

16. AIR QUALITY

16.1. INTRODUCTION

The potential for air quality impacts from the Proposed Action is examined in this chapter. According to the *City Environmental Quality Review (CEQR) Technical Manual*, air quality impacts can be either direct or indirect. Direct impacts result from emissions generated by stationary sources from a prototype, such as emissions from on-site fuel combustion for heat and hot water systems (“stationary sources”). Indirect impacts are caused by off-site emissions associated with a project, such as emissions from on-road vehicle trips (“mobile sources”) generated by the Proposed Action.

16.2. PRINCIPAL CONCLUSION

The Proposed Action would not result in any significant adverse air quality impacts.

16.2.1. Mobile Sources

The Proposed Action would not result in significant adverse air quality impacts due to mobile sources. Based on the traffic screening criteria provided in *CEQR Technical Manual*, the Proposed Action would not exceed the thresholds for requiring a mobile source air quality analysis, and therefore, no further analysis is warranted.

16.2.2. Stationary Sources

The Proposed Action would not result in any significant adverse air quality impacts due to stationary sources. Based on the prototypical analysis, two of four prototypes require detail analysis and two of four prototypes require screening analysis. The prototypical analysis showed that there would be no potential significant adverse air quality impacts from fossil fuel-fired heat and hot water systems associated with any prototype.

16.3. SCREENING ANALYSIS

The Proposed Action is a “generic action,” and there are no known potential or projected development sites and, due to its broad applicability, it is difficult to predict the sites where development would be facilitated by the Proposed Action. To produce a reasonable analysis of likely effect of the Proposed Action, four representative development prototypes have been identified, as described in the Analytical Framework. The screening analysis was performed to assess air quality impacts associated with emissions from heat and hot water systems for all prototypes. The methodology described in the *2014 CEQR Technical Manual* was used for the analysis.

The screening methodology determines the threshold distance between the HVAC stack and the nearest sensitive receptor of similar or greater height beyond which the action would not have a significant adverse impact. The screening procedures consider the different type of fuel to be used, the maximum development size, type of development and the heat and hot water systems exhaust stack height to evaluate whether a significant adverse impact may occur. The screening distance is assumed to be 400 feet if there are no buildings of similar or taller than the proposed prototype, indicating that the Proposed Action would facilitate

the development of the tallest building in the neighborhood.

Based on aforementioned parameters, if the distance between the HVAC stack and the nearest receptor of similar or greater height is less than the threshold distance as per in the *2014 CEQR Technical Manual* figures, the potential for significant adverse air quality impacts is identified, and a detail analysis involving a refined dispersion model is needed. Otherwise, if the prototype passes the screening analysis, no further analysis would be required.

Since information on the heat and hot water systems was not available for the citywide action, the distance between the boiler stack and the nearest receptor of similar or greater height is assumed to be the distance between the roof edges of two buildings as a worst-case analysis for screening. The receptors for the screening analysis were placed at either the nearest existing building or at the nearest proposed potential development site with equal or similar height. It was assumed that No. 2 fuel oil would be used in all prototypes heat and hot water systems for conservative analysis. If the screen for oil passes then there is no restriction in the type of fuel. The primary pollutants of concern are SO₂ and PM which are described below. The exhaust stacks were assumed to be located 3 feet above the roof (as per the *2014 CEQR Technical Manual*) and placed on the highest tier for buildings with different tier configurations. For sources that did not pass the screening analyses, a refined modeling analysis was performed.

16.3.1. Mobile Sources Screening

The Proposed Action has the potential to increase traffic volumes on streets within and surrounding rezoning area and could result in localized increases in CO and PM levels (these pollutants are described below). Therefore, a mobile source screening analysis was conducted for each prototype to determine the potential for CO and PM impact in accordance to *2014 CEQR Technical Manual* guidelines.

Based on the traffic screening analysis provided in the, "Transportation," Chapter, the number of incremental trips generated by the Proposed Action associated with each prototype would be lower than the *2014 CEQR Technical Manual* carbon monoxide (CO)-based screening threshold of 140 auto trips per hour at an intersection as well as the minimum screening threshold of 12 heavy-duty diesel vehicles (HDDV) for fine particulate matter (PM_{2.5}). The minimum thresholds throughout the city were chosen for conservative purpose. Consequently, the Proposed Action would not result in significant adverse mobile source air quality impacts, and no further analysis is warranted.

16.3.2. Stationary Sources

A stationary source analysis was conducted to evaluate potential impacts from the proposed prototypes heat and hot water systems. All prototypes were subjected to an assessment to determine whether or not an air quality analysis is warranted. If the prototype indicated that no change in floor area, density or height between the No-Action and the With-Action scenarios, it is concluded that there would be no stationary source air quality impacts and no further analysis is warranted. All prototypes with floor area, density or height changes would be subject to HVAC screening analysis. For the prototypes that did not pass screening analysis, a detail analysis is conducted to determine whether or not a potential for air quality impact may occur. The pollutant analyzed includes SO₂, PM_{2.5} as described below. The stack height is assumed to be 3 feet above the roof height.

The screening analysis was performed to evaluate whether potential air quality impacts from the heat and hot water systems associated with each prototype could potentially impact other existing or project sensitive receptors nearby. The analysis was conducted based on the floor area, stack height and the distance to the nearest sensitive receptor as described above.

The development proposed by Prototype 3 would facilitate the development of the tallest building in the neighborhood, therefore, the distance between to the nearest receptors of similar or greater height is assumed to be greater than 400 feet. The development proposed by Prototype 3 passed the screening analysis using No. 2 fuel oil as the fuel type. Therefore, no further detailed analyses are warranted and no significant impacts would be anticipated for this prototype.

The development proposed by Prototype 4 would repurpose an existing moving and storage company to a self-storage facility. The fuel usage between the two uses will not differ as the floor area and building height remain the same for this prototype. Therefore no further detailed analyses are warranted and no significant impacts would be anticipated for this prototype.

A total of two prototypes (Prototypes 1 and 2) failed the screening analysis using No. 2 fuel oil as the fuel type. The distance to the nearest receptors of similar or greater height for these prototypes are presented in Table1. Therefore, each of these prototypes required a refined modeling analysis with No. 2 fuel oil.

Using the stack height and gross square footage associated with each prototype, the minimum distance (screening distance) required between the building’s exhaust stack and the nearest building façade of equal or greater height was determined. The screening analysis is summarized below (see Table 1):

Table 1: HVAC Screening Results				
Prototype No.	Stack Height (ft)	Gross Floor Area (gsf)	Minimum Distance to Nearest Building (ft)	Screening Result
1	43	70,000	0	FAIL
2	91	167,000	400	PASS
3	55	85,000	30	FAIL
4	53	100,000		N/A ¹

16.4. DETAILED ANALYSIS

16.4.1. Methodology

¹ There is no difference between the building height and floor area between the no action and with action development for Prototype 4. Therefore, no screening analysis is required.

The Proposed Action is a “generic action,” and there are no known potential or projected development sites and, due to its broad applicability, it is difficult to predict the sites where development would be facilitated by the Proposed Action. To produce a reasonable analysis of likely effect of the Proposed Action, four representative development prototypes have been identified, as described in Chapter 2, “Analytical Framework.”

Ambient air quality is affected by air pollutants produced by both motor vehicles and stationary sources. According to the CEQR Technical Manual, mobile source and stationary source analyses are required to determine the potential air quality impacts from the Proposed Action. Emissions from motor vehicles are referred to as mobile source emissions, while emissions from fixed facilities, such as the HVAC system of building, are referred to as stationary source emissions. Pollutants relevant to both mobile source and stationary source are listed below.

16.4.2. Pollutants for Analysis

Ambient concentrations of carbon monoxide (CO) are predominantly influenced by mobile source emissions. Particulate matter (PM), volatile organic compounds (VOCs), and nitrogen oxides (nitric oxide (NO) and nitrogen dioxide (NO₂), collectively referred to as NO_x) are emitted from both mobile and stationary sources. Fine PM is also formed when emissions of NO_x, sulfur oxides (SO_x), ammonia, organic compounds, and other gases react or condense in the atmosphere. Emissions of sulfur dioxide (SO₂) are associated mainly with stationary sources. On-road diesel vehicles currently contribute very little to SO₂ emissions since the sulfur content of on-road diesel fuel, which is federally regulated, is extremely low. Ozone is formed in the atmosphere by complex photochemical processes that include NO_x and VOCs. Ambient concentrations of CO, PM, NO₂, SO₂, ozone, and lead are regulated by the U.S. Environmental Protection Agency (EPA) under the Clean Air Act, and are referred to as ‘criteria pollutants’; emissions of VOCs, NO_x, and other precursors to criteria pollutants are also regulated by EPA.

16.4.2.1. Carbon Monoxide

CO, a colorless and odorless gas, is produced in the urban environment primarily by the incomplete combustion of gasoline and other fossil fuels. In urban areas, approximately 80 to 90 percent of CO emissions are from motor vehicles. CO concentrations can diminish rapidly over relatively short distances; elevated concentrations are usually limited to locations near crowded intersections, heavily traveled and congested roadways, parking lots, and garages. Consequently, CO concentrations must be analyzed on a local (microscale) basis.

16.4.2.2. 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 chemical reactions that take place in the atmosphere in the presence of sunlight. In addition to being a precursor to the formation of Ozone, NO₂ (one component of NO_x) is also a regulated pollutant.

16.4.2.3. Particulate Matter —PM₁₀ and PM_{2.5}

PM is a broad class of air pollutants that includes discrete particles of a wide range of sizes and chemical compositions, as either liquid droplets (aerosols) or solids suspended in the atmosphere. The constituents of PM are both numerous and varied, and they are emitted from a wide variety of sources.

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

Gasoline-powered and diesel-powered vehicles, especially heavy duty trucks and buses operating on diesel fuel, are a significant source of respirable PM, most of which is PM_{2.5}; PM concentrations may, consequently, be locally elevated near roadways. The Proposed Action would not result in traffic exceeding the PM_{2.5} vehicle emissions screening analysis thresholds as defined in *2014 CEQR Technical Manual* Chapter 17, Sections 210 and 311.

16.4.2.4. Sulfur Dioxide

SO₂ emissions are primarily associated with the combustion of sulfur-containing fuels (oil and coal). Due to the federal and State restrictions on the sulfur content in diesel fuel for on-road and non-road vehicles, no significant quantities are emitted from vehicular sources. Vehicular sources of SO₂ are not significant and therefore, analysis of SO₂ from mobile and/or non-road sources was not warranted.

16.4.2.5. Noncriteria Pollutants

In addition to the criteria pollutants discussed above, noncriteria pollutants may be of concern. Noncriteria pollutants are emitted by a wide range of man-made and naturally occurring sources.

Federal ambient air quality standards do not exist for noncriteria pollutants but the New York State Department of Environmental Conservation (NYSDEC) has issued standards for certain noncriteria pollutant. The NYSDEC guidance thresholds represent ambient levels that are considered safe for public exposure.

The citywide Action would not introduce new sensitive receptors on existing manufacturing-zoned areas, auto related or dry cleaning facilities. Therefore, an analysis to examine the potential for impacts to the Proposed Action from industrial emissions was not warranted.

16.4.3. Emission Estimates and Stack Parameters

Prototypes that did not pass the screening analysis were subsequently analyzed using a refined dispersion model, the EPA AERMOD dispersion model. AERMOD is a state-of-the-art dispersion model, applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (including point, area, and volume sources). AERMOD is a steady-state plume model that incorporates current concepts about flow and dispersion in complex terrain, including updated treatments of the boundary layer theory, understanding of turbulence and dispersion, and includes handling of terrain interactions.

The AERMOD model calculates pollutant concentrations from one or more points (e.g., exhaust stacks) based on hourly meteorological data for five years (2011-2015) from LaGuardia Airport, 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 analyses of potential impacts from exhaust stacks were made assuming stack tip downwash, urban dispersion and surface roughness length, and elimination of calms. AERMOD can be run with and without building downwash (the downwash option accounts for the effects on plume dispersion created by the structure the stack is located on, and other nearby structures). Therefore, the analysis was performed using the AERMOD model under with downwash and without downwash scenario respectively.

For the refined analysis, the exhaust stacks for the heat and hot water systems were assumed to be located at distance of 10 feet away from the edge of the roof closest to the nearest receptor in consistent with building code §[1501.4] 27-859. The refined dispersion modeling analysis was performed for PM_{2.5}, and SO₂. The analysis was then performed using calculated emission rates for fuel oil.

The AERMOD analysis was performed by utilizing a unitary emission rate (1 gram/second) as the input. The estimated emissions based on total floor area were converted into grams/second and multiplied by the modeled unitary concentrations to determine the worst-case impact. The resulted concentrations were added to background concentrations and then compared to the National Ambient Air Quality Standards (NAAQS) and *de minimis* criteria in order to determine any potential for significant adverse impact.

Fuel consumption was estimated based on procedures outlined in the *2014 CEQR Technical Manual* as discussed above. Using worst-case assumptions the type of fuel was Oil No. 2. Emission factors from the fuel oil sections of EPA's AP-42 were used to calculate emission rates for the proposed prototype's heat and hot water systems.

16.4.4. Receptor Placement

Discrete receptors (*i.e.*, locations at which concentrations are calculated) were modeled along the existing building façades to represent potentially sensitive locations such as operable windows and air intake vents. Rows of receptors at spaced intervals on the modeled buildings were analyzed at multiple elevations.

16.4.5. Background Concentrations

To estimate the maximum expected pollutant concentration at a given location (receptor), the predicted impacts must be added to a background value that accounts for existing pollutant concentrations from other sources that are not directly accounted for in the model (see Table 1). To develop background levels, the latest available maximum concentration measured at the most representative NYSDEC ambient monitoring station was used considering the proposed development is city-wide. The concentration measured over the latest available 5-year period (2008-2012) was used for 3-hour average SO₂ background concentration and the latest available 3-year period (2013-2015) was used for 1-Hour SO₂ and 24-hour PM_{2.5} background concentration.

PM_{2.5} impacts are assessed on an incremental basis and compared with the PM_{2.5} *de minimis* criteria, without considering the annual background. Therefore the annual PM_{2.5} background is not presented in the table. The PM_{2.5} 24-hour average background concentration of 26.2 µg/m³ based on the 2013 to 2015 average of 98th percentile concentrations measured at the PS 19 (Manhattan) monitoring station was used

to establish the *de minimis* value for the 24-hour increment, consistent with the guidance provided in the 2014 CEQR Technical Manual.

16.4.6. Table 16-2: Background Pollutant Concentrations

Pollutant	Average Period	Location	Concentration ($\mu\text{g}/\text{m}^3$)	NAAQS ($\mu\text{g}/\text{m}^3$)
SO ₂	1-hour ¹	Botanical Garden, Bronx	41.4	197
	3-hour ²	Botanical Garden, Bronx	162	1,300
PM _{2.5}	24-hour	PS 19, Manhattan	26.2	35

Notes:

(1) The 1-Hour SO₂ background concentration is based on the maximum 99th percentile concentration averaged over three years of data, from 2013–2015.

(2) The 3-hour SO₂ background concentration is based on the 5-year highest second-highest measured value from 2008–2012.

Source: New York State Air Quality Report Ambient Air Monitoring System, NYSDEC, 2011-2015.

16.5. DETERMINING THE SIGNIFICANCE OF AIR QUALITY IMPACTS

The *City Environmental Quality Review (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. 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 2) would be deemed to have a potential significant adverse impact.

Table 16-2: National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary		Secondary	
	ppm	µg/m ³	ppm	µg/m ³
Carbon Monoxide (CO)				
8-Hour Average (1)	9	10,000	N/A	
1-Hour Average (1)	35	40,000		
Lead				
Rolling 3-Month Average (2)	N/A	0.15	N/A	0.15
Nitrogen Dioxide (NO₂)				
1-Hour Average (3)	0.100	188	N/A	
Annual Average	0.053	100	0.053	100
Ozone (O₃)				
8-Hour Average (4,5)	0.075	150	0.075	150
Respirable Particulate Matter (PM₁₀)				
24-Hour Average (1)	N/A	150	N/A	150
Fine Respirable Particulate Matter (PM_{2.5})				
Annual Mean (6)	N/A	12	N/A	15
24-Hour Average (7)	N/A	35	N/A	35
Sulfur Dioxide (SO₂) (8)				
1-Hour Average (9)	0.075	196	N/A	N/A
Maximum 3-Hour Average (1)	N/A	N/A	0.50	1,300
<p>Notes:</p> <p>ppm – parts per million (unit of measure for gases only)</p> <p>µg/m³ – micrograms per cubic meter (unit of measure for gases and particles, including lead)</p> <p>NA – not applicable</p> <p>All annual periods refer to calendar year.</p> <p>Standards are defined in ppm. Approximately equivalent concentrations in µg/m³ are presented.</p> <p>(1) Not to be exceeded more than once a year.</p> <p>(2) EPA has lowered the NAAQS down from 1.5 µg/m³, effective January 12, 2009.</p> <p>(3) 3-year average of the annual 98th percentile daily maximum 1-hr average concentration. Effective April 12, 2010.</p> <p>(4) 3-year average of the annual fourth highest daily maximum 8-hr average concentration.</p> <p>(5) EPA has proposed lowering the primary and secondary standards further to within the range 0.065-0.070 ppm. EPA will take final action on the proposed standards by Oct. 1, 2015.</p> <p>(6) 3-year average of annual mean. EPA has lowered the primary standard from 15 µg/m³, effective March 2013.</p> <p>(7) Not to be exceeded by the annual 98th percentile when averaged over 3 years.</p> <p>(8) EPA revoked the 24-hour and annual primary standards, replacing them with a 1-hour average standard. Effective August 23, 2010.</p> <p>(9) 3-year average of the annual 99th percentile daily maximum 1-hr average concentration.</p> <p>Source: 40 CFR Part 50: National Primary and Secondary Ambient Air Quality Standards.</p>				

In order to maintain concentrations lower than the NAAQS in attainment areas, or to ensure that concentrations would not be significantly increased in non-attainment areas, threshold levels have been defined for certain pollutants; any action predicted to increase the concentrations of these pollutants above the thresholds would be deemed to have a potential significant adverse impact, even in cases where violations of the NAAQS are not predicted.

PM2.5 De Minimis Criteria

The *CEQR Technical Manual* state that Predicted 24-hour maximum PM2.5 concentration increase of more than half the difference between the 24-hour background concentration and the 24-hour standard; or Predicted annual average PM2.5 concentration increments greater than 0.3 µg/m³ at any receptor location for stationary sources.

The policy states that such a project would be deemed to have a potentially significant adverse impact if the project's maximum impacts are predicted to increase PM2.5 concentrations by more than 0.3 µg/m³ averaged annually or more than 4.4 µg/m³ on a 24-hour basis.

16.6. FUTURE WITHOUT THE PROPOSED ACTION

In the future without the Proposed Action, it is assumed that the existing use, bulk and floor area for each prototype would remain. Some development for each prototype would occur on an as-of-right basis in the future without the Proposed Action. Thus, no stationary source analysis is included for the No-Action condition.

16.7. FUTURE WITH THE PROPOSED ACTION

The With Action scenario for Prototypes 1, 2 and 3 would introduce some changes in floor area and/or bulk regulation between the No-Action and the With-Action scenarios. Therefore, air quality screening analysis would be provided for these prototypes. Prototypes that did not pass the screening analysis would be subsequently analyzed using a refined dispersion model, the EPA AERMOD dispersion model.

16.7.1. Individual Heat and Hot Water Systems

16.7.1.1. Refined Dispersion Analysis

The screening analysis results show that a total of two prototypes (Prototype 1 and 3) required a refined modeling analyses to determine the potential for air quality impacts. For detail analysis, the exhaust stacks for the heat and hot water systems were assumed to be located at distance of 10 feet away from the edge of the building closest to the nearest receptor consistent with building code §[1501.4] 27-859.

The estimated emissions based on total floor area were converted into grams/second and multiplied by the modeled unitary concentrations to determine the worst-case impact. The resulted concentrations were added to background concentrations and then compared to the National Ambient Air Quality Standards (NAAQS). PM2.5 impacts are assessed on an incremental basis and compared with the PM2.5 *de minimis* criteria, consistent with the guidance provided in the *2014 CEQR Technical Manual*.

The detail analysis was performed using the AERMOD model under with and without downwash scenario respectively. The results of both scenarios are summarized in Table 4. The result for without downwash scenario is in bold. Generally, as shown in the table, higher concentrations result from the without downwash scenario. It was determined that these prototypes all passed the refined analysis for No. 2 fuel

oil. Therefore, no restrictions are required and no significant adverse impacts are predicted for these prototypes.

Table 16-4: Maximum Modeled Concentration ($\mu\text{g}/\text{m}^3$) With/Without downwash

Pollutant		SO ₂		PM _{2.5} (Increment)	
Averaging Period		1-Hour	3-Hour	24-Hour	Annual
Total Modeled Concentration	Prototype 1	41.83 / 41.80	162.40 / 162.31	2.62 / 1.68	0.13 / 0.12
	Prototype 3	43.86 / 42.17	163.86 / 162.34	4.00 / 0.62	0.15 / 0.04
Background		41.4	162	26.2	N/A
NAAQS / <i>De Minimis</i> ¹		197	1310	4.4*	0.3*

⁽¹⁾The PM_{2.5} *de minimis* criteria is 4.4 $\mu\text{g}/\text{m}^3$ for the 24-Hour period, which is half the difference between the NAAQS of 35 $\mu\text{g}/\text{m}^3$ and the ambient monitored background of 26.2 $\mu\text{g}/\text{m}^3$, and 0.3 $\mu\text{g}/\text{m}^3$ for the annual period.

16.8. CONCLUSIONS

The Proposed Action would not result in any significant adverse air quality impacts for stationary source. Based on the Prototypical analysis, Prototypes 1 and 3 require detail analysis, Prototype 2 require screening analysis. Prototype 4 does not require any analysis because the action would introduce no change in floor area or bulk between the No-Action and the With-Action scenarios. The prototypical analyses showed that there would be no potential significant adverse air quality impacts from fossil fuel-fired heat and hot water systems associated with each prototype. Therefore, the Proposed Action would not result in significant adverse air quality impacts due to stationary sources.