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Air Quality

This chapter examines the possible effects on air quality conditions from the proposed action. Ambient air quality, or the quality of the surrounding air, may be affected by air pollutants produced by motor vehicles, referred to as "mobile sources;" fixed facilities, such as stack emissions from on-site fuel burned boilers for heating, ventilation, and air conditioning (HVAC) systems, usually referenced as "stationary sources;" or a combination of both. An air quality assessment determines both a proposed project's effects on ambient air quality as well as the effects of ambient air quality on the project.

Introduction

As described in **Chapter 1, "Project Description,"** the proposed action will be analyzed in this environmental review as a generic action. The introduction of a CPC special permit for new hotels in M1 districts could result in shifting hotel development from M1 districts to other locations where they will continue to be permitted as-of-right but would not otherwise change any rules regulating development in these locations. Thus, the possible effects of a shift in some hotel development from M1 districts in the future No-Action and With-Action conditions

will be considered by means of a prototypical analysis. Accordingly, the air quality assessment will be performed for each of the seven prototypical sites to identify the possible effects of shifting from one use (such as a residential or different commercial use) in the No-Action condition to a commercial hotel use in the With-Action condition.

The key air quality issues that would be addressed are:

- Mobile Sources: Changes in vehicular travel associated with proposed development activities.
- Stationary HVAC Emissions: Emissions from the proposed heating, ventilation, and air conditioning (HVAC) systems on other proposed development buildings (project-on-project), and existing land uses (project-on-existing).
- Stationary Air Toxics Emissions: Emissions of air toxics from existing industrial sources within 400 feet.
- Major or Large Source: Emissions from existing major or large sources within 1,000 feet.

Principal Conclusions

Air quality analyses were conducted on the prototypical sites to assess the key air quality issues pertaining to the shift from non-hotel use in the No-Action condition to commercial hotel use in the With-Action condition. Based on a screening analysis, it was demonstrated that the proposed action would not generate significant emissions from mobile sources, and a detailed analysis was not warranted.

The stationary HVAC analysis found that emissions from the proposed HVAC system at prototypical site 2 could result in exceedances of applicable criteria thresholds for certain air pollutants at an adjacent existing building of greater height. It also indicated that cumulative emissions from the proposed HVAC systems associated with three buildings at prototypical site 3 could result in exceedances of applicable criteria thresholds for certain air pollutants at nearby existing buildings of greater heights. However, the configurations and context of these prototypical sites analyzed here are unique. The proposed action is a citywide action and has broad applicability; the availability of development sites that would be located adjacent to receptor buildings of similar or greater height, or development sites that would allow for hotel development with multiple buildings in close proximity to one another, is relatively low. Additionally, the analysis was conducted based on conservative assumptions with regard to building envelopes, emissions calculation, stack location and stack height, etc. It is anticipated that as specific information on actual development becomes available in the future, with more realistic assumptions and appropriate restrictions on stack parameters, exceedances of applicable criteria thresholds might be eliminated. Further, there would be no air quality effects at the ground level.

Additionally, emissions of air toxics released from existing industrial sources would not result in an exceedance of applicable criteria thresholds for each analyzed pollutant. Furthermore, the cumulative hazard risk assessment also demonstrated

that combined emissions of multiple air toxic contaminants from existing industrial sources would not result in air quality impacts. Lastly, no air quality impacts would be anticipated to result from existing major or large sources.

Screening Analyses

Screening analyses were conducted to assess the effects of the proposed action on air quality conditions, as related to emissions from mobile sources and stationary sources. The air quality screening analyses were performed following the methodologies set forth in the 2014 *CEQR Technical Manual*, as detailed below.

Mobile Source Screening Analysis

Pollutant of Concern

The EPA has identified six common air pollutants, which are known as criteria pollutants (Ozone, Particulate Matter, Carbon Monoxide, Lead, Sulfur Dioxide, and Nitrogen Dioxide), as being of concern nationwide. The criteria pollutants associated with mobile source emissions (vehicular-related) are Carbon Monoxide (CO) and Particulate Matter ($PM_{2.5}$ and PM_{10}). $PM_{2.5}$ refers to particulate matter with an aerodynamic diameter size of 2.5 micrometers or less, and PM_{10} refers to particulate matter with an aerodynamic diameter of 10 micrometers or less.

CO and PM Screening Analysis

Following the *CEQR Technical Manual* guidance, a mobile screening analysis was conducted to evaluate the potential for mobile source emissions of CO and PM ($PM_{2.5}$ and PM_{10}) to affect ambient pollutant levels in the study area. For each of the prototypical sites, a mobile source screening analysis was conducted, and at every intersection identified in the traffic study area the number of project-generated vehicle trips during the peak hour was compared to thresholds for conducting a detailed analysis for CO or PM, as described in Chapter 17, Sections 210 and 311, of the *CEQR Technical Manual*. Table 15-1 presents the CO and PM screening threshold for each of the Prototypical Sites.

Table 15-1 Mobile Screening Thresholds

Prototypical Sites	CO Screening Threshold	PM Screening Threshold[1]
Site 1 (Manhattan)	140 vehicle trips	based on road type at each intersection
Site 2 (Long Island City)	160 vehicle trips	based on road type at each intersection
Site 3 (Jamaica)	170 vehicle trips	based on road type at each intersection
Site 4 (South Slope)	170 vehicle trips	based on road type at each intersection
Site 5 (Downtown Brooklyn)	160 vehicle trips	based on road type at each intersection
Site 6 (Brownsville)	170 vehicle trips	based on road type at each intersection
Site 7 (Williamsburg)	170 vehicle trips	based on road type at each intersection

Source: *2014 CEQR Technical Manual.*

Note: The number of project-generated peak hour heavy-duty diesel vehicles (or its equivalency in vehicular $PM_{2.5}$ emissions) are determined using the worksheet provided on page 17-12 of the *CEQR Technical Manual* (Autos will be assumed to be LDGT1 in the worksheet).

According to the Level 1 Trip Generation Screening Assessment, the estimated overall peak-hour incremental vehicle trips generated by the proposed action for the a.m., midday, p.m. and Saturday midday at each prototypical site are listed below in Table 15-2.

Table 15-2 Summary of Overall Incremental Vehicle Trips Generated by the Proposed Action

Prototypical Sites	Overall Incremental Vehicle Trips Generated by the Proposed Action			
	AM	MD	PM	Sat Midday
Site 1 (Manhattan)	18	28	21	16
Site 2 (Long Island City)	4	81	24	45
Site 3 (Jamaica)	122	237	200	75
Site 4 (South Slope)	5	7	6	2
Site 5 (Downtown Brooklyn)	44	54	48	38
Site 6 (Brownsville)	15	14	20	14
Site 7 (Williamsburg)	33	62	55	40

As indicated in Table 15-2, the proposed action would generate less than 50 vehicle trips at Prototypical Sites 1, 4, and 6. With such minimal vehicle trips, and in accordance with the *CEQR Technical Manual*, the CO and PM screening thresholds will not be exceeded at any intersection; therefore, a detailed microscale analysis would not be warranted these prototypical sites. For prototypical Sites 2, 3, 5, and 7, where the proposed action is anticipated to generate more than 50 vehicle trips during certain peak hours, a Level 2 Trip Generation Screening Assessment was conducted as part of the transportation analysis. Project-generated trips were assigned to specific intersections in the traffic study area. Both CO-based and PM-based mobile screening analyses were performed for each of these four prototypical sites based on the traffic volumes at each intersection, using the mobile source screening worksheet on Page 17-12 of the *CEQR Technical Manual*. The screening analyses are presented in **Appendix A.7**.

As indicated in **Appendix A.7**, all intersections in prototypical Sites 2, 3, and 5 passed the mobile screening analyses, while five intersections in prototypical Site 7 failed the mobile screening analysis even though the project-generated vehicle trips are minimal (i.e., less than 50 vehicle trips) at these intersections. Per consultation with DCP, the mobile source screening worksheet of the current *CEQR Technical Manual* was updated to revise conservative assumptions for estimating $PM_{2.5}$ emission factors, including over-predicted vehicular emissions from the outdated Mobile6.2 emission model. A comparison of emission factors from Mobile6.2 model and the latest version of MOVES model (MOVES2014a) was provided in **Appendix A.7**, which indicated that the emission factor from the MOVES2014a model is approximately half of that from the Mobile6.2 model for automobiles. With that being taken into consideration, the five intersections in prototypical Site 7 would pass the mobile source screening analysis.

Therefore, it is anticipated that the proposed action would not result in significant

adverse mobile source (vehicular-related) air quality conditions, and no further analysis would be warranted.

HVAC Screening Analysis

For each of the prototypical sites where a single building will be proposed, an HVAC screening analysis was performed following the methodology described in the *CEQR Technical Manual* to assess the potential for emissions from the HVAC system of the proposed building to affect existing land uses or other known developments (project-on-existing and project on no-action development).

For prototypical Site 3 (Jamaica) where a total of three buildings (at Sites 3a, 3b, and 3c) would be developed, an HVAC screening analysis was first performed to assess the potential for emissions from the HVAC system of the proposed buildings to impact each other (project-on-project), as well as the potential from each proposed building to impact existing land uses (project-on-existing). At Site 3c, the proposed building would have two towers (one at Site $3c_1$ which is located along 148th Street and reaches a maximum height of 155 feet above grade, and the other one at Site $3c_2$ which is located along 147th Street and reaches a maximum height of 115 feet above grade) sharing a one-story base. Per guidance from DCP, Site 3c was assessed two ways. The first was to assume a single stack located on the taller tower (Site $3c_1$) with system load accounting for floor area of base plus both towers; the second was to assume two stacks (one on each tower) and splitting the system load floor area accordingly[1]. Given that Sites 3a and 3b have similar building heights and are adjacent to each other, a cumulative project-on-project HVAC analysis was conducted to assess the potential for combined emissions from Sites 3a and 3b to affect Site 3c. Additionally, a cumulative project-on-existing HVAC analysis was conducted to assess the potential for combined emissions from the three proposed buildings at Site 3 to affect existing land uses or other known developments.

The HVAC screening methodology utilizes information regarding the type of fuel to be used, the maximum development size, and the HVAC exhaust stack height to determine the minimum required distance from the stack source to the nearest receptor of similar or greater height. If the distance from the source to the nearest building of similar or greater height is less than the minimum required distance, , further analysis would be required.

For conservative assessment purposes, a HVAC screening analysis was initially conducted assuming the use of No. 2 fuel oil. If the screening analysis failed with the use of No. 2 fuel oil, a screening analysis assuming the use of natural gas was performed. A summary of the HVAC screening analyses is provided below in **Table 15-3**, and the screening graphs are provided in **Appendix A.7**.

[1] Based on the lot area and number of floors for each tower, it was assumed that Site $3c_1$ accounts for approximately 78% of the total floor area of Site 3c, and Site $3c_2$ accounts for approximately 28% of the total floor area of Site 3c.

Table 15-3 Summary of HVAC Screening Analysis

Prototypical Site No.	Proposed Land Use	Total Floor Area (gsf)	BLDG Ht (ft)	Closest Affected Site of Similar or Greater Height	Closest Affected Site BLDG Ht (ft)	Distance to Nearest BLDG (ft)	Oil Screening Result	NG Screening Result
Site 1	Commercial	34,500	355	325 Lexington Ave	379	202	Pass	Pass
Site 2	Commercial	70,121	75	27-08 42nd Rd	99	0	Fail	Fail
Site 3a	Commercial	71,125	125	Site 3b	125	0	Fail	Fail
Site 3b	Commercial	77,501	125	Site 3a	125	0	Fail	Fail
Sites 3a+3b[1]	Commercial	148,626	125	Site 3c	155	51	Fail	Fail
Site 3c[2]	Commercial	111,125	155	90-75 Sutphin Blvd[3]	223	57	Fail	Fail
Site $3c_1$	Commercial	79,835	155	148-10 Archer Ave[4]	175	77	Pass	Pass
Site $3c_2$	Commercial	31,290	115	Site $3c_1$	155	30	Fail	Fail
Site 3[5]	Commercial	259,751	155	90-75 Sutphin Blvd[3]	155	57	Fail	Fail
Site 4	Commercial	8,078	30	248 17th St	37	0	Fail	Fail
Site 5	Commercial	53,360	195	532 Fulton St[6]	195	90	Pass	Pass
Site 6	Commercial	29,325	85	1560 East New York Ave	163	382	Pass	Pass
Site 7	Commercial	57,500	55	101 North 5th St	75	73	Pass	Pass

Notes:

1. The purpose is to assess the possible cumulative project-on-project effect from Sites 3a and 3b onto Site 3c.
2. The purpose is to assess the possible cumulative project-on-project effect from the two towers ($3c_1$ and $3c_2$) at Site 3c onto existing buildings or other known developments, assuming there is only one stack on the taller tower ($3c_1$).
3. There is a 19-story known development at 90-75 Sutphin Boulevard. The proposed building height will be 223 feet.
4. There is a 15-story known development at 148-10 Archer Avenue. The proposed building height will be 175 feet.
5. The purpose is to assess the possible cumulative project-on-existing effect from Sites 3a, 3b and 3c onto existing buildings or other known developments.
6. There is a 19-story known development at 532 Fulton Street. It is assumed that the proposed building height will be 195 feet for the purpose of this HVAC screening analysis.

The HVAC screening analysis found that no adverse effects on air quality conditions would occur at the ground level.

It should be noted that for Sites 2, 3a, 3b, and 4, there are receptors adjacent to the proposed building, therefore the HVAC screening procedures from the *CEQR Technical Manual* are not applicable (the distance between source and receptor is less than 30 feet), and a more refined air quality analysis is required. Additionally, as indicated in **Table 15-3**, the cumulative project-on-project HVAC screening analysis conducted for Sites 3a and 3b failed for both oil and natural gas. Site 3c also failed for both oil and natural gas screening analyses. Therefore, a more refined air quality analysis would be warranted for these sites.

Industrial Source Screening Analysis

In accordance with the *CEQR Technical Manual* guidance, an air quality analysis was conducted to assess the possible effects on the prototypical sites from air toxics emissions emitted by existing processing or manufacturing facilities that have air permits issued by New York City Department of Environmental Protection (DEP) and New York State Department of Environmental Conservation (NYSDEC).

A survey of existing land uses within 400 feet of the prototypical sites was conducted, using the Google Maps, street views, land use maps, and other available data from New York City Department of City Planning (DCP), to identify existing processing/manufacturing sites. A total of six active industrial permits were obtained from DEP. A brief description of the six permits and related industrial process is provided below.

- Prototypical Site *1 (Manhattan)*: Two active permits were received from DEP/DCP—PA038295 (ventilation for gas sterilization system) and PB063803 (dry cleaning). All dry-cleaning facilities in New York City are required to be equipped with fourth generation emission control systems, with built-in carbon absorber and refrigeration units, by the New York State's PERC Dry Cleaning Facilities Regulation (Part 232). These facilities are considered dry-to-dry type non-vented refrigerated totally enclosed systems with no emissions. Therefore, per current DEP/DCP guidance, the industrial analysis for the dry-cleaning facility (PB063803) would not be warranted as part of the CEQR process.
- Prototypical Site *2 (Queens-Long Island City)*: Two active permits were received from DEP/DCP—PA039182 (auto spray booth) and PB058101 (metal casting). The metal casting facility (PB039182) is located beyond 400 feet from prototypical site 2, therefore it was eliminated from the industrial source analysis.
- Prototypical Site *3 (Queens-Jamaica)*: Two active permits were received from DEP/DCP—PA045499 and PB026010. Both permits were issued for the operation of an auto paint spray booth. However, the auto body shop associated with permit PA045499 has been demolished and the site is currently vacant. Thus, PA045499 was eliminated from the industrial source analysis. Additionally, a survey of existing land uses also identified the following three other auto body shops near the prototypical Site 3: "Master Auto Panda" at 149-15 Archer Avenue, "Archer Auto Services" at 149-10 Archer Avenue, and "Allstar Auto of Queens Inc"

at 149-16 Archer Avenue. Based on communication with the owners, none of these three auto body shops operate auto paint work on-site currently, therefore, an industrial source analysis would not be warranted.

Therefore, a total of three active industrial permits need to be analyzed as part of the air quality assessment. An industrial screening analysis was performed, following the procedures described in the *CEQR Technical Manual*, to assess the potential effects from industrial sources on each of the three prototypical sites (Sites 1, 2, 3). Emission rates from the permits were used as a basis to estimate the initial emissions of air pollutants emitted by the source. The Industrial Source Screen Table 17-3 of the *CEQR Technical Manual* was then used to convert their corresponding initial pollutant emissions from the source to pollutant concentrations at each prototypical site, depending on the distance between the source and the proposed building. All Pollutants listed on the permits were analyzed and the resulting concentrations were compared to the NYSDEC DAR-1 Annual Guideline Concentration (AGC) and Short-term Guideline Concentration (SGC) thresholds.[2]

Additionally, for the two permits associated with auto spray operation in prototypical site 3, emission rates of "solids" and "solvents" were provided. In accordance with current DCP guidance, all "solids" in the paint being exhausted into the atmosphere as particles were considered as $PM_{2.5}$ emissions. For "solvents," the total emission rate could be broken down into different types of pollutants based on the generic weight percentage of each component in the paint. Resulting concentrations for each pollutant were compared to the NYSDEC DAR-1 SGC/AGC thresholds.

Table 15-4 presents the emission rates of each pollutant from existing industrial sources within a 400-foot radius of each of the three Prototypical Sites, and **Table 15-5** presents the predicted short-term and annual concentrations of each pollutant using the methodologies as described above.

[2] NYSDEC DAR-1 - http://www.dec.ny.gov/docs/air_pdf/dar1.pdf.

Table 15-4 Emission Rates from Existing Industrial Sources

Permit No.	Chemical Name	CAS	% by Weight	Hourly Emission Rate (lb/hr)	Annual Emission Rate (lb/year)	Short-term Emission Rate (g/s)	Annual Emission Rate (g/s)
Prototypical Site 1 (99 Park Ave, Manhattan)							
PA038295	Ethylene Oxide	00075-21-8	-	0.0042	2.2	5.29E-04	3.16E-05
Prototypical Site 2 (27-34 Jackson Ave, Long Island City)							
PA039182	Aliphatic Ester	NY595-00-0	-	0.13	52	0.016	7.48E-04
	Aliphatic Ketone	NY615-00-0	-	0.17	68	0.021	9.78E-04
	Toluene	00108-88-3	-	0.47	188	0.059	2.70E-03
	Aliphatic Petroleum Distillates	NY559-00-0	-	0.56	224	0.071	3.22E-03
	Xylene	01330-20-7	-	0.73	292	0.092	4.20E-03
	Aromatic Petroleum Distillates	64742-95-6	-	0.13	52	0.016	7.48E-04
Prototypical Site 3 (93-04 150th St/ 149-28 Archer Ave, Jamaica)							
PB026010	Solids ($PM_{2.5}$)	NY075-02-5	-	0.013	23.4	5.46E-04	3.37E-04
	Acetone	00067-64-1	43%	0.053	96.0	6.72E-03	1.38E-03
	Aliphatic Hydrocarbon	64742-89-8	10%	0.012	22.3	1.56E-03	3.21E-04
	Aromatic Petroleum Distillates	64742-94-5	5%	0.006	11.2	7.81E-04	1.61E-04
	Butane	00106-97-8	11%	0.014	24.6	1.72E-03	3.53E-04
	Ethanol	00064-17-5	2%	0.002	4.5	3.12E-04	6.42E-05
	Ethyl 3-Ethoxypropionate	00763-69-9	9%	0.011	20.1	1.41E-03	2.89E-04
	Ethylbenzene	00100-41-4	5%	0.006	11.2	7.81E-04	1.61E-04
	Methyl Ethyl Ketone	00078-93-3	8%	0.010	17.9	1.25E-03	2.57E-04
	N-Butyl Acetate	00123-86-4	5%	0.006	11.2	7.81E-04	1.61E-04
	Propane	00074-98-6	11%	0.014	24.6	1.72E-03	3.53E-04
	Stoddard Solvent	08052-41-3	10%	0.012	22.3	1.56E-03	3.21E-04
	Toluene	00108-88-3	10%	0.012	22.3	1.56E-03	3.21E-04
	Xylene	01330-20-7	10%	0.012	22.3	1.56E-03	3.21E-04

Table 15-5 Summary of Industrial Screening Analysis

Dist. (ft)	Permit No.	Chemical Name	CAS	Short-term Concentration (µg/m³)	SGC (µg/m³)	Pass /Fail	Annual Concentration (µg/m³)	AGC (µg/m³)	Pass /Fail
Prototypical Site 1 (99 Park Ave, Manhattan)									
323	PA038295	Ethylene Oxide	00075-21-8	0.84	18	Pass	2.5E-03	1.9E-02	Pass
Prototypical Site 2 (27-34 Jackson Ave, Long Island City)									
352	PA039182	Aliphatic Ester	NY595-00-0	-	-	-	0.05	3200	Pass
		Aliphatic Ketone	NY615-00-0	-	-	-	0.06	3200	Pass
		Toluene	00108-88-3	80.9	37000	Pass	0.18	5000	Pass
		Aliphatic Petroleum Distillates	NY559-00-0	-	-	-	0.21	3200	Pass
		Xylene	01330-20-7	125.6	22000	Pass	0.28	100	Pass
		Aromatic Petroleum Distillates	64742-95-6	-	-	-	0.05	100	Pass
Prototypical Site 3 (93-04 150th St/ 149-28 Archer Ave, Jamaica)									
193	PB026010	Solids (PM2.5)	NY075-02-5	0.94	88	Pass	0.067	12	Pass
		Acetone	00067-64-1	26.3	180000	Pass	0.275	30000	Pass
		Aliphatic Hydrocarbon	64742-89-8	-	-	-	0.064	3200	Pass
		Aromatic Petroleum Distillates	64742-94-5	-	-	-	0.032	100	Pass
		Butane	00106-97-8	6.7	238000	Pass	-	-	-
		Ethanol	00064-17-5	-	-	-	0.013	45000	Pass
		Ethyl 3-Ethoxypropionate	00763-69-9	5.5	140	Pass	0.058	64	Pass
		Ethylbenzene	00100-41-4	-	-	-	0.032	1000	Pass
		Methyl Ethyl Ketone	00078-93-3	4.9	13000	Pass	0.051	5000	Pass
		N-Butyl Acetate	00123-86-4	3.1	95000	Pass	0.032	17000	Pass
		Propane	00074-98-6	-	-	-	0.070	43000	Pass
		Stoddard Solvent	08052-41-3	-	-	-	0.064	900	Pass
		Toluene	00108-88-3	6.1	37000	Pass	0.064	5000	Pass
		Xylene	01330-20-7	6.1	22000	Pass	0.064	100	Pass

As indicated in **Table 15-5**, the estimated concentrations of all pollutants at prototypical sites 1, 2, and 3 were below the SGC/AGC thresholds, therefore no further analysis is warranted.

Additionally, because there are no permitted sites with common pollutants within each of the prototypical sites, therefore, a cumulative analysis was not warranted.

Major or Large Emission Sources

As described in Section 220 and Section 321 in Chapter 17 of the *CEQR Technical Manual*, an air quality assessment is required to evaluate the potential impacts of emissions from existing major or large emission sources when a project would result in new uses within a 1,000-foot radius of such sources. Major sources are identified as those sources located at Title V facilities that require Prevention of Significant Deterioration permits. Large sources are identified as sources located at facilities that require a State Facility Permit.

To assess the potential effects of any large or major sources on the development site, a review of existing permitted facilities was conducted. Sources of information reviewed include the NYSDEC Title V and State Facility Permit databases and available aerial photos provided by Google and Bing.[3,4]

Based on review of available information mentioned above, there are no existing major or large emission sources within a 1,000-foot radius of the prototypical sites. Therefore no further analysis would be warranted.

Detailed Analyses

As previously described, Sites 2, 3a, 3b, 3c, and 4 failed the HVAC screening analyses for both No.2 oil and natural gas, therefore, a more refined air quality analysis was conducted, to further assess the emissions from the proposed HVAC systems.

Refined HVAC Analysis

A more refined HVAC analysis was conducted using EPA's AERMOD model (version 16216) for prototypical sites that failed both No.2 oil and natural gas screening analysis. For the refined HVAC analysis, natural gas was assumed as the fuel type used for the HVAC systems.

AERMOD is a state-of-the-art dispersion model, applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources (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

[3] NYSDEC Title V- http://www.dec.ny.gov/dardata/boss/afs/issued_atv.html

[4] State Permit- http://www.dec.ny.gov/dardata/boss/afs/issued_asf.html

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 analyses of potential emissions from exhaust stacks was performed assuming stack tip downwash, urban dispersion and surface roughness length, and elimination of calms. AERMOD can be run with and without building downwash (the building downwash option accounts for the effects on plume dispersion created by the structure on which the stack is located, and other nearby structures). The analysis was performed using the AERMOD with and without building downwash options to assess worse-case conditions from these sources.

Pollutant of Concern

As previously described, EPA has identified six common air pollutants, which are known as criteria pollutants (Ozone, Particulate Matter, Carbon Monoxide, Lead, Sulfur Dioxide, and Nitrogen Dioxide). For prototypical sites that failed the HVAC screening analysis, a more refined air quality analysis was performed assuming the use of natural gas in their HVAC systems. The criteria pollutants associated with natural gas combustion are 1-hour Nitrogen Dioxide (NO_2), and 24-hour and annual $PM_{2.5}$.

Pollutant Criteria

The predicted concentrations of 1-hour NO_2 associated with the proposed HVAC systems were compared with the National Ambient Air Quality Standards (NAAQS), and the predicted concentrations of 24-hour and annual $PM_{2.5}$ were compared with the City's *de minimis* criteria.

National Ambient Air Quality Standards (NAAQS) were implemented as a result of the Clean Air Act (CAA), amended in 1990 (see Table 15-6)[5]. The NAAQS applies to six criteria pollutants as described above, and it has been adopted as the ambient air quality standards for the State of New York.

[5] United States Environmental Protection Agency (October 2011). National Ambient Air Quality Standards. Retrieved from <http://www.epa.gov/air/criteria.html>

Table 15-6 National and New York State Ambient Air Quality Standards

Pollutant	Averaging Time	Standard
Carbon Monoxide (CO)	1-Hour	35 ppm (40,000 µg/m3)
	8-Hour	9 ppm (10,000 µg/m3)
Lead (Pb)	Rolling 3-month Average	0.15 µg/m3
Nitrogen Dioxide	Annual	53 ppb (100 µg/m3)
	1-Hour	100 ppb (188 µg/m3)
Ozone (O3)	8-Hour	0.075 ppm
Particulate Matter (PM10)	24-Hour	150 µg/m3
Particulate Matter (PM2.5)	Annual	12.0 µg/m3
	24-Hour	35.0 µg/m3
Sulfur Dioxide (SO2)	Annual	0.03 ppm (80 µg/m3)
	24-Hour	0.14 ppm (365 µg/m3)
	3-Hour	0.5 ppm (1,300 µg/m3)
	1-Hour	75 ppb (196 µg/m3)

Source: *2014 CEQR Technical Manual*

$PM_{2.5}$ *De Minimis* Criteria were developed by the New York City to determine the significance of the increase in $PM_{2.5}$ concentrations that would result from the proposed action, as set forth in the *CEQR Technical Manual*. Significant increases of $PM_{2.5}$ concentrations in New York City are defined as:

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

Emission Rates and Stack Parameters

Emission rates of air pollutants from the proposed HVAC systems were calculated using the maximum development size as defined in the Reasonable Worst-Case Development Scenario (RWCDS), the energy consumption data from *CEQR Technical Manual*, and emission factors from EPA's AP-42[6]. Stack parameters such as stack

[6] AP-42 (Fifth Edition): Compilation of Air Emission Factors. < https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emission-factors>

diameter, stack exhaust temperature, and exhaust stack velocity will be selected from the NYCDEP Combustion Application boiler database.

A few assumptions are listed as follows:

- The fuel consumption data for commercial buildings will be used for the proposed development: 45.2 ft^3/ft^2/year for natural gas;
- The emission factors used for NO_2 and $PM_{2.5}$ for natural gas combustion are 100 $lb/10^6$ ft^3 and 7.6 $lb/10^6$ ft^3, respectively;
- Short-term emission rates for the proposed buildings were estimated based on an assumption that all fuel usage of 100 days (3 coldest months of the year or 2,400 hours) of winter heating season, with no emissions for the rest of the year;
- Annual emission rates were calculated assuming that the total emissions will be averaged out over 24 hours per day and 365 days per year;
- The 1-hour NO_2 concentrations were estimated using EPA AERMOD's Tier 3 Ozone Limiting Method (OLM) option to account for NO_2/NO_X conversion. An in-stack ratio of 0.1[7] and the default equilibrium NO_2/NO_X ratio of 0.9 will be assumed[8];
- It is assumed that exhaust stacks will be located three feet above the highest tier of the prototypical building and the stacks will be located ten (10) feet away from the edge of roof per New York City Fuel Gas code § 503.5.4.

Meteorological Data

The refined HVAC analysis were conducted using the latest five consecutive years (2012-2016) of meteorological data. Surface data are obtained from La Guardia Airport and JFK Airport, and data from the nearest monitoring station will be used depending upon the distance between the monitoring station and the analyzed prototypical site. Upper air data are obtained from Brookhaven station, New York. Meteorological data will be processed using the current EPA AERMET version and the EPA procedure. These meteorological data provide hour-by-hour wind speeds and directions, stability states, and temperature inversion elevations over the 5-year period.

Receptor Locations

Sensitive receptor buildings were identified with heights similar or greater than the source. Discrete receptors were placed on each floor of the receptor building along each building façade where operable windows and air intakes could be located. The maximum building envelope as defined in the RWCDS was used.

[7] http://www.epa.gov/ttn/scram/no2_isr_database.htm.

[8] USEPA. Technical Support Document (TSD) for NO_2-related AERMOD modifications (July 2015).

Background Concentrations

Appropriate background concentration values measured at the nearest NYSDEC ambient monitoring station were added to modeling results to get the total concentrations for 1-hour NO_2. Resulting concentrations were compared with the NAAQS.

The 24-hour $PM_{2.5}$ average background concentrations were used to establish the *de minimis* value, consistent with the guidance provided in the *CEQR Technical Manual*. The annual $PM_{2.5}$ average conditions were assessed on an incremental basis without considering the annual background and compared with the $PM_{2.5}$ *de minimis* criteria threshold of 0.3 µg/m^3. The applicable background concentrations for each prototypical site are presented in **Table 15-7**.

Table 15-7 Background Concentrations for HVAC Analyses

Pollutant	Averaging Period	Location	Concentration (µg/m^3)
Prototypical Site 2 (Long Island City)			
NO_2[1]	1-Hour	Queens College, Queens	112.2
$PM_{2.5}$[2]	24-Hour	PS 19, Manhattan	23.9
Prototypical Site 3 (Jamaica)			
NO_2[1]	1-Hour	Queens College, Queens	112.2
$PM_{2.5}$[2]	24-Hour	Queens College, Queens	19.7
Prototypical Sites 4 (South Slope)			
NO_2[1]	1-Hour	Queens College, Queens	112.2
$PM_{2.5}$[2]	24-Hour	JHS 126, Brooklyn	20.5

Source: NYSDEC Ambient Air Quality Report, 2016, (http://www.dec.ny.gov/chemical/8536.html)
Notes:
1) The 1-hour SO_2 background concentration is based on the maximum 99th percentile concentration averaged over three years of data from NYSDEC (2014-2016).
2) The 24-hour $PM_{2.5}$ background concentration is based on maximum 98th percentile concentration averaged over three years of data from NYSDEC (2014-2016).

Analysis Results

Results of the refined HVAC analysis are summarized in **Table 15-8**.

Table 15-8 Summary of Refined HVAC Analysis

Prototypical Site No.	Modeled Concentration (µg/m³)		Maximum Concentration[2] (µg/m³)	NAAQS	De Minimis	Pass / Fail
	Downwash	No Downwash				
Prototypical Site 2						
1-hr NO_2[1]	186.7	262	262	188	-	Fail
24-hr $PM_{2.5}$	2.12	10.99	10.99	-	5.55	Fail
Annual $PM_{2.5}$	0.09	0.58	0.58	-	0.3	Fail
Prototypical Site 3a						
1-hr NO_2[1]	152.2	146.8	152.2	188	-	Pass
24-hr $PM_{2.5}$	1.11	1.22	1.22	-	7.65	Pass
Annual $PM_{2.5}$	0.05	0.06	0.06	-	0.3	Pass
Prototypical Site 3b						
1-hr NO_2[1]	154.2	157.1	157.1	188	-	Pass
24-hr $PM_{2.5}$	1.12	1.39	1.39	-	7.65	Pass
Annual $PM_{2.5}$	0.05	0.06	0.06	-	0.3	Pass
Prototypical Sites 3a+3b (cumulative)[3]						
1-hr NO_2[1]	186.2	186.3	186.3	188	-	Pass
24-hr $PM_{2.5}$	2.57	3.20	3.2	-	7.65	Pass
Annual $PM_{2.5}$	0.09	0.12	0.12	-	0.3	Pass
Prototypical Site 3c (cumulative)[4]						
1-hr NO_2[1]	172.7	175.0	175.0	188	-	Pass
24-hr $PM_{2.5}$	1.60	1.94	1.94	-	7.65	Pass
Annual $PM_{2.5}$	0.06	0.08	0.08	-	0.3	Pass
Prototypical Site $3c_1$						
1-hr NO_2[1]	155.3	158.9	158.9	188	-	Pass
24-hr $PM_{2.5}$	1.26	1.41	1.41	-	7.65	Pass
Annual $PM_{2.5}$	0.05	0.06	0.06	-	0.3	Pass
Prototypical Site $3c_2$						
1-hr NO_2[1]	172.0	165.7	172.0	188	-	Pass
24-hr $PM_{2.5}$	1.85	0.87	1.85	-	7.65	Pass
Annual $PM_{2.5}$	0.07	0.05	0.07	-	0.3	Pass
Prototypical Site 3 (cumulative)[5]						
1-hr NO_2[1]	204.4	209.2	209.2	188	-	Fail
24-hr $PM_{2.5}$	2.10	2.41	2.41	-	7.65	Pass
Annual $PM_{2.5}$	0.09	0.12	0.12	-	0.3	Pass
Prototypical Site 4						
1-hr NO_2[1]	129.7	130.7	130.7	188	-	Pass
24-hr $PM_{2.5}$	0.6	1.04	1.04	-	7.25	Pass
Annual $PM_{2.5}$	0.04	0.06	0.06	-	0.3	Pass

Notes:

1) Hourly NO_2 background concentration was added to the modeled 1-hour NO_2 concentration to predict the total maximum 1-hour NO_2 concentration.
2) Maximum concentration represents the higher pollutant level predicted from "Downwash" and "No Downwash" options.
3) The purpose is to assess the possible cumulative project-on-project effect from Sites 3a and 3b onto Site 3c.
4) The purpose is to assess the possible cumulative project-on-existing effect from the two towers at Site 3c onto existing buildings or other known developments, assuming there is only one stack on the taller tower ($3c_1$).
5) The purpose is to assess the possible cumulative project-on-existing effect from Sites 3a, 3b, and 3c onto existing buildings or other known developments.

As shown in **Table 15-8**, the detailed AERMOD analysis indicated that emissions from the proposed HVAC system at prototypical site 2 would result in exceedances of 1-hour NO_2 NAAQS, and the 24-hour and annual $PM_{2.5}$ *de minimis* criteria thresholds would occur at an adjacent existing building of greater height. However, since the proposed action is a citywide action and has broad applicability, and the applicable of development sites that would locate adjacent to receptor buildings of similar or greater height is relatively low. Additionally, the analysis was conducted based on conservative assumptions with regard to building envelopes, emissions calculation, stack location, and stack height, etc. It is anticipated that as specific information on actual development becomes available in the future, with more realistic assumptions and appropriate restrictions on stack parameters, exceedances of applicable criteria thresholds might be eliminated.

For prototypical Site 3 which includes multiple sites, the refined HVAC analysis was conducted to assess the potential effects from individual HVAC system at each building, as well as cumulative effects from multiple HVAC systems. For individual effects, both project-on-existing and project-on-project analyses were conducted. The analyses demonstrated that emissions from a single HVAC system associated with each of the buildings at prototypical site 3 were below the NAAQS or the City's *de minimis* criteria.

A cumulative project-on-project analysis was conducted to assess the potential for combined HVAC emissions from Sites 3a and 3b to affect Site 3c. As indicated in **Table 15-8**, the predicted concentrations for all analyzed pollutants were below the NAAQS or the City's *de minimis* criteria.

For Site 3c, as previously described, the analysis was performed in two ways. The first analysis was to assume a single stack located on the taller tower (Site $3c_1$) with its system energy load accounting for floor area of the base plus both towers; the second analysis was to assume two boiler stacks (one on each tower) and splitting the system energy load floor area accordingly. As indicated in **Table 15-8**, emissions from the HVAC system(s) at Site 3c were below the NAAQS or the City's *de minimis* criteria.

The cumulative project-on-existing HVAC analysis conducted for the entire prototypical Site 3 indicated that, the combined emissions from the three proposed buildings (Sites 3a, 3b, and 3c) would result in exceedance of the NAAQS threshold for 1-hour NO_2 concentration at nearby existing buildings of greater height. However, since the proposed action is a citywide action and has broad applicability, and the availability of development sites that would allow for hotel development

with multiple buildings in close proximity to one another is relatively low. Additionally, the analysis was conducted based on conservative assumptions with regard to building envelopes, emissions calculation, stack location, and stack height, etc. It is anticipated that as specific information on actual development becomes available in the future, with more realistic assumptions and appropriate restrictions on stack parameters, exceedances of applicable criteria thresholds might be eliminated.

Additionally, the refined HVAC analysis also demonstrated that the predicted 1-hour NO_2 concentration, and the 24-hour and annual $PM_{2.5}$ concentrations at prototypical Site 4 were below the NAAQS or the City's *de minimis* criteria.

Conclusion

Air quality analyses were conducted on the prototypical sites to assess the key air quality issues pertaining to the shift from non-hotel use in the No-Action condition to commercial hotel use in the With-Action condition. Based on a screening analysis, it was demonstrated that the proposed action would not generate significant emissions from mobile sources, and a detailed analysis was not warranted.

The stationary HVAC analysis found that emissions from the proposed HVAC system at prototypical site 2 could result in exceedances of applicable criteria thresholds for certain air pollutants at an adjacent existing building of greater height. It also indicated that cumulative emissions from the proposed HVAC systems associated with three buildings at prototypical site 3 could result in exceedances of applicable criteria thresholds for certain air pollutants at nearby existing buildings of greater heights. However, since the proposed action is a citywide action, it has broad applicability; the availability of development sites that would be located adjacent to receptor buildings of similar or greater height, or development sites that would allow for hotel development with multiple buildings in close proximity to one another, is relatively low. It is anticipated that, as specific information on actual development becomes available in the future, with more realistic assumptions and appropriate restrictions on stack parameters, exceedances of applicable criteria thresholds might be eliminated. Further, there would be no air quality effects at the ground level.

Additionally, emissions of air toxics released from existing industrial sources would not result in an exceedance of applicable criteria thresholds for each analyzed pollutant. Furthermore, the cumulative hazard risk assessment also demonstrated that combined emissions of multiple air toxic contaminants from existing industrial sources would not result in air quality impacts. Lastly, no air quality impacts would be anticipated to result from existing major or large sources.