$)

Analysis Site	Location	No Action	With Action
1	1st Avenue and 39th Street	51.3	66.7
2	2nd Avenue and 39th Street	62.9	68.3
3	3rd Avenue and 39th Street	70.6	86.7

Notes:
NAAQS—24-hour average 150 $\mu g/m^3$.
Concentrations presented include a background concentration of 44.0 $\mu g/m^3$.

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 *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 13-16 and 13-17**, respectively. Note that $PM_{2.5}$ concentrations in the No Action condition are not presented, since impacts are assessed on an incremental basis.

Table 13-16
Maximum Predicted 24-Hour Average $PM_{2.5}$
Incremental Concentration ($\mu g/m^3$)

Analysis Site	Location	Increment	*De Minimis* Criterion
1	1st Avenue and 39th Street	4.8	7.7
2	2nd Avenue and 39th Street	2.2	7.7
3	3rd Avenue and 39th Street	7.6	7.7

Note: $PM_{2.5}$ *de minimis* criteria—24-hour average, not to exceed more than half the difference between the background concentration (19.6 $\mu g/m^3$) and the 24-hour standard of 35 $\mu g/m^3$.

Table 13-17
Maximum Predicted Annual Average $PM_{2.5}$ Incremental Concentration ($\mu g/m^3$)

Analysis Site	Location	Increment	*De Minimis* Criterion
1	1st Avenue and 39th Street	0.3	0.1
2	2nd Avenue and 39th Street	0.8	0.1
3	3rd Avenue and 39th Street	1.1	0.1

Note: $PM_{2.5}$ *de minimis* criteria—annual (neighborhood scale), 0.1 $\mu g/m^3$.

The results in **Table 13-16** show that the 24-hour $PM_{2.5}$ increments are predicted to be below the *de minimis* criterion at each of the analysis sites. As shown in **Table 13-17**, at all three intersection sites analyzed, the maximum annual incremental $PM_{2.5}$ concentration is predicted to exceed the *de minimis* criteria. The annual $PM_{2.5}$ concentrations exceeding the CEQR *de minimis* criteria would be considered a significant adverse air quality impact. Therefore, traffic mitigation measures were examined to avoid potential significant impact at these intersection locations. Mitigation measures are discussed in Chapter 20, "Mitigation." With the inclusion of the traffic mitigation measures, there would be no significant adverse impacts.

PARKING ANALYSIS

Based on the methodology previously described, the maximum predicted CO and PM concentrations from the parking garage at the proposed Building 21 were analyzed, assuming a near side sidewalk receptor on the same side of the street (7 feet), and a far side sidewalk receptor across 1st Avenue (54 feet), as well as a receptor on the façade of the building. All values are the highest predicted concentrations for any time period analyzed.

The maximum predicted 8-hour average CO concentration modeled is 2.1 ppm. This value includes a predicted concentration of 0.2 ppm from emissions within the parking facility, 0.5 ppm from on-street contribution, and a background level of 1.4 ppm. The maximum predicted concentration is substantially below the applicable standard of 9 ppm and the *de minimis* CO criterion of 3.8 ppm.

The maximum predicted 24-hour and annual average $PM_{2.5}$ increments from the vehicles using the garage are 0.73 $\mu g/m^3$ and 0.13 $\mu g/m^3$, respectively. These values are well below the respective $PM_{2.5}$ *de minimis* criteria of 7.7 $\mu g/m^3$ for the 24-hour average concentration and 0.3 $\mu g/m^3$ for the annual average concentration.

Since the mobile source intersection analysis determined that the intersection site at 1st Avenue and 39th Street was predicted to result in a significant adverse air quality impact, the maximum predicted CO and $PM_{2.5}$ incremental concentrations from the proposed garage, which would be adjacent to this intersection, also were calculated to determine their estimated contribution. The maximum predicted 8-hour average CO concentration at the 1st Avenue and 39th Street intersection, including the contribution from the proposed parking garage, would be 2.1 ppm, with an incremental increase of 0.7 ppm compared to the No Action condition. These values are below the respective NAAQS and *de minimis* criteria; therefore, no significant adverse impacts are predicted for CO from the Proposed Project in the With Action condition.

The maximum predicted 24-hour and annual average $PM_{2.5}$ concentrations compared to the No Action at the 1st Avenue and 39th Street intersection, including the contribution from the proposed parking garage, would result in an incremental increase of 5.4 $\mu g/m^3$ and 0.39 $\mu g/m^3$, respectively. Since the cumulative incremental concentrations exceeds the CEQR *de minimis* criteria on an

annual average basis, traffic mitigation measures were examined to avoid a potential significant impact at the affected intersection locations. Mitigation measures are discussed in Chapter 20, "Mitigation."

ANALYSIS OF ELEVATED GOWANUS EXPRESSWAY

Carbon Monoxide

As described in Section D, "Methodology for Predicting Pollutant Concentrations," an analysis was undertaken to determine maximum CO concentrations on the Proposed Project from vehicle emissions along the nearby elevated portion of the Gowanus Expressway. The maximum predicted 1-hour and 8-hour average CO concentrations are presented in **Table 13-18**. The results show that With Action CO concentrations at the buildings within the Project Area near the elevated roadway would be well below the 1-hour and 8-hour CO NAAQS.

Table 13-18
Maximum Predicted 8-Hour Average CO Concentrations from the Elevated Gowanus Expressway on the Proposed Project

Analysis Site	1-Hour Concentration (ppm)	8-Hour Concentration (ppm)
Elevated Gowanus Expressway Between 38th Street and 30th Street	1.9	1.4
Note: 1-hour standard is 35 ppm, 8-hour standard is 9 ppm.		

Particulate Matter

PM concentrations at the proposed buildings due to vehicle emissions along the elevated Gowanus Expressway were determined for the With Action condition using the methodology previously described. Since the analysis is for an existing emissions source, the emissions do not represent an increase due to the Proposed Project. The results of the analysis were compared with the City's $PM_{2.5}$ *de minimis* criteria, which demonstrate on a 24-hour hour average basis there would be no significant adverse impacts from vehicle emissions along the elevated Gowanus Expressway on air quality at buildings within the Project Area near the elevated expressway. However, maximum annual $PM_{2.5}$ concentrations were predicted to exceed the *de minimis* criterion at a number of receptor locations near the Gowanus Expressway. Therefore, in order to avoid an exceedance of this annual $PM_{2.5}$ *de minimis* criterion, restrictions on operable windows near the elevated Gowanus Expressway would be required through Air Quality (E) Designations. **Tables 13-19 and 13-20** show the With Action maximum predicted 24-hour and annual average $PM_{2.5}$ concentrations with these restrictions in place. Concentrations were predicted along the façades of each of the buildings within the Project Area with sensitive uses adjacent to and facing the elevated Gowanus Expressway.

Table 13-19
Maximum Predicted 24-Hour Average $PM_{2.5}$ Concentrations from the Elevated Gowanus Expressway on the Proposed Project

Analysis Site	Concentration (µg/m^3)	*De Minimis* (µg/m^3)
Elevated Gowanus Expressway Between 38th Street and 30th Street	1.8	7.7
Note: $PM_{2.5}$ *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.		

Table 13-20
Maximum Predicted Annual Average $PM_{2.5}$ Concentrations from the Elevated Gowanus Expressway on the Proposed Project

Analysis Site	Concentration (µg/m³)
Elevated Gowanus Expressway Between 38th Street and 30th Street	0.29
Note: $PM_{2.5}$ *de minimis* criteria—annual (at discrete receptors), 0.3 µg/m³.	

In determining the significance of annual average $PM_{2.5}$ incremental concentrations greater than 0.3 µg/m³, it was determined that concentrations that were predicted to occur on the ground-level retail portions of Buildings 3–6 are not considered significant since in the No Build Condition, these same areas are also assumed to be developed as retail; therefore, the actual incremental increase in $PM_{2.5}$ concentrations would only be attributable to the additional project-generated traffic on the adjacent segment of the elevated Gowanus Expressway, which would result in a negligible increase in $PM_{2.5}$ concentrations, well below the annual *de minimis* criteria.

As discussed above, to ensure that there are no potential significant adverse impacts of $PM_{2.5}$ from the elevated Gowanus Expressway, certain restrictions would be required as part of the Proposed Actions through Air Quality (E) Designations (E-527) that would apply to portions of existing Finger Buildings. These restrictions were assumed in the analysis leading to the projected values in **Table 13-20**, and would avoid the potential for significant air quality impacts from stationary sources. The restrictions would be as follows:

Gateway Building

To preclude the potential for significant adverse air quality impacts from the elevated Gowanus Expressway, no operable windows or air intakes would be permitted below a height of 30 feet above grade on the eastern facade of Block 695, Lots 37-43, below a height of 20 feet above grade along the northern façade within 75 feet of the lot line facing 3rd Avenue and the southern façade within 50 feet of the lot line facing 3rd Avenue.

Finger Building 7–8

To preclude the potential for significant adverse air quality impacts from the elevated Gowanus Expressway, no operable windows or air intakes on the eastern façade of Buildings 7 and 8 would be permitted below a height of 20 feet above grade.

Building 10

To preclude the potential for significant adverse air quality impacts from the elevated Gowanus Expressway, no operable windows or air intakes on the eastern façade of Building 10 would be permitted below a height of 20 feet above grade, and for academic uses, below a height of 30 feet above grade.

Between the Draft and Final EIS, additional modeling may be performed to further refine the analysis of the air quality impacts of the Gowanus Expressway on the Proposed Project. Current proposed restrictions on operable windows and air intakes on the Gateway Building, Finger Building 7 and 8, and Building 1 may be modified or eliminated should additional modeling indicate that pollutant concentrations are below applicable standards and impact criteria.

STATIONARY SOURCES

HEATING AND HOT WATER SYSTEMS

Tables 13-21 and 13-22 present the maximum predicted concentrations from the heating and hot water systems of the Project buildings at off-site and project receptors, respectively. As shown in the tables, maximum predicted concentrations from the Project buildings are below the NAAQS and $PM_{2.5}$ *de minimis* criteria. Therefore, the Proposed Project would not result in a significant impact due to existing and proposed heating and hot water system emissions.

Table 13-21
Maximum Modeled Pollutant Concentrations
from Heating and Hot Water Systems
Off-Site Receptors (µg/m³)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	Criterion
NO_2	1-hour	(1)	(1)	138.2	188(2)
	Annual	0.69	32.9	33.6	100
$PM_{2.5}$	24-hour	2.86	-	2.86	7.7(3)
	Annual	0.17	-	0.17	0.3(4)
PM_{10}	24-hour	2.86	44	46.9	150

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) 1-hour average NAAQS.
(3) $PM_{2.5}$ *de minimis* criteria—24-hour average, not to exceed more than half the difference between the background concentration (19.6 µg/m³) and the 24-hour standard of 35 µg/m³.
(4) $PM_{2.5}$ *de minimis* criteria—annual (discrete receptor), 0.3 µg/m³.

Table 13-22
Maximum Modeled Pollutant Concentrations
from Heating and Hot Water Systems
On the Proposed Actions (µg/m³)

Pollutant	Averaging Period	Maximum Modeled Impact	Background	Total Concentration	Criterion
NO_2	1-hour	(1)	(1)	145.5	188(2)
	Annual	1.18	32.9	34.1	100
$PM_{2.5}$	24-hour	6.31	-	6.31	7.7(3)
	Annual	0.299	-	0.299	0.3(4)
PM_{10}	24-hour	6.31	44.0	50.3	150

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) 1-hour average NAAQS.
(3) $PM_{2.5}$ *de minimis* criteria—24-hour average, not to exceed more than half the difference between the background concentration (19.6 µg/m³) and the 24-hour standard of 35 µg/m³.
(4) $PM_{2.5}$ *de minimis* criteria—annual (discrete receptor), 0.3 µg/m³.

To ensure that there are no potential significant adverse impacts of $PM_{2.5}$ or NO_2 from some of the RWCDS heating and hot water system emissions, certain restrictions would be required as part of the Proposed Actions through Air Quality (E) Designations (E-527) that would be placed on the existing and proposed Finger Buildings and 39th Street Buildings. These restrictions were

assumed in the analysis leading to the projected values in **Tables 13-21 and 13-22**, and would avoid the potential for significant air quality impacts from stationary sources using the very conservative assumptions used in the analysis. The restrictions would be as follows:

Finger Building 1-2

The fossil fuel-fired heating and hot water equipment serving buildings 1 and 2 must be fitted with low NO_x (30 ppm) burners and utilize only natural gas, and the heating and hot water exhaust stack must be located on Building 2 at least 91 feet above grade, to avoid potential air quality impacts.

Finger Building 3-4

The fossil fuel-fired heating and hot water equipment serving buildings 3 and 4 must be fitted with low NO_x (30 ppm) burners and utilize only natural gas, and the heating and hot water exhaust stack must be located on Building 3 at least 91 feet above grade, and must be 417 feet away from the lot line facing 3rd Avenue, to avoid potential air quality impacts.

Finger Building 5-6

The fossil fuel-fired heating and hot water equipment serving buildings 5 and 6 must be fitted with low NO_x (30 ppm) burners and utilize only natural gas, and the heating and hot water exhaust stack must be located on Building 5 at least 91 feet above grade, to avoid potential air quality impacts.

Finger Building 7

The fossil fuel-fired heating and hot water equipment serving Building 7 must be fitted with low NO_x (30 ppm) burners and utilize only natural gas, and the heating and hot water exhaust stack must be at least 91 feet above grade, to avoid potential air quality impacts.

Finger Building 8

The fossil fuel-fired heating and hot water equipment serving Building 8 must be fitted with low NO_x (30 ppm) burners and utilize only natural gas, and the heating and hot water exhaust stack must be at least 91 feet above grade, to avoid potential air quality impacts.

Finger Building 9-10

The fossil fuel-fired heating and hot water equipment serving Buildings 9 and 10 must be fitted with low NO_x (30 ppm) burners and utilize only natural gas, and the heating and hot water exhaust stack must be located on Building 9 at least 117 feet above grade, to avoid potential air quality impacts.

Finger Building 11

The fossil fuel-fired heating and hot water equipment serving Building 11 must utilize only natural gas, and the heating and hot water exhaust stack must be at least 173 feet above grade, to avoid potential air quality impacts.

Gateway Building (Finger Building)

The fossil fuel-fired heating and hot water equipment serving Gateway Building must utilize only natural gas, and the heating and hot water exhaust stack must be at least 173 feet above grade, to avoid potential air quality impacts.

39th Street Buildings 19–20

The fossil fuel-fired heating and hot water equipment serving Buildings 19 and 20 must be fitted with low NO_x (30 ppm) burners and utilize only natural gas, and the heating and hot water exhaust stacks must be at least 45 feet above grade, to avoid potential air quality impacts.

39th Street Building 21

The fossil fuel-fired heating and hot water equipment serving Building 21 must utilize only natural gas, and the heating and hot water exhaust stack must be at least 153 feet above grade, to avoid potential air quality impacts.

39th Street Building 22-26

The fossil fuel-fired heating and hot water equipment serving Buildings 22, 23, 24, 25 and 26 must be fitted with low NO_x (30 ppm) burners and utilize only natural gas, and heating and hot water exhaust stack must be located on Building 22 at least 117 feet above grade, to avoid potential air quality impacts.

With these restrictions, emissions from fossil fuel-fired heating and hot water systems would not result in any significant adverse air quality impacts.

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 development site is ultimately developed.

INDUSTRIAL SOURCES

Impacts of Existing Industrial Uses on the Proposed Project

Table 13-23 presents the maximum potential modeled short-term and long-term impacts of the analyzed industrial sources on toxic air pollutant concentrations on the Project Area. The table also lists the SGC and AGC for each toxic air pollutant.

Table 13-23
Maximum Predicted Pollutant Concentration Increments (µg/m³)

Pollutant	CAS No.	1-Hour Average (µg/m³)	SGC (µg/m³)[1]	Annual Average (µg/m³)	AGC (µg/m³)[1]
Solvents	NY998-00-0	1,153.8	98,000	59	7,000
Acetone	00067-64-1	497	180,000	25.4	30,000
Aliphatic Hydrocarbon	64742-89-8	115	--	6	3,200
Aromatic Petroleum distillates	64742-94-5	59.2	--	3	100
Butane	00106-97-8	127	238,000	6.5	--
Ethanol	00064-17-5	23.1	--	1.2	45,000
Ethyl 3-Ethoxyproprioanate	00763-69-9	103	140	5.4	64
Ethylbenzene	00100-41-4	59.2	--	3	1,000
Methyl Ethyl Ketone	00078-93-3	91.7	13,000	4.8	5,000
N-Butyl Acetate	00123-86-4	590	95,000	3	17,000
Propane	00074-98-6	127	--	6.5	43,000
Stoddard Solvents	08052-41-3	115	--	6	900
Toluene	00108-88-3	115	37,000	6	5,000
Xylene	01330-20-7	115	22,000	6	100
$PM_{2.5}$	NY075-02-5	24[2]	35[3]	10[4]	12
PM_{10}	NY075-00-5	52[2,5]	150[3]	3.0	--

Sources:
[1] DEC Division of Air Resources. *DAR-1 AGS/SGC Tables.* August 2016.
[2] 24-hour average concentration including background concentration.
[3] NAAQS 24-hour average.
[4] $PM_{2.5}$ maximum predicted concentration was added to a background concentration of 8.2 (µg/m³).
[5] PM_{10} maximum predicted concentration was added to a background concentration of 44 (µg/m³).

The AERMOD analysis determined that emissions of air toxic compounds from existing industries in the area would not result in any potential significant adverse air quality impacts on the Proposed Project.

Impacts of Existing/Future Processes at Industry City

The results of the AERMOD model were used to predict the worst-case potential air toxics concentrations from the use groups that would be permitted in the proposed SICD at modeled receptor locations. The unitary results ($\mu g/m^3$ per g/s) were scaled by the 93rd percentile emission rates from the emissions profile. The results were compared with the SGC and AGC values reported in the NYSDEC's DAR-1 Tables guidance document to determine the potential for significant impacts.[21] For each source location modeled, pollutants that were modeled to exceed AGCs and/or SGCs are summarized, along with the affected receptors.

A summary of the analysis results is presented in **Table 13-24**. A complete summary of the modeled concentrations for each pollutant for each of the analyzed use categories is presented in **Appendix F**, "Air Quality."

Table 13-24
Maximum Modeled Pollutant Concentrations ($\mu g/m^3$)

Pollutant	CAS No.	Short-term Impact ($\mu g/m^3$)	SGC ($\mu g/m^3$)(1)	Annual Impact ($\mu g/m^3$)	AGC ($\mu g/m^3$)(1)
Formaldehyde	00050-00-0	10.22	30	0.022	0.1
Glycerin	00056-81-5	189.59	---	1.312	240.0
Cyanides	00057-12-5	138.84	380	0.750	3.5
Ethanol	00064-17-5	4,834.23	---	26.498	45,000.0
Formic acid	00064-18-6	0.51	1,900	0.001	22.0
Acetic acid	00064-19-7	42.41	3,700	0.306	60.0
Methanol	00067-56-1	511.01	33,000	0.858	4,000.0
Isopropyl alcohol	00067-63-0	4,237.25	98,000	16.763	7,000.0
Acetone	00067-64-1	2,907.24	180,000	11.633	30,000.0
Propanol	00071-23-8	0.51	---	0.002	590.0
Butyl alcohol, n-	00071-36-3	1,786.53	---	7.221	1,500.0
Methyl chloroform	00071-55-6	4,123.86	9,000	3.718	5,000.0
Methane	00074-82-8	9.58	---	0.017	1,600.0
Chloromethane	00074-87-3	30.66	22,000	0.066	90.0
Hydrogen cyanide	00074-90-8	14.56	520	0.124	0.8
Chlorobromomethane	00074-97-5	0.51	---	0.003	2,500.0
Acetonitrile	00075-05-8	5.11	---	0.007	60.0
Dichloromethane	00075-09-2	5.11	14,000	0.029	60.0
Formamide	00075-12-7	126.73	---	0.877	43.0
Ethylene oxide	00075-21-8	1.02	18	0.001	0.02
Isophorone	00078-59-1	25.55	2,800	0.184	---
Isobutyl alcohol	00078-83-1	3,113.44	---	17.994	360.0
Methyl ethyl ketone	00078-93-3	2,344.31	13,000	15.916	5,000.0
Trichloroethane, 1, 1, 2	00079-00-5	270.84	---	0.098	1.4
Dibutyl phalate	00084-74-2	2.04	---	0.057	12.0
Naphthalene	00091-20-3	511.01	7,900	1.150	3.0
Ethyl benzene	00100-41-4	3,679.28	---	0.155	1,000.0
Styrene	00100-42-5	511.01	17,000	2.949	1,000.0
Benzyl alcohol	00100-51-6	32.70	1,300	0.095	350.0

[21] NYSDEC, DAR-1 Guidelines for the Evaluation and Control of Ambient Air Contaminants Under Part 212; Appendix A, Toxicity Classification and Guideline Development Methodology for Annual and Short-Term Guideline Concentrations (AGC/SGC), August 2016.

Table 13-24 (cont'd)
Maximum Modeled Pollutant Concentrations (µg/m^3)

Pollutant	CAS No.	Short-term Impact (µg/m^3)	SGC (µg/m^3)(1)	Annual Impact (µg/m^3)	AGC (µg/m^3)(1)
Propylene glycol methyl et	00107-98-2	37.81	36,850	0.977	2,000.0
Methyl isobutyl ketone	00108-10-1	2,503.14	31,000	17.000	3,000.0
Isopropyl acetate	00108-21-4	122.64	84,000	0.706	1,000.0
Toluene	00108-88-3	5,540.34	37,000	20.319	5,000.0
Cyclohexone	00108-94-1	12.26	20,000	0.035	190.0
Phenol	00108-95-2	112.42	5,800	0.681	20.0
Propyl acetate	00109-60-4	0.51	100,000	1.73×10^{-4}	20,000.0
Tetrahydrofuran	00109-99-9	7.67	30,000	0.097	350.0
Isobutyl acetate	00110-19-0	40.88	---	0.282	565.0
Hexane	00110-54-3	1,262.20	---	3.642	700.0
Glycol monoethylether	00110-80-5	2.04	370	0.016	200.0
Cyclohexane	00110-82-7	0.51	---	0.012	6,000.0
Ethylenglycolmonbuty	00111-76-2	534.26	14,000	3.238	1,600.0
Butoxyethyl acetate	00112-07-2	3.07	---	0.009	310.0
Butyl carbitol	00112-34-5	309.26	370	1.785	200.0
Triethylamine	00121-44-8	332.16	2,800	1.917	7.0
Hydroquinone	00123-31-9	0.51	---	2.21×10^{-5}	2.4
Diacetone alcohol	00123-42-2	2.04	---	0.005	570.0
Butyl acetate	00123-86-4	970.92	95,000	4.361	17,000.0
Carbon dioxide	00124-38-9	285,144.08	---	16.145	21,000.0
Sodium nitrobenzsulfate	00127-68-4	6.64	---	0.039	9.0
Monoethanolamine	00141-43-5	0.51	1,500	0.004	18.0
Ethyl acetate	00141-78-6	1,328.63	---	5.514	3,400.0
N-heptane	00142-82-5	306.61	210,000	4.423	3,900.0
Sodium cyanide	00143-33-9	46.63	380	0.147	3.5
Potassium cyanide	00151-50-8	72.00	380	0.454	3.5
Sodium carbonate	00497-19-8	195.74	200	1.693	---
Butyl acetate, tert-	00540-88-5	61.32	---	0.354	2,300.0
Copper cyanide	00544-92-3	7.18	380	0.045	3.5
Zinc stearate	00557-05-1	0.51	---	0.002	24.0
Zinc cyanide	00557-21-1	6.64	380	0.042	3.5
Cyanic acid (potassium salt)	00590-28-3	0.51	380	1.84×10^{-4}	3.5
Amyl acetate, n-	00628-63-7	5.62	53,000	0.151	630.0
Carbon monoxide	00630-08-0	2,833.86	40,000	17.773	---
Cadmium oxide	01306-19-0	21.46	---	2.34×10^{-4}	0.0
Iron oxide	01309-37-1	125.20	---	0.903	12.0
Potassium hydroxide	01310-58-3	68.07	200	0.428	---
Sodium hydroxide	01310-73-2	77.31	200	0.550	---
Zinc oxide	01314-13-2	0.51	---	0.004	0.006
Xylene,m,o&p mixt.	01330-20-7	7,003.25	22,000	24.751	100.0
Kaolin (clay)	01332-58-7	4.09	---	0.107	4.8
Lead oxide	01335-25-7	2.89	---	0.007	0.04
Aluminum oxide	01344-28-1	20.44	---	0.118	4.5
Ethyleneglycol monopropyl ether	02807-30-9	149.85	370	0.867	200.0
Lead stearate	07428-48-0	0.51	---	0.001	0.1
Aluminum	07429-90-5	25.55	---	0.147	2.4
Lead	07439-42-1	1.02	---	0.007	0.04
Lead	07439-92-1	0.51	---	0.010	0.04
Tin	07440-31-5	9.31	20	0.065	0.2
Antimony	07440-36-0	2.71	---	0.019	1.2
Cadmium	07440-43-9	0.51	---	1.84×10^{-6}	0.0
Copper	07440-50-8	0.48	---	0.003	490.0
Zinc	07440-66-6	34.24	---	0.197	45.0
Sulfur dioxide	07446-09-5	190.36	196	0.556	80.0
Sodium bisulfite	07631-90-5	0.51	---	0.004	12.0
Zinc chloride (fume)	07646-85-7	16.21	200	0.168	2.4
Hydrogen chloride	07647-01-0	683.14	2,100	2.400	20.0

Table 13-24 (cont'd)
Maximum Modeled Pollutant Concentrations (µg/m^3)

Pollutant	CAS No.	Short-term Impact (µg/m^3)	SGC (µg/m^3)(1)	Annual Impact (µg/m^3)	AGC (µg/m^3)(1)
Phosphoric acid	07664-38-2	197.94	300	1.360	10.0
Hydrogen fluoride	07664-39-3	5.11	6	0.003	0.1
Ammonia	07664-41-7	1,920.28	2,400	11.081	100.0
Sulfuric acid	07664-93-9	6.00	120	0.057	1.0
Nitric acid	07697-37-2	37.45	86	0.232	12.0
Bromine	07726-95-6	2.56	130	0.006	1.6
Barium sulfate	07727-43-7	0.51	---	3.69×10^{-5}	12.0
Hydrogen sulfide	07783-06-4	863.38	---	0.035	2.0
Naphtha	08030-30-6	14,195.32	---	4.713	900.0
Ligroine	08032-32-4	2,812.84	---	6.866	900.0
Polyvinyl chloride	09002-86-2	0.51	---	3.69×10^{-4}	2.4
Borate	10043-35-3	0.51	---	0.004	4.8
Nitrogen oxide	10102-43-9	28.72	---	11.583	74.0
Nitrogen dioxide	10102-44-0	172.82	188	0.620	100.0
Ammonium chloride	12125-02-9	12.26	380	0.085	24.0
Titanium dioxide	13463-67-7	10.73	---	0.282	24.0
Talc	14807-96-6	142.61	---	0.268	4.8
Dipropylene glycol methyl ether	34590-94-8	14.31	91,000	0.013	1,400.0
Naphtha light aliphatic	64742-89-8	2,008.27	---	14.486	3,200.0
Naphtha light aromatic	64742-95-6	19.42	---	0.056	100.0
Particulates	NY075-00-0	145.57	150	9.833	---

Notes:
(1) *DAR-1 AGS/SGC Tables,* NYSDEC Division of Air Resources, Bureau of Stationary Sources, August 2016.
(2) Concentrations of air toxics that would be included in a Restrictive Declaration restricting emissions of the pollutant and/or stack setbacks are not included in this summary table for the particular pollutant.

Of the 14 use categories analyzed, a total of 9 use categories were determined to cause potential exceedances of SGCs and/or AGCs at sensitive receptors on the Proposed Project. No significant adverse air quality impacts were identified at existing or proposed receptors at off-site locations. To ensure that there are no potential significant adverse impacts of air toxic compounds from specific use groups in the proposed SICD, certain restrictions would be included a Restrictive Declaration as part of the Proposed Actions. These restrictions were assumed in the analysis leading to the results presented in **Table 13-23**, and would avoid the potential for significant air quality impacts from stationary sources using the assumptions used in the analysis.

The restrictions would be as follows:

Block 679, at the portion of Lot 1 within 130 feet west of 3rd Avenue; Block 683, Lot 1; Block 687, Lot 1; Block 691, Lot 1 and 44; Block 695, Lots 1 and 20; Block 706, Lots 1 and 24; and Block 710, Lot 1.

General Restrictions

For the use category of glass or large glass products, including structural or plate glass or similar products: emissions of particulate matter are prohibited.

For the use category of metal or metal ores, reduction, refining, smelting, or alloying: emissions of trichloroethylene, tetrachloroethylene, sulfuric acid, nickel chloride, nickel sulfate, nitrogen dioxide, benzidine, cadmium oxide, arsenic, cadmium, sodium nitrite, sodium dichromate, and chromic acid are prohibited.

For the use category of metal alloys or foil, miscellaneous, including solder, pewter, brass, bronze, or tin, lead or gold foil, or similar products: emissions of lead and cadmium are prohibited.

For the use category of metal casting or foundry products, heavy, including ornamental iron work, or similar products, emissions of zinc oxide are prohibited.

For the use category of plastic, raw: emissions of formaldehyde, phosphoric acid, vinyl chloride, butyl benzyl phthalate, acrylonitrile, dioctyl phthalate, and chromic acid are prohibited.

For the use category of rubber, natural or synthetic, including tires, tubes, or similar products: emissions of formaldehyde, nickel oxide, ammonia, zinc oxide, and chromic acid are prohibited.

For the use category of soaps or detergents: emissions of particulate matter are prohibited.

For the use category of steel, structural products, including bars, girders, rails, wire rope, or similar products: emissions of formaldehyde, trichloroethylene, glycol ethers, tetrachloroethylene, nickel, and chromic acid are prohibited.

For the use category of stone processing or stone products, including abrasives, asbestos, stone screenings, stone cutting, stone work, sand or lime products, or similar processes or products: emissions of particulate matter are prohibited.

Building Restrictions

- *Finger Building 1*: Exhaust stack for industrial uses on Building 1 must be at least 120 feet from the eastern lot line facing 3rd Avenue.
- *Finger Building 2*: Exhaust stack for industrial uses on Building 2 must be at least 140 feet from the eastern lot line facing the 3rd Avenue.
- *Finger Building 3*: Exhaust stack for industrial uses on Building 3 must be at least 120 feet from the lot line facing the 3rd Avenue.
- *Finger Building 8*: Exhaust stack for industrial uses on Building 8 are prohibited from locating within either areas as defined by:
  - Within 40 feet of the northern lot line facing 33rd Street and within 210 feet of the lot line facing 2nd Avenue; or
  - Within 40 feet of the northern lot line facing 33rd Street and within 240 feet of the lot line facing 3rd Avenue.
- *Building 21*: Exhaust stack for industrial uses on Building 21 must be located above the tallest portion of the building roof.
- *Building 22:* Exhaust stack for industrial uses on Building 22 must be at least 70 feet from the eastern lot line facing the 1st Avenue.
- *Building 26*: Exhaust stack for industrial uses on Building 26 must be at least 70 feet from the eastern lot line facing the 1st Avenue.

Between the Draft and Final EIS, additional modeling may be performed based on adjustments to the list of analyzed use group categories and the associated emissions for use group categories that are currently permitted at Industry City. In addition, modeling will be performed to further define potential restrictions to siting industrial source exhaust stacks. As a result, modifications may be made to the proposed Special Permit for the SICD regarding the restrictions of certain use group categories that were found to have the potential for air quality impacts in the Proposed Project based on the analysis presented herein. ✷