APPENDIX E
AIR QUALITY

A. PROCEDURES AND ASSUMPTIONS FOR THE STATIONARY SOURCE ANALYSIS

INTRODUCTION

As described in Chapter 17 of the Final Supplemental Environmental Impact Statement (Final SEIS) for the Proposed Actions, a detailed stationary source analysis was conducted using the Environmental Protection Agency (EPA) AERMOD dispersion model. The analysis was conducted to assess potential air quality impacts due to the Proposed Actions from heating, ventilation and air conditioning (HVAC) systems on receptor locations. Presented below is a description of the procedures used in the modeling and the assumptions and data used. A more general description of the stationary source analyses performed, as well as the results obtained, is presented in the Final SEIS.

HVAC EMISSIONS

A stationary source analysis was conducted to evaluate potential impacts from the Proposed Actions' HVAC systems. The boilers would generate hot water for building and domestic hot water heating. Stack exhaust parameters and emission estimates for the proposed boiler installations were conservatively estimated for the Proposed Actions' build year.

SHORT-TERM EMISSIONS

Short-term emissions rates were calculated based on emission 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.

Multiple scenarios were modeled to estimate emissions and predict short-term stationary source impacts. The boilers would be capable of operating at various loads depending on the heating and hot water demands of the Proposed Actions' buildings. Therefore, the boiler equipment was modeled at operating loads of 25, 50, 75 and 100 percent to calculate impacts over a full range of operating conditions. The stack exhaust parameters and the estimated maximum short-term emission rates are provided in Table E-1 for the boilers operating at 100 percent load, while tables E-2, E-3 and E-4 are for the boilers operating at 75 percent, 50 percent and 25 percent, respectively.

ANNUAL EMISSIONS

Based on conservative heating demand projections, the boilers were assumed to operate based on an energy demand of 5,000 degree-days per year[1]. Table E-6 presents a summary of the total annual emissions from the Proposed Actions, based on the above operating assumptions.

Table E-1
Boiler Emission Rates and Stack Parameters (100% Load)

		Boiler Capacity									
Parameter		**700 HP**		**600 HP**		**500 HP**		**400 HP**		**300 HP**	
Development		708-1		685-1		WS1-1		WS1-2		616-1, 616-2	
Number of Boilers*		4		3		3		3		3	
Heat Input Rate (MMBtu/hr, HHV)		27.89		23.91		19.93		15.94		11.96	
Stack Exhaust Temp. (°F)		330		330		330		330		330	
Stack Exhaust Flow (lbs/hr)		27,888		23,904		19,920		15,936		11,952	
Stack Exhaust Flow (ACFM)		9,503.3		8,145.5		6,788		5,430.5		4,073	
Stack Exhaust Velocity (ft/s)		30		30		30		30		30	
	Pollutant	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**
Lb/MMBtu, HHV	NO_x	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980
	CO	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824
	$PM_{2.5}$	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075
	PM_{10}	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075
	SO_2	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006
Lb/hr**	NO_x	3.983	2.733	3.414	2.343	2.846	1.953	2.276	1.562	1.708	1.172
	CO	0.996	2.298	0.854	1.970	0.712	1.642	0.569	1.313	0.427	0.986
	$PM_{2.5}$	0.424	0.209	0.363	0.179	0.303	0.149	0.242	0.119	0.182	0.089
	PM_{10}	0.474	0.209	0.406	0.179	0.339	0.149	0.271	0.119	0.203	0.089
	SO_2	5.736	0.016	4.918	0.014	4.099	0.012	3.279	0.009	2.460	0.007

Notes:
*** Number of boilers in each building includes one redundant boiler for backup.**
**** Emission rates presented here are per boiler.**
HP = boiler horsepower rating.
MMBtu = million British thermal units per hour
HHV = higher heating value of fuel
ACFM = actual cubic feet per minute
Emission rates and stack parameters are based on 100 percent load operation (per unit).
Emission factors are based on AP-42, while stack parameters are based on vendor data.

[1] A degree-day is defined as one degree in temperature difference between the ambient outdoor temperature and a design temperature used for indoor space heating, typically 65 °F.

Table E-2
Boiler Emission Rates and Stack Parameters (75% Load)

		Boiler Capacity									
Parameter		**700 HP**		**600 HP**		**500 HP**		**400 HP**		**300 HP**	
Development		708-1		685-1		WS1-1		WS1-2		616-1, 616-2	
Number of Boilers*		4		3		3		3		3	
Heat Input Rate (MMBtu/hr, HHV)		20.92		17.93		14.95		11.96		8.97	
Stack Exhaust Temp. (°F)		320		320		320		320		320	
Stack Exhaust Flow (lbs/hr)		20916		17928		14940		11952		8964	
Stack Exhaust Flow (ACFM)		7127.5		6109.1		5091		4072.9		3054.8	
Stack Exhaust Velocity (ft/s)		22.5		22.5		22.5		22.5		22.5	
	Pollutant	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**
Lb/MMBtu, HHV	NO_x	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980
	CO	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824
	$PM_{2.5}$	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075
	PM_{10}	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075
	SO_2	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006
Lb/hr**	NO_x	2.987	2.049	2.561	1.757	2.135	1.465	1.707	1.172	1.281	0.879
	CO	0.747	1.724	0.641	1.478	0.534	1.232	0.427	0.985	0.320	0.739
	$PM_{2.5}$	0.318	0.157	0.272	0.134	0.227	0.112	0.182	0.089	0.137	0.067
	PM_{10}	0.356	0.157	0.305	0.134	0.254	0.112	0.203	0.089	0.152	0.067
	SO_2	4.302	0.012	3.689	0.011	3.074	0.009	2.459	0.007	1.845	0.005

Notes:
*** Number of boilers in each building includes one redundant boiler for backup.**
**** Emission rates presented here are per boiler.**
HP = boiler horsepower rating.
MMBtu = million British thermal units per hour
HHV = higher heating value of fuel
ACFM = actual cubic feet per minute
Emission rates and stack parameters are based on 75 percent load operation (per unit).
Emission factors are based on AP-42, while stack parameters are based on vendor data.

Table E-3
Boiler Emission Rates and Stack Parameters (50% Load)

		Boiler Capacity									
Parameter		**700 HP**		**600 HP**		**500 HP**		**400 HP**		**300 HP**	
Development		708-1		685-1		WS1-1		WS1-2		616-1, 616-2	
Number of Boilers*		4		3		3		3		3	
Heat Input Rate (MMBtu/hr, HHV)		13.95		11.96		9.97		7.97		5.98	
Stack Exhaust Temp. (°F)		310		310		310		310		310	
Stack Exhaust Flow (lbs/hr)		13944		11952		9960		7968		5976	
Stack Exhaust Flow (ACFM)		4751.7		4072.8		3394		2715.3		2036.5	
Stack Exhaust Velocity (ft/s)		15		15		15		15		15	
	Pollutant	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**	**#2 Oil**	**N.G.**
Lb/MMBtu, HHV	NO_x	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980
	CO	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824
	$PM_{2.5}$	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075
	PM_{10}	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075
	SO_2	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006
Lb/hr**	NO_x	1.992	1.367	1.707	1.172	1.423	0.977	1.138	0.781	0.854	0.586
	CO	0.498	1.149	0.427	0.985	0.356	0.821	0.245	0.657	0.214	0.493
	$PM_{2.5}$	0.212	0.105	0.182	0.089	0.152	0.075	0.121	0.059	0.091	0.045
	PM_{10}	0.237	0.105	0.203	0.089	0.169	0.075	0.136	0.059	0.102	0.045
	SO_2	2.868	0.008	2.459	0.007	2.049	0.006	1.639	0.005	1.23	0.004

Notes:
*** Number of boilers in each building includes one redundant boiler for backup.**
**** Emission rates presented here are per boiler.**
HP = boiler horsepower rating.
MMBtu = million British thermal units per hour
HHV = higher heating value of fuel
ACFM = actual cubic feet per minute
Emission rates and stack parameters are based on 50 percent load operation (per unit).
Emission factors are based on AP-42, while stack parameters are based on vendor data.

Table E-4
Boiler Emission Rates and Stack Parameters (25% Load)

Parameter		Boiler Capacity									
Parameter		700 HP		600 HP		500 HP		400 HP		300 HP	
Development		708-1		685-1		WS1-1		WS1-2		616-1, 616-2	
Number of Boilers*		4		3		3		3		3	
Heat Input Rate (MMBtu/hr, HHV)		6.97		5.98		4.98		3.99		2.99	
Stack Exhaust Temp. (°F)		300		300		300		300		300	
Stack Exhaust Flow (lbs/hr)		6972		5976		4980		3984		2988	
Stack Exhaust Flow (ACFM)		2375.8		2036.4		1697		1357.6		1018.3	
Stack Exhaust Velocity (ft/s)		7.5		7.5		7.5		7.5		7.5	
	Pollutant	#2 Oil	N.G.	#2 Oil	N.G.	#2 Oil	N.G.	#2 Oil	N.G.	#2 Oil	N.G.
Lb/MMBtu, HHV	NO_x	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980	0.1428	0.0980
	CO	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824	0.0357	0.0824
	$PM_{2.5}$	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075	0.0152	0.0075
	PM_{10}	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075	0.0170	0.0075
	SO_2	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006	0.2057	0.0006
Lb/hr**	NO_x	0.996	0.683	0.854	0.586	0.712	0.488	0.569	0.391	0.427	0.293
	CO	0.249	0.575	0.214	0.493	0.178	0.411	0.142	0.328	0.107	0.247
	$PM_{2.5}$	0.106	0.052	0.091	0.045	0.076	0.037	0.061	0.029	0.046	0.022
	PM_{10}	0.119	0.052	0.102	0.045	0.085	0.037	0.068	0.029	0.051	0.022
	SO_2	1.434	0.004	1.229	0.004	1.025	0.003	0.819	0.002	0.615	0.002

Notes:
*** Number of boilers in each building includes one redundant boiler for backup.**
**** Emission rates presented here are per boiler.**
HP = boiler horsepower rating.
MMBtu = million British thermal units per hour
HHV = higher heating value of fuel
ACFM = actual cubic feet per minute
Emission rates and stack parameters are based on 25 percent load operation (per unit).
Emission factors are based on AP-42, while stack parameters are based on vendor data.

Table E-5
Total Annual Emissions (Tons per Year)

Pollutant	Tons per year
NO_X	31.69
CO	7.92
PM_{10}	3.77
$PM_{2.5}$	3.37
SO_2	45.6

Since the boilers would operate primarily during colder periods, the annual impact analysis used average monthly weather data for New York City to distribute the annual boiler utilization each month of the year to approximate the average monthly boiler demand. The HVAC equipment was modeled at 25, 50, 75, and 100 percent load to account for varying boiler operating conditions throughout the year.

MODELING APPROACH

As described in the Final SEIS, modeling was performed with the AERMOD model using five years of meteorology (2001-2005). As per the *CEQR Technical Manual*, modeling was performed both with and without building downwash to determine impacts under worst-case conditions. Buildings which could potentially cause wake effects due to building downwash were surveyed using Graphical Information Systems (GIS) and Sanborn Maps, as well as information on proposed developments in the project study area. EPA's Building Profile Input Program (BPIP) program, which is described in the *User's Guide to the Building Profile Input Program*, EPA, Research Triangle Park, North Carolina, was used to determine the projected building dimensions for the AERMOD modeling with the building downwash algorithm enabled. For both the with and without downwash cases, the Proposed Actions was modeled at 25 percent, 50 percent, 75 percent and 100 percent operating capacity to simulate a full range of potential operations.

A comprehensive receptor network (i.e., off-site locations with continuous public access) was developed for the modeling analyses. The receptor network included regularly spaced ground-level receptors and numerous discrete receptors at tall buildings. Receptors were placed on nearby existing and proposed buildings which could potentially be affected by the Proposed Actions, as well as the project itself.

To examine impacts at ground level, the receptor network included a 1.1 kilometer (km) polar grid with a grid spacing of 50 meters (m), centered on the project site. Additional receptors were placed at sidewalk locations around the project site in order to predict pollutant concentrations at locations where the contribution from project-generated traffic to air quality would be greatest. Ground level locations were modeled as flagpole receptors set at pedestrian height, consistent with guidance criteria in the *City Environmental Quality Review (CEQR) Technical Manual.*

Receptors representing buildings or other occupied sensitive locations were modeled at various flagpole elevations to represent operable windows, ventilation intakes, etc. A general elevated receptor network was created at a six-story elevation to represent typical low-rise building construction in all directions around the project site, out to a distance of approximately 1.1 km (with a total of 378 receptors). Individual existing and proposed buildings around the project site that were taller than six stories were modeled with additional receptors. A total of 78 off-site buildings were modeled out to a distance of approximately ½ mile from the project site (with a total of 1,907 receptors including the proposed UNDC Project). In addition, a total of 1,747 receptors were placed at elevated locations on the Proposed Actions' buildings. Receptors were placed at various building elevations on all façades to ensure that potential worst-case project-on-project impacts would be identified.

Since the receptors used in the modeling included locations on the Proposed Actions itself, additional modeling and post-processing of the model output was necessary to exclude certain receptors when determining maximum pollutant concentrations on the Proposed Actions. This is appropriate since the AERMOD model assumes the stack plume travels directly towards the elevated receptor, which is unrealistic because the stack plume would be greatly influenced by the project building's own roof structure. To analyze pollutant concentrations at elevated receptors on project buildings, source groups were created consisting of all of the Proposed Actions' sources except within each source group, one building's source(s) was excluded. For example, to examine impacts from the Proposed Actions on Building 685-1, a source group was created which contained all of the Proposed Actions' stationary sources except the boiler source for Building 685-1. Next, the model output file created with each source group was reviewed.

Receptors at the building for which the source was excluded were reviewed to determine the maximum overall concentration, and receptors at other locations were ignored. For example, the output file for the source group containing all sources except Building 685-1 examined the receptors at Building 685-1, and ignored all other receptors. This process was performed for each of the project buildings which are proposed to have an HVAC system. For Waterside 2, Building 1, which would be on steam, the maximum pollutant concentrations were determined by modeling all of the Proposed Actions' sources, as with off-site receptors.

The maximum predicted concentrations were obtained from the plot files and were added to the background concentrations to estimate the ambient air quality at potential elevated receptor locations near the project site. The results of this analysis are presented in Chapter 17 of the Final SEIS.

ANALYSIS RESULTS

Using the procedures described above, the AERMOD model was used to estimate the maximum off-site pollutant concentrations that would result from the Proposed Actions. The maximum predicted concentrations from the modeling were added to the background concentrations to estimate the ambient air quality at the locations near the project site. The 1-hour and 8-hour CO concentrations and 3-hour and 24-hour SO_2 concentrations were calculated by adding maximum (highest first-high) short-term impacts to the highest second-high background concentrations over five most recent available years. The PM_{10} 24-hour average maximum total predicted concentrations were calculated by adding the highest predicted 24-hour average to the highest second-highest background concentration.

The maximum modeled concentration results for each of the analyzed loads are presented in Table E-6 (with downwash) and Table E-7 (without downwash). As shown in Table E-7, maximum concentrations were predicted to occur without downwash, under maximum boiler load and on receptors located on the Proposed Actions' buildings. The results of the analysis, as described in Chapter 17, concluded that the Proposed Actions' HVAC sources would not result in any significant adverse air quality impacts.

Tables E-8 and E-9 present modeled concentrations with and without downwash, respectively, assuming the proposed UNDC Project is developed. Only receptors on project buildings are presented. Maximum concentrations were predicted on the proposed 708 First Avenue development.

Tables E-10 and E-11 present the maximum total concentrations, including ambient background concentrations. $PM_{2.5}$ concentrations are not presented in these tables since impacts are evaluated on an incremental basis. Tables E-12 and E-13 present the maximum total concentrations assuming the proposed UNDC Project is developed. The maximum total concentrations exceed the NAAQS for PM_{10} and SO_2. As noted in Chapter 17, the UNDC Project would be subject to its own environmental review which would need to demonstrate that it would not result in any significant impacts on air quality, including the Proposed Actions.

Table E-6
Modeled Concentrations with Downwash

Pollutant	Averaging Period	Maximum Predicted Impact (μg/m^3)											
		Project Buildings				Non-Project Buildings				Ground-Level			
		100%	75%	50%	25%	100%	75%	50%	25%	100%	75%	50%	25%
$PM_{2.5}$	24-hour	**1.8**	1.7	1.5	0.8	**1.51**	1.19	0.83	0.47	**1.55**	1.24	0.88	0.48
	Annual	0.09	0.10	0.10	**0.11**	0.08	0.09	0.09	**0.098**	0.09	0.10	0.10	**0.11**
PM_{10}	24-hour	**3.0**	2.4	1.6	0.9	**1.7**	1.3	0.9	0.5	**1.7**	1.4	1.0	0.5
SO_2	3-hour	**66.3**	56.3	42.1	23.2	**50.9**	41.4	29.6	18.2	**36.4**	29.2	21.1	12.9
	24-hour	**36.7**	28.6	19.8	10.8	**20.5**	16.0	11.2	6.3	**21.0**	16.7	11.8	6.4
	Annual	1.24	1.29	1.36	**1.44**	1.14	1.19	1.25	**1.33**	1.24	1.3	1.37	1.45
NO_2 [2]	Annual	0.47	0.49	0.52	**0.55**	0.43	0.45	0.48	**0.51**	0.48	0.50	0.52	**0.6**
CO (ppm)	1-hour	**0.04**	0.03	0.02	0.01	0.03	0.027	0.02	0.01	**0.01**	0.01	0.01	0.006
	8-hour	**0.02**	0.01	0.009	0.006	0.01	0.009	0.006	0.004	**0.01**	0.008	0.006	0.003

Notes:
1. Maximum concentrations are shown in bold for each type of receptor network modeled.
2. NO_2 impacts were estimated using a NO_2/NO_X ratio of 0.55

Table E-7
Modeled Concentrations without Downwash

Pollutant	Averaging Period	Maximum Predicted Impact (μg/m^3)											
		Project Buildings				Non-Project Buildings				Ground-Level			
		100%	75%	50%	25%	100%	75%	50%	25%	100%	75%	50%	25%
$PM_{2.5}$	24-hour	2.30	**2.32**	2.22	1.97	**1.21**	1.03	0.83	0.48	**0.1**	0.07	0.05	0.03
	Annual	0.05	0.07	0.10	**0.17**	0.022	0.024	0.03	**0.03**	0.001	0.001	0.001	**0.001**
PM_{10}	24-hour	**5.8**	4.3	3.3	2.3	**1.4**	1.2	0.9	0.53	**0.1**	0.08	0.06	0.03
SO_2	3-hour	**289.5**	217.7	158.8	87.8	**55.6**	44.7	31.8	19.7	**3.7**	3.0	2.2	1.5
	24-hour	**69.9**	52.2	40.0	27.9	**16.4**	13.9	11.2	6.4	**1.2**	1.0	0.7	0.40
	Annual	0.68	0.89	1.37	**2.32**	0.29	0.32	0.38	**0.44**	0.011	0.013	0.014	**0.017**
NO_2 [1]	Annual	0.26	0.34	0.52	**0.88**	0.11	0.12	0.15	**0.17**	0.004	0.005	0.005	**0.006**
CO (ppm)	1-hour	**0.2**	0.16	0.12	0.06	**0.03**	0.03	0.02	0.014	**0.002**	0.002	0.001	0.001
	8-hour	**0.1**	0.04	0.03	0.02	**0.01**	0.008	0.006	0.004	**0.001**	0.007	0.0005	0.0003

Notes:
1. Maximum concentrations are shown in bold for each type of receptor network modeled.
2. NO_2 impacts were estimated using a NO_2/NO_X ratio of 0.55

Table E-8
Modeled Concentrations with UNDC with Downwash

Pollutant	Averaging Period	Maximum Predicted Impact (μg/m^3)			
		Project Buildings			
		100%	75%	50%	25%
$PM_{2.5}$	24-hour	**24.94**	24.91	24.88	24.85
	Annual	0.13	0.134	0.138	**0.144**
PM_{10}	24-hour	**46.73**	46.70	46.7	46.63
SO_2	3-hour	**2740.4**	2740.4	2740.4	2740.4
	24-hour	**360.6**	360.2	359.8	359.4
	Annual	1.8	1.85	1.91	**2.0**
NO_2 [1]	Annual	0.59	0.62	0.64	**0.67**
CO (ppm)	1-hour	**1.95**	1.95	1.95	1.95
	8-hour	**0.28**	0.28	0.28	0.28

Notes:
1. Maximum concentrations are shown in bold for each type of receptor network modeled.
2. NO_2 impacts were estimated using a NO_2/NO_X ratio of 0.55

Table E-9
Modeled Concentrations with UNDC without Downwash

Pollutant	Averaging Period	Maximum Predicted Impact (μg/m^3)			
		Project Buildings			
		100%	75%	50%	25%
$PM_{2.5}$	24-hour	**103.7**	103.7	103.7	103.7
	Annual	3.71	3.71	3.71	**3.71**
PM_{10}	24-hour	**194.7**	194.7	194.7	194.7
SO_2	3-hour	**5574**	5574	5574	5574
	24-hour	**1499.5**	1499.5	1499.5	1499.5
	Annual	53.57	53.57	53.57	**53.57**
NO_2 [1]	Annual	13.12	13.12	13.12	**13.12**
CO (ppm)	1-hour	**3.46**	3.46	3.46	3.46
	8-hour	**0.81**	0.81	0.81	0.81

Notes:
1. Maximum concentrations are shown in bold for each type of receptor network modeled.
2. NO_2 impacts were estimated using a NO_2/NO_X ratio of 0.55

The maximum overall concentrations, including background concentrations, are presented in Table E-10 (with downwash) and Table E-11 (without downwash). Table E-12 presents maximum concentrations with downwash with UNDC, while Table E-13 presents maximum concentrations without downwash with UNDC. As shown in Table E-12 and Table 13, maximum concentrations from the UNDC, which are based on worst-case assumptions, have the potential for significant air quality impacts on the Proposed Actions, specifically at 708 First Avenue.

Table E-10
Maximum Total Concentrations with Downwash

Pollutant	Averaging Period	Background	Maximum Predicted Impact (μg/m^3)						
			Project Buildings		Non-Project Buildings		Ground-Level		
			Increment	Maximum Predicted concentration	Increment	Maximum Predicted concentration	Increment	Maximum Predicted concentration	NAAQS
PM_{10}	24-hour	60	3.0	63	1.7	61.7	1.7	61.7	150
SO_2	3-hour	201	66.3	267.3	50.9	252	36.4	237.4	1,300
	24-hour	123	36.7	159.7	20.5	143.5	21	144.0	365
	Annual	97	1.44	38.4	1.33	38.3	1.45	38.5	80
NO_2 [1]	Annual	71.5	0.55	72.05	0.51	72	0.6	72.1	100
CO	1-hour	4.0 ppm	0.04 ppm	4.04 ppm	0.03 ppm	4.03 ppm	0.01 ppm	4.01 ppm	35 ppm
	8-hour	2.5 ppm	0.02 ppm	2.52 ppm	0.01	2.51 ppm	0.01 ppm	2.51 ppm	9 ppm

Note: 1. NO_2 impacts were estimated using a NO2/NOX ratio of 0.55

Table E-11
Maximum Total Concentrations without Downwash

Pollutant	Averaging Period	Background	Maximum Predicted Impact (µg/m³)						
			Project Buildings		Non-Project Buildings		Ground-Level		
			Increment	Maximum Predicted concentration	Increment	Maximum Predicted concentration	Increment	Maximum Predicted concentration	NAAQS
PM_{10}	24-hour	60	5.8	65.8	1.4	61.4	0.1	60.1	150
SO_2	3-hour	201	289.5	490.5	55.6	256.6	3.7	204.7	1,300
	24-hour	123	69.9	192.9	16.4	139.4	1.2	124.2	365
	Annual	37	2.32	39.3	0.44	37.4	0.017	37.02	80
NO_2 [1]	Annual	71.5	0.88	72.4	0.17	71.7	0.006	71.51	100
CO	1-hour	4.0 ppm	0.2 ppm	4.2 ppm	0.03 ppm	4.03 ppm	0.002 ppm	4.0 ppm	35 ppm
	8-hour	2.5 ppm	0.1 ppm	2.6 ppm	0.01 ppm	2.51 ppm	0.001 ppm	2.5 ppm	9 ppm

Notes:
1. NO_2 impacts were estimated using a NO2/NOX ratio of 0.55

Table E-12
Maximum Total Concentrations with UNDC with Downwash

Pollutant	Averaging Period	Background	Maximum Predicted Impact (µg/m³)		
			Project Buildings		
			Increment	Maximum Predicted concentration	NAAQS
PM_{10}	24-hour	60	46.73	106.73	150
SO_2	3-hour	201	2740.4	2941.4	1,300
	24-hour	123	360.6	483.6	365
	Annual	37	2.0	39	80
NO_2 [1]	Annual	71.5	0.67	72.17	100
CO	1-hour	4.0 ppm	1.95 ppm	5.95 ppm	35 ppm
	8-hour	2.5 ppm	0.28 ppm	2.78 ppm	9 ppm

Notes: 1. NO_2 impacts were estimated using a NO2/NOX ratio of 0.55

Table E-13
Maximum Total Concentrations with UNDC Without Downwash

Pollutant	Averaging Period	Background	Maximum Predicted Impact (µg/m³)		
			Project Buildings		
			Increment	Maximum Predicted concentration	NAAQS
PM_{10}	24-hour	60	194.7	254.7	150
SO_2	3-hour	201	5574	5775	1,300
	24-hour	123	1499.5	1622.5	365
	Annual	37	53.57	90.57	80
NO_2 [1]	Annual	71.5	13.12	84.62	100
CO	1-hour	4.0 ppm	3.46	7.46	35 ppm
	8-hour	2.5 ppm	0.81	3.31	9 ppm

Notes: 1. NO_2 impacts were estimated using a NO2/NOX ratio of 0.55

B. EFFECTS OF TRAFFIC MITIGATION MEASURES ON AIR QUALITY

Chapter 17 showed the maximum predicted carbon monoxide (CO) and particulate matter (PM_{10} and $PM_{2.5}$) concentrations for the Proposed Actions, and concluded that the Proposed Actions would not result in any significant adverse air quality impacts. Therefore, no air quality mitigation is required. This section considers the effects on air quality of the Proposed Actions with implementation of the traffic mitigation measures discussed in Chapter 23, "Mitigation."

The tables presented below illustrate the effect that proposed traffic mitigation measures, developed as part of the traffic analysis for the Proposed Actions (see Chapter 15, "Traffic and Parking"), would have on maximum predicted pollutant concentrations with the Proposed Actions at intersections where traffic mitigation is proposed. Tables E-14 and E-15 summarize the maximum CO and PM_{10} build and build with mitigation concentrations, respectively. Tables E-16 and E-17 summarize the maximum 24-hour and annual average $PM_{2.5}$ concentration increment with the mitigation measures in place, respectively.

The values shown are the highest predicted concentrations for the analyzed receptor locations. The results shows that with the proposed traffic mitigation measures, future concentrations of pollutants with the Proposed Actions would be below the National Ambient Air Quality Standards (NAAQS) for CO and PM_{10} and would not result in any significant adverse air quality impacts using the *de minimis* criteria for CO impacts or the updated interim guidance criteria for $PM_{2.5}$ impacts.

Table E-14
Future Maximum Predicted 8-Hour Average Carbon Monoxide Build and Build with Mitigation Concentrations (parts per million)

Receptor Site	Location	Time Period	8-Hour Concentration (ppm) [1]	
			Build	Build with Mitigation
2	Second Avenue at 42nd Street	PM	5.3	5.0
3	Second Avenue at 34th Street	PM	5.2	5.0
4	Second Avenue at the Queensboro Bridge	PM	5.5	5.5
Note: [1] 8-hour standard is 9 ppm.				

Table E-15
Future Maximum Predicted 24-Hour Average PM_{10} Build and Build with Mitigation Concentrations ($\mu g/m^3$)

Receptor Site	Location	24-Hour Concentration [1]	
		Build	Build with Mitigation
2	Second Avenue at 42nd Street	75.2	75.2
3	Second Avenue at 34th Street	75.7	75.7
Note: [1] 24-hour standard is 150 $\mu g/m^3$.			

Table E-16
Future Maximum Predicted 24-Hour Average $PM_{2.5}$ Concentrations Increments with Mitigation ($\mu g/m^3$)

Receptor Site	Location	24-Hour Concentration Increments (1)	
		Build	Build with Mitigation
2	Second Avenue at 42nd Street	0.06	0.06
3	Second Avenue at 34th Street	0.02	0.001

Note: [1] $PM_{2.5}$ interim guidance criteria—24-hour average, 2 $\mu g/m^3$ (5 $\mu g/m^3$ not-to-exceed value).

Table E-17
Future Maximum Predicted Annual Average $PM_{2.5}$ Concentrations Increments with Mitigation ($\mu g/m^3$)

Receptor Site	Location	Annual Concentration Increments (1)	
		Build	Build with Mitigation
2	Second Avenue at 42nd Street	0.01	0.02
3	Second Avenue at 34th Street	0.004	0.004

Note: [1] $PM_{2.5}$ interim guidance criteria—annual (neighborhood scale), 0.1 $\mu g/m^3$.

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