18. Construction

18.1 INTRODUCTION

This chapter assesses the potential impacts associated with the construction of projected development sites located within the proposed East Midtown Subdistrict. It is assumed that construction of the buildings on these sites would result from the Proposed Action's reasonable worst-case development scenario (RWCDS) described in Chapter 1, "Project Description" of this EIS.

The significance of construction impacts and associated need for mitigation is generally based upon the duration and magnitude of the impacts. According to the *CEQR Technical Manual,* construction duration is often broken down into short term (less than two years) and long term (two or more years). Where the duration of construction is expected to be short term, impacts resulting from such short-term construction typically do not require detailed construction impact analyses.

The inconvenience and disruption arising from the construction of the projected development sites could likely include temporary diversion of pedestrians, vehicles, and construction truck traffic to other streets. For the Proposed Action, it is estimated that the total construction duration of the projected development sites would take approximately 16-1/2 years. It is estimated that the larger development sites would take approximately 3-1/2 years to construct, while the smaller sites would take approximately 2 years to construct. Since construction activities associated with the Proposed Action would occur on multiple development sites within the same geographic area, such that there is the potential for several construction timelines to overlap, a preliminary assessment of potential construction impacts was prepared in accordance with the guidelines of the *CEQR Technical Manual.*

The findings of the preliminary assessment identified the need to undertake more detailed construction impact assessments for traffic, air quality and noise. To conduct that detailed assessment, this chapter also describes the conceptual construction phasing and schedule for the RWCDS.

18.2 PRINCIPAL CONCLUSIONS

18.2.1 Transportation

Construction of the Proposed Action is expected to result in significant adverse traffic impacts, as described below. No significant adverse impacts to parking, transit, or pedestrian conditions are anticipated.

18.2.1.1 Traffic

During construction activities, traffic would be generated by construction workers commuting via autos and trucks and making deliveries to projected development sites. The results of a detailed traffic analysis show that the Proposed Action would have significant adverse impacts to nine intersections during the construction AM peak hour (6:00–7:00 a.m.). Measures to address these impacts are described in Chapter 19, "Mitigation."

18.2.1.2 Parking

During construction activities, the parking demand associated with construction workers commuting via private automobiles and completed projects within the rezoning area would be adequately accommodated by available parking spaces in off-street parking facilities within a ¼-mile radius of the rezoning area.

18.2.1.3 Transit

The construction sites are located in an area that is well served by public transportation. A total of 8 subway stations/complexes, 16 local bus routes, 54 express bus routes, and 1 commuter rail station are located in the vicinity of the rezoning area. Given the magnitude of public transit services in the study area, trips made using transit during the construction peak hours would be spread among several projected development sites within the rezoning area and distributed between numerous subway stations, bus routes and commuter rail at Grand Central Terminal. As this would result in nominal increases in transit demand at individual station entrances and bus routes outside of the typical commuter peak periods, as a consequence it is not expected that peak construction activities would result in a potential for significant adverse impact to transit services.

18.2.1.4 Pedestrians

Incremental pedestrian trips during construction activities would be widely dispersed among sidewalks, corners, and crosswalks in the area and would not coincide with commuter peak hours. No significant adverse impacts to pedestrian conditions would be anticipated to occur during construction. At locations where temporary sidewalk closures are required during construction activities, adequate protection or temporary sidewalks and appropriate signage would be provided in accordance with New York City Department of Transportation (DOT) requirements.

18.2.2 Air Quality

Construction activities could affect local air quality because of engine emissions generated by on-site construction equipment and trucks entering/exiting the site during construction, and because of fugitive dust emissions generated by construction activities. An analysis of emissions from on-site construction activities and off-site (trucks and vehicles) was undertaken to quantify the potential effects of emissions from the proposed project.

The analysis first estimated the $PM_{2.5}$ emissions generated for each phase of construction for all proposed sites on a quarterly basis from 2016 to 2033. The period with the highest cumulative emissions (second quarter of 2022) was selected as the period with the highest potential for combined $PM_{2.5}$ emissions from all proposed sites. Then an impact assessment was performed for all applicable pollutants (using dispersion models) for the cluster of proposed sites under construction during this peak period. Projected Development Sites 5, 6, 7, 8, and 11 (located between Vanderbilt and Fifth Avenues and East 43rd to East 48th Streets) were included in the modeling impact assessment, which predicted the cumulative effect of the emissions for each one of these sites, including on-site and off-site sources, on sidewalk and elevated receptors (i.e., operable windows and potential building air intakes).

This quantitative analysis indicated that the proposed project would not result in any concentrations of NO_2, PM_{10}, and CO that exceed the National Ambient Air Quality Standards (NAAQS). In addition, the maximum predicted incremental concentrations of $PM_{2.5}$ would not exceed the City's applicable interim guidance criteria. Therefore, no significant adverse air quality impacts are expected from the construction-related sources.

18.2.3 Noise and Vibration

A construction noise analysis was performed to quantify the magnitude of construction-related noise exposure for the peak construction time period of the second quarter of 2022. The findings indicate that noise levels above the CEQR 5 dBA impact threshold are expected at several existing adjacent buildings to Projected Development Sites 5, 6, and 7. The highest noise levels are projected to be at ground level and at elevated receptor locations adjacent to existing commercial buildings on West 43rd Street between Madison and Fifth Avenues that border Projected Development Site 5. Although these locations are expected to experience exterior noise levels significantly above CEQR limits, for those buildings with double-paned glazed-glass windows and a closed ventilation system, it would keep interior noise levels for those buildings below or near the CEQR 50-dBA L_{10} impact threshold. The interior noise levels of these adjacent commercial buildings would likely approach or marginally exceed the CEQR 50-dBA L_{10} impact threshold for short periods of time. The potential does exist for similar noise-level increases at these and/or other receptor locations in the immediate vicinity of Project Development Sites 5, 6, and 7 during other construction quarters bordering this peak construction period (i.e., second quarter of 2022). At the time the DEIS was prepared, it was believed that an evaluation of construction noise exposure during the quarters covering the time period of 2021 to 2023 was necessary to disclose whether a significant adverse construction noise impact would actually occur. Upon further review between Draft and Final EIS, it was determined that the additional evaluation was not necessary since the analysis already presented was decidedly conservative and that an evaluation of the duration of construction noise exposure was not needed to determine the potential for significant adverse construction noise impacts. Therefore, if the peak construction scenario conservatively assumed for the purposes of this analysis is realized, the

Proposed Action would result in a significant adverse construction noise impact. Mitigation measures that may address these impacts are discussed in Chapter 19, "Mitigation."

The buildings of most concern with regard to potential damage from vibration generated during construction are those buildings located immediately adjacent or across the street from a proposed development site. Commercial buildings adjacent to Projected Development Sites 5 and 6 between Madison and Fifth Avenues could experience elevated vibration levels. No pile driving or blasting is expected as part of construction resulting from the Proposed Action. The types of construction activities expected to occur during the peak construction period are on the lower end of vibration-generating equipment—vibratory roller, hoe ram, bulldozer and loaded trucks—with the largest peak-particle velocity (PPV) of 0.20 inch per second, which is well below the 0.50 inch per second PPV vibration limit for structural damage. However, vibration perception above the 65 VdB annoyance limit could extend outward for approximately 230 feet from the source, but this would be during limited periods of time at a particular location and therefore would not result in any significant adverse impact due to vibration.

18.2.4 Other Technical Areas

18.2.4.1 Land Use and Neighborhood Character

Construction of the 19 projected development sites would be spread out over a period of 16-1/2 years, throughout approximately 70-block rezoning area. Throughout the construction period, access to residences, businesses and institutions in the area surrounding the development sites would be maintained, as required by City regulations. In addition, measures would be implemented to control noise, vibration, emissions and dust on construction sites, including the erection of construction fencing incorporating sound reducing measures and other requirements as dictated by the New York City construction noise code. Since none of these impacts would be continuous or ultimately permanent, they would not create significant impacts on land use patterns or neighborhood character in the area. Therefore, while construction of the new buildings resulting from the Proposed Action would cause temporary impacts, particularly related to noise, it is expected that such impacts in any given area would be relatively short term, even under the worst-case construction sequencing and therefore not create a neighborhood character impact. Therefore, no significant construction impacts to land use and neighborhood character are expected.

18.2.4.2 Socioeconomics

During the construction period, construction activities would be dispersed throughout the 70-block proposed rezoning area and would not affect access to particular businesses over an extended duration. Therefore, construction impacts to socioeconomic conditions are not expected.

18.2.4.3 Open Space

No open space resources would be disrupted during the construction resulting from the Proposed Action, nor would any access to publically accessible open space be impeded during construction within the proposed rezoning area. In addition, measures would be implemented to control noise, vibration, emissions and dust on construction sites, including the erection of construction fencing incorporating sound reducing measures. Since none of these impacts would be continuous or ultimately permanent, they would not create significant impacts on open space in the area. Therefore, while construction of the new buildings due to the Proposed Action would cause temporary impacts, particularly related to noise, it is expected that such impacts in any given area would be relatively short term, even under the worst-case construction sequencing and therefore not create an open space impact. Therefore, no significant construction impacts to open space are expected.

18.2.4.4 Historic and Cultural Resources

The New York City Landmarks Preservation Commission (LPC), at DCP's request, reviewed the identified projected and potential development sites that could experience new/additional in-ground disturbance as a result of the Proposed Action, and concluded that none of the lots comprising those sites have any archaeological significance. As such, the Proposed Action is not expected to result in any significant adverse impacts to archaeological resources.

The Proposed Action would result in development on both projected and potential development sites that are located within 90 feet of a designated New York City Landmark (NYCL) or a resource that is listed on the State/National Register of Historic Places (S/NR); however, these resources would not be adversely impacted by construction because they would be subject to protection from construction-related damage under the New York City Department of Buildings' (DOB) Technical Policy and Procedure Notice (TPPN) #10/88. However, there are also 24 NYCL- and/or S/NR-eligible resources located within 90 feet of the projected and potential development sites for which TPPN #10/88 would not apply and, therefore, the Proposed Action could potentially result in construction-related impacts to these eligible resources. Possible measures that may address these impacts are discussed in Chapter 19, "Mitigation."

18.2.4.5 Hazardous Materials

A preliminary screening of potential hazardous materials impacts was performed for all of the 19 projected and 20 potential development sites. The hazardous materials assessment identified that each of the projected and potential development sites has some associated concern regarding environmental conditions. As a result, the proposed zoning map actions include (E) designations for all of the projected and potential development sites. Therefore, the Proposed Action is not expected to result in significant adverse impacts related to hazardous materials.

With the requirements of the (E) designation on the projected and potential development sites, there would be no impact from the potential presence of contaminated materials. The implementation of the preventative and remedial measures required under the (E) designation would serve to avoid the potential that significant adverse hazardous materials impacts would result from construction on the projected and potential development sites resulting from the Proposed Action. Following such construction, there would be no potential for significant adverse impacts.

18.3 CONCEPTUAL CONSTRUCTION SCHEDULE AND ACTIVITIES

Since construction activities associated with the Proposed Action would occur on multiple development sites within the same geographic area, such that there is the potential for several construction timelines to overlap. For example, it is anticipated that construction activities would overlap at Projected Development Sites 3, 4, and 9 during the years of 2017 to 2020. This cluster of development sites in which construction activities could overlap is generally located along Madison and Vanderbilt Avenues between East 39th and East 47th Streets as shown on Figure 18-1.

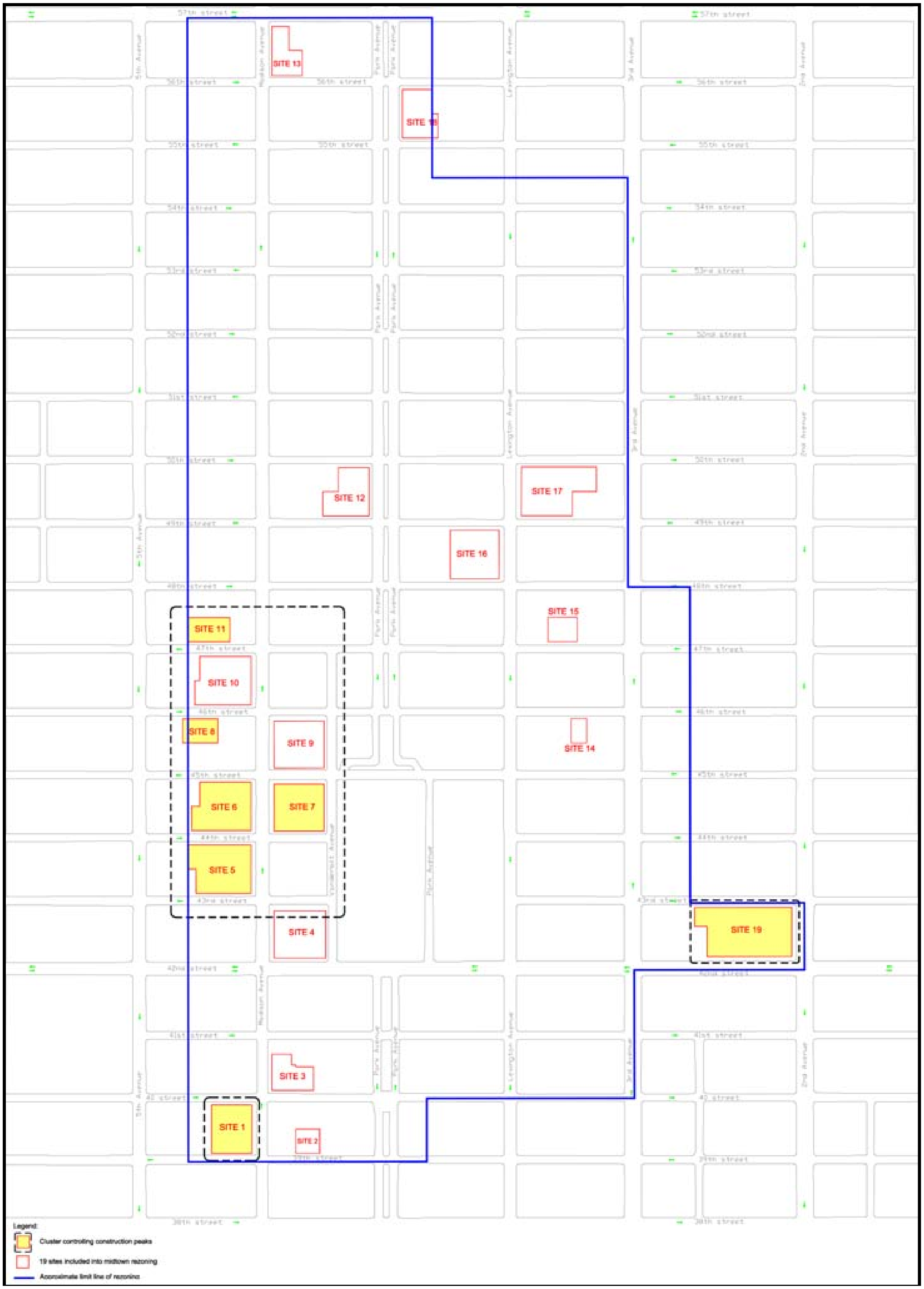
This chapter presents a description of the construction process for the purposes of quantification of environmental-effect causing activities only. It is not intended to describe the precise construction methods that may ultimately be used, nor is it intended to dictate or confine the construction process. Actual construction methods and materials may vary, depending in part on how the construction contractors choose to implement their work to be most cost effective, within the requirements set forth in bid, contract, and construction documents. Construction specifications will require that construction contractors comply with applicable environmental regulations and obtain necessary permits for the duration of construction. Construction of the project will follow applicable federal, state, and local laws for building and safety, as well as local noise ordinances, as appropriate.

The following sections provide a description of the anticipated sequencing of construction activities at the projected development sites. Also provided is a description of likely working hours, staging and laydown areas, sidewalk and lane closures, and construction worker parking that could be associated with construction activities at the projected development sites.

18.3.1 Construction Sequencing

Information regarding the anticipated schedule of proposed construction activities and phases was provided by the DCP. As shown on Figure 18-2 construction of the Proposed Action is anticipated to begin in 2016 and it is conservatively assumed that construction of all projected development sites would be completed by the end of the 2033 analysis year. Construction of various components of the project development sites would occur over a number of years, with construction activities and intensities varying, depending upon which components of the overall development sites are underway at a given time. For construction projects that extend over multiple years, a peak year is identified to isolate the greatest potential for adverse effects.

FIGURE 18-1: RWCDS PROJECTED DEVELOPMENT SITES – CONSTRUCTION SITE CLUSTERS



18.3.2 Typical Construction Activities

The anticipated phases and duration of construction activities at a typical projected development site are summarized below:

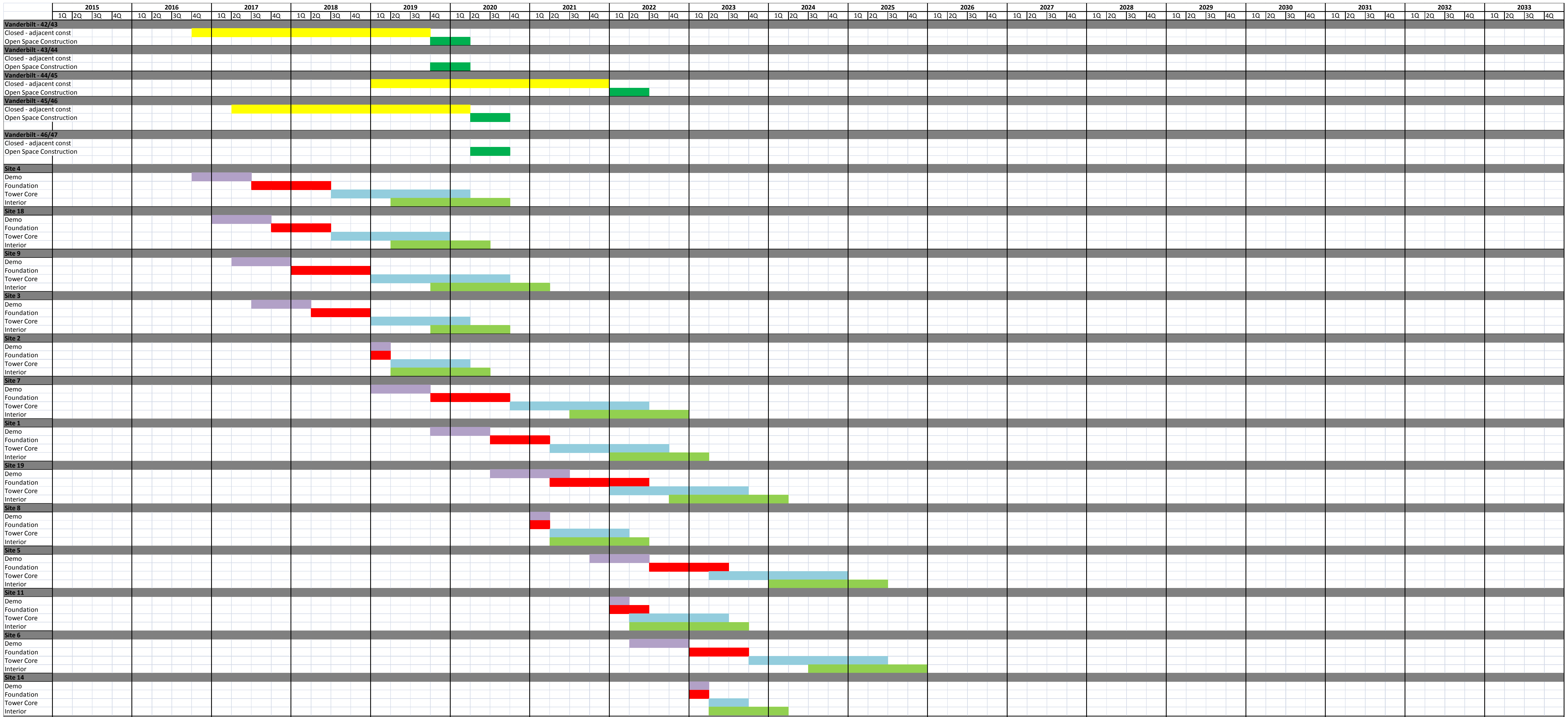
- Phase 1 – Site Clearance, including demolition or deconstruction of existing buildings.
- Phase 2 – Excavation and pouring of foundation. Activities during these months would include excavation for the foundation, any required dewatering and reinforcing and pouring of the foundations and structures below street level.
- Phase 3 – Erection of building core, including steel framework, decking, concrete slabs, shear walls, façade, roof construction and cladding.
- Phase 4 – Interior fit-out and finishing including mechanical installation. The final months of construction would include the installation of heating ventilation and air conditioning (HVAC) equipment and ductwork; installation of elevator, utility and life safety systems; and work on interior walls and finishes.

The phases, duration and overlap of construction activities specific to a particular development site are identified on Figure 18-2. It should be noted that the actual duration of such activities could vary based upon which site is developed. For example, the time necessary for each activity would vary depending upon such factors as work hours, traffic restrictions, and contractors' means and methods. Other factors would include the number and type of utilities requiring relocation, and location and condition of nearby surface and subsurface structures.

Figure 18-2 also identifies the total daily estimates of workers and trucks for each quarter through the duration of construction activities at the projected development sites. The number of workers would peak during the second quarter of 2022, with up to 3,048 workers per day. During the same time period there would be a peak of 145 trucks per day associated with project construction activities.

The types of equipment that would be used for construction activities include various earth-moving apparatus (excavators, graders, bulldozers, loaders, etc.), cranes, pile drivers, augers, drilling equipment, compaction rollers and tampers, concrete trucks, pumping equipment, generators/compressors, and various types of trucks (flat bed, dumps, trailers, etc.).

FIGURE 18-2: ANTICIPATED CONSTRUCTION SCHEDULE FOR ASSESSMENT OF CONSTRUCTION IMPACTS



	2015				2016				2017				2018			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
TOTAL WORKERS								246	380	549	532	496	385	353	1091	1091
TOTAL TRUCKS								28	44	63	61	54	41	35	39	39

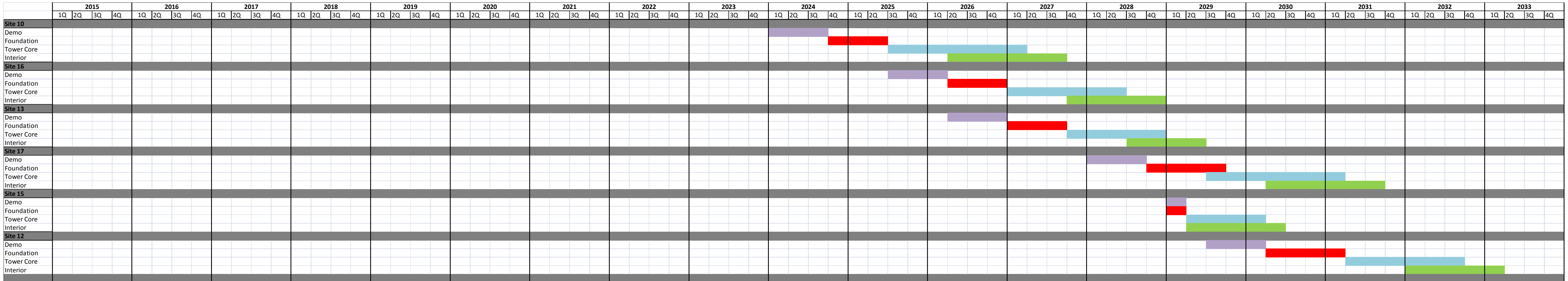
	2019				2020				2021				2022			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
TOTAL WORKERS	2252	2494	2494	2734	2341	1392	1512	1156	1709	1747	1625	1802	2867	3048	1948	1697
TOTAL TRUCKS	83	92	92	105	96	71	90	67	83	86	63	83	123	145	91	92

	2023				2024				2025				2026			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
TOTAL WORKERS	1562	2060	1788	1370	1766	1551	1718	1664	1081	1081	833	833	666	914	914	914
TOTAL TRUCKS	75	82	65	45	80	67	77	66	49	49	40	40	30	46	46	46

	2027				2028				2029				2030			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
TOTAL WORKERS	1173	643	643	822	912	912	575	689	505	443	941	737	737	618	590	590
TOTAL TRUCKS	40	25	25	22	40	40	33	32	33	24	48	32	32	22	20	20

	2031				2032				2033			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
TOTAL WORKERS	590	583	583	458	587	587	587	129	129			
TOTAL TRUCKS	20	18	18	11	17	17	17	6	6			

FIGURE 18-2: ANTICIPATED CONSTRUCTION SCHEDULE FOR ASSESSMENT OF CONSTRUCTION IMPACTS (CONTINUED)



	2015 1Q	2015 2Q	2015 3Q	2015 4Q	2016 1Q	2016 2Q	2016 3Q	2016 4Q	2017 1Q	2017 2Q	2017 3Q	2017 4Q	2018 1Q	2018 2Q	2018 3Q	2018 4Q	2019 1Q	2019 2Q	2019 3Q	2019 4Q	2020 1Q	2020 2Q	2020 3Q	2020 4Q
TOTAL WORKERS								246	380	549	532	496	385	353	1091	1091	2252	2494	2494	2734	2341	1392	1512	1156
TOTAL TRUCKS								28	44	63	61	54	41	35	39	39	83	92	92	105	96	71	90	67

	2021 1Q	2021 2Q	2021 3Q	2021 4Q	2022 1Q	2022 2Q	2022 3Q	2022 4Q	2023 1Q	2023 2Q	2023 3Q	2023 4Q	2024 1Q	2024 2Q	2024 3Q	2024 4Q	2025 1Q	2025 2Q	2025 3Q	2025 4Q	2026 1Q	2026 2Q	2026 3Q	2026 4Q
TOTAL WORKERS	1709	1747	1625	1802	2867	3048	1948	1697	1562	2060	1788	1370	1766	1551	1718	1664	1081	1081	833	833	666	914	914	914
TOTAL TRUCKS	83	86	63	83	123	145	91	92	75	82	65	45	80	67	77	66	49	49	40	40	30	46	46	46

	2027 1Q	2027 2Q	2027 3Q	2027 4Q	2028 1Q	2028 2Q	2028 3Q	2028 4Q	2029 1Q	2029 2Q	2029 3Q	2029 4Q	2030 1Q	2030 2Q	2030 3Q	2030 4Q	2031 1Q	2031 2Q	2031 3Q	2031 4Q	2032 1Q	2032 2Q	2032 3Q	2032 4Q	2033 1Q	2033 2Q	2033 3Q	2033 4Q
TOTAL WORKERS	1173	643	643	822	912	912	575	689	505	443	941	737	737	618	590	590	590	583	583	458	587	587	587	129	129			
TOTAL TRUCKS	40	25	25	22	40	40	33	32	33	24	48	32	32	22	20	20	20	18	18	11	17	17	17	6	6			

18.3.3 Estimate of Construction Period Trucks and Construction Workers

After analyzing prior EIS documents and information for similar known construction projects in Manhattan, "production rates" were established to identify an estimate and forecast of trucks and workers required that would be required per unit of gross square feet or gross cubic yards of new site development. These "production rates" were adjusted with a "time correction factor" and a "construction magnitude factor" to accommodate the different durations and site sizes.[1] The estimate of the number of trucks and workers per quarter for each site is identified on Figure 18-2 and summarized in Table 18-1.

18.3.4 Determining Peak Year for Cumulative Construction and Operational Effects

According to the *CEQR Technical Manual*, if a project involves multiple development sites over varying construction timelines, a preliminary assessment must be undertaken to determine if the operational trips from completed portions of the project and construction trips associated with construction activities could overlap. For the purposes of establishing a reasonable worse case for construction assessment, based on the conceptual construction schedule presented on Figure 18-2, the second quarter of 2022 was selected as the construction peak year for assessment in this chapter. As shown on Figure 18-2, there would be five sites that are already completed and operational (Project Development Sites, 2, 3, 4, 9, and 18) and seven sites that are under construction (Project Development Sites, 1, 5, 6, 7, 8, 11, and 19).

18.3.5 Construction Working Hours

In accordance with City laws and regulations, construction work at the projected development sites would be undertaken Monday through Friday and would generally begin at 7:00 a.m., with workers arriving to prepare work areas between 6:00 a.m. and 7:00 a.m. Construction work activities would typically finish around 3:30 p.m., but on some occasions, the workday could be extended to 6:00 p.m., depending upon the need to complete some specific tasks beyond normal work hours.

Construction work on the weekends would require a permit from the DOB. The approval of a noise mitigation plan from the DEP would also be required since the New York City Noise Control Code, limits construction to weekdays between the hours of 7:00 a.m. and 6:00 p.m., as well as sets noise limits for pieces of construction equipment. The level of activity for any weekend work is often less than a normal workday and would likely occur on Saturday from 7:00 a.m. to 5:00 p.m.

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[1] "Production rates" refers to quantity of material demolished, built or transported per unit time.
"Time correction factor" refers to the ratio between the schedule of the "known project" and schedule of each site on the proposed rezoning.
"Construction magnitude factor" refers to the ratio between the magnitude of the "known project" and magnitude of each site on the proposed rezoning.

TABLE 18-1: QUARTERLY PEAK NUMBERS OF DAILY CONSTRUCTION WORKERS AND DELIVERY TRUCKS: (19 PROJECTED DEVELOPMENT SITES WITH NEW CONSTRUCTION)

Summary Table - Peak trucks - Peak Workers

	2016				2017				2018				2019				2020				2021				2022				2023				2024			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
TOTAL WORKERS PER DAY PER Q				246	380	549	532	496	385	353	1091	1091	2252	2494	2494	2734	2341	1392	1512	1156	1709	1747	1625	1802	2867	3048	1948	1697	1562	2060	1788	1370	1766	1551	1718	1664
TOTAL TRUCKS PER DAY PER Q				28	44	63	61	54	41	35	39	39	83	92	92	105	96	71	90	67	83	86	63	83	123	145	91	92	75	82	65	45	80	67	77	66

	2025				2026				2027				2028				2029				2030				2031				2032				2033			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
TOTAL WORKERS PER DAY PER Q	1081	1081	833	833	666	914	914	914	1173	643	643	822	912	912	575	689	505	443	941	737	737	618	590	590	590	583	583	458	587	587	587	129	129			
TOTAL TRUCKS PER DAY PER Q	49	49	40	40	30	46	46	46	40	25	25	22	40	40	33	32	33	24	48	32	32	22	20	20	20	18	18	11	17	17	17	6	6			

18.3.6 Construction Staging Areas, Sidewalk and Lane Closures

Construction staging areas, also referred to as "laydown areas," are sites that would be used for the storage of materials and equipment, and other construction-related activities. Work zones are those areas where the construction is occurring. Field offices for contractors and construction managers would be situated in temporary job site trailers at staging areas or existing office space near the work areas. Staging areas would typically be fenced and lit for security, as well as adhere to New York City building codes.

Staging areas of adequate size and proximity to the alignment are essential to minimize construction traffic through the East Midtown Rezoning area and to provide adequate space and access for construction activities. Because of the dense urban environment of the East Midtown Rezoning area, very few vacant parcels are available within close proximity to the proposed development sites that could be used for staging areas. As such, construction staging would most likely occur on the projected development sites themselves and may in some cases, extend within the curb and travel lanes and sidewalks of public streets adjacent the construction site.

Except for the permanent closure of Vanderbilt Avenue between East 44th and East 47th Streets to traffic for open space construction, no rerouting of traffic is anticipated during construction activities and all moving lanes on streets are expected to be available to traffic at all times. It is anticipated that some sidewalks immediately adjacent to construction sites would be closed to accommodate heavy loading areas for at least several months of the construction period for each site. Pedestrians would either use a temporary walkway in a sectioned-off portion of the street or be diverted to walk on the opposite side of the street. Detailed Maintenance and Protection of Traffic (MPT) plans for each construction site would be submitted for approval to the DOT Office of Construction Mitigation and Coordination (OCMC). Appropriate protective measures for ensuring pedestrian safety surrounding each of the projected development sites would be implemented under these plans.

Construction activities would also be subject to compliance with the New York City Noise Code and by U.S. Environmental Protection Agency (EPA) noise emission standards for construction equipment. In addition, there would be requirements for street crossing and entrance barriers, protective scaffolding and compliance with applicable construction safety measures.

18.4 PRELIMINARY ASSESSMENT

In accordance with the guidelines of the *CEQR Technical Manual*, this preliminary assessment evaluated the effects associated with the Proposed Action's construction-related activities including transportation (traffic, transit, parking, and pedestrians), air quality, noise, land use and neighborhood character, socioeconomic conditions, community facilities, open space, historic and cultural resources, natural resources and hazardous materials.

18.4.1 Transportation

Construction activities at projected development sites from 2016 to 2033 would generate construction worker and truck traffic. An evaluation of construction sequencing and worker/truck projections was undertaken to assess potential transportation-related impacts associated with construction. As demonstrated below, projected construction activities are not expected to result in significant adverse impacts to parking, transit, or pedestrians. However, a detailed assessment is required to determine the potential for significant adverse traffic impacts.

18.4.1.1 Traffic

a. Trip Generation Projections

The average daily workforce and truck trip estimates in Table 18-2 were used to determine the peak quarter and worst-case scenario for potential traffic-related impacts during construction. These projections were further refined to account for worker modal splits, vehicle occupancy rates, and trip ends (arrivals and departures). Given the proximity to construction sites to mass transit services, most of the construction workers (approximately 70 percent) would be expected to use public transportation in their commute to and from work within Manhattan. The remaining 30 percent of workers would travel by personal automobile at an average occupancy rate of approximately two persons per vehicle. These assumptions were utilized in the *53 West 53rd Street FEIS* and are based on a 2006 survey at the construction site of the New York Times Building near Times Square.

Estimates of daily construction-vehicle trips were developed for each calendar year and quarter and are summarized in Table 18-2. These represent the sum of trips by personal autos used by construction workers and trucks making deliveries to construction sites. Each worker vehicle was assumed to arrive in the morning and depart in the afternoon or evening; whereas, each truck delivery was assumed to result in two truck trips during the same hour (one inbound and one outbound). For comparison purposes, truck trips were converted into Passenger Car Equivalents (PCEs) assuming that one truck is equal to two PCEs. Table 18-2 shows that the peak volume of autos, trucks, and PCEs would all occur in the second quarter of 2022.

TABLE 18-2: TOTAL DAILY VEHICLE TRIPS DURING CONSTRUCTION BY QUARTER

	2016				2017				2018				2019				2020			
Vehicle Type	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Autos	0	0	0	71	110	159	154	143	111	102	315	315	651	721	721	790	677	402	437	334
Trucks	0	0	0	57	88	126	122	107	82	69	78	78	166	185	185	210	191	143	181	134
Total Vehicles	0	0	0	128	198	285	276	250	193	171	393	393	817	906	906	1,000	868	545	618	468
Total PCEs	0	0	0	185	286	411	397	357	275	241	471	471	983	1,090	1,090	1,210	1,059	688	798	603

	2021				2022				2023				2024				2025			
Vehicle Type	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Autos	494	505	470	521	829	**881**	563	491	451	595	517	396	510	448	497	481	312	312	241	241
Trucks	166	172	126	166	246	**290**	183	185	149	164	130	90	160	134	153	132	99	99	80	80
Total Vehicles	660	677	596	687	1,074	**1,171**	746	675	600	759	647	486	670	583	650	613	411	411	320	320
Total PCEs	826	849	722	853	1,320	**1,460**	928	860	750	923	777	576	830	717	803	746	510	510	400	400

	2026				2027				2028				2029				2030			
Vehicle Type	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Autos	192	264	264	264	339	186	186	238	264	264	166	199	146	128	272	213	213	178	170	170
Trucks	61	92	92	92	80	50	50	44	80	80	65	63	65	48	97	63	63	44	40	40
Total Vehicles	253	357	357	357	419	236	236	282	343	343	231	262	211	176	368	276	276	223	210	210
Total PCEs	314	449	449	449	499	287	287	326	423	423	296	325	276	225	465	339	339	267	250	250

	2031				2032				2033			
Vehicle Type	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Autos	170	169	169	132	169	169	169	37	37	0	0	0
Trucks	40	36	36	21	34	34	34	13	13	0	0	0
Total Vehicles	210	204	204	153	203	203	203	50	50	0	0	0
Total PCEs	250	240	240	174	237	237	237	62	62	0	0	0

Notes:
PCE = Passenger Car Equivalent
Bold text indicates peak workers or trucks

b. Peak-Hour Construction Worker Vehicle and Truck Trips

Most site activities would take place during the typical construction shift of 7:00 a.m. to 3:30 p.m. However, some construction tasks, such as foundation and superstructure work, would extend to 6:00 p.m., requiring a portion of the construction workforce to remain for an extended shift. A nominal number of truck deliveries may also be expected during these later hours. Construction truck trips would be made throughout the day (with more trips made during the early morning), and most trucks would remain in the area for short durations. On the other hand, construction worker travel would typically take place during the hours before and after the work shift. For analysis purposes, each worker vehicle was assumed to arrive in the morning and depart in the afternoon or evening; whereas, each truck delivery was assumed to result in two truck trips during the same hour.

The estimated daily vehicle trips were distributed throughout the workday based on projected work shift allocations and conventional arrival/departure patterns of construction workers and trucks. For construction workers, the majority (80 percent) of the arrival and departure trips would take place during the hour before and after each shift (6:00–7:00 a.m. for arrival and 3:30–4:30 p.m. for departure on a normal day shift or 6:00–7:00 p.m. for days with extended shifts). For construction trucks, deliveries would occur throughout the day when the construction site is active. However, to avoid traffic congestion, some construction truck deliveries would also often peak during the hour before the regular day shift (25 percent of shift total), overlapping with construction worker arrival traffic. Based on these assumptions, hourly construction-vehicle trip projections (in PCEs) for the second quarter of 2022 were estimated and are summarized in Table 18-3. The table shows that overall construction-vehicle trips would peak during the hours of 6:00–7:00 a.m. and 3:00–4:00 p.m.

TABLE 18-3: 2022 CONSTRUCTION-VEHICLE TRIP PROJECTIONS (IN PCEs)

Time Period	Construction Trips			Incremental Operational Trips			Displaced Trips			Total Trips		
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
6:00 AM - 7:00 AM	425	72	497	-18	-26	-44	-11	-14	-25	396	32	428
7:00 AM - 8:00 AM	117	29	146	-17	-42	-59	-79	-58	-137	21	-71	-50
8:00 AM - 9:00 AM	29	29	58	181	23	204	-677	-350	-1,027	-467	-298	-765
9:00 AM - 10:00 AM	29	29	58	179	60	239	-628	-381	-1,009	-421	-291	-712
10:00 AM - 11:00 AM	29	29	58	43	47	90	-335	-354	-689	-263	-278	-541
11:00 AM - 12:00 PM	29	29	58	60	63	124	-361	-369	-730	-272	-277	-548
12:00 PM - 1:00 PM	29	29	58	24	31	55	-609	-610	-1,219	-556	-550	-1,106
1:00 PM - 2:00 PM	29	29	58	121	109	230	-519	-499	-1,018	-369	-361	-730
2:00 PM - 3:00 PM	14	59	73	112	87	199	-449	-406	-855	-323	-260	-582
3:00 PM - 4:00 PM	0	352	352	39	39	77	-305	-311	-616	-266	80	-186
4:00 PM - 5:00 PM	0	44	44	-27	58	31	-252	-434	-686	-280	-331	-611
5:00 PM - 6:00 PM	0	0	0	-94	96	2	-377	-745	-1,122	-471	-649	-1,120
Totals	**730**	**730**	**1,460**	**602**	**546**	**1,148**	**-4,602**	**-4,530**	**-9,132**	**-3,270**	**-3,254**	**-6,524**

During peak construction in the second quarter of 2022, seven projected development sites would be under construction (Sites 1, 5, 6, 7, 8, 11, and 19) and five projected development sites would be completed and in operation (Sites 2, 3, 4, 9, and 18). The peak construction-vehicle trip projections in Table 18-3 also account for existing trips to land uses that would be displaced by construction sites and incremental operational trips from completed projects in the rezoning area. As shown in the table, there would be a net increase of 428 PCEs from 6:00–7:00 a.m. As the level of trip generation would exceed the CEQR threshold of 50 peak-hour vehicle trips, a quantitative traffic analysis was prepared for the 6:00-7:00 a.m. time period and is provided in the Detailed Assessment section. All other hours of construction would have a net decrease in PCEs and would not have the potential to result in significant adverse traffic impacts.

c. Curb Lane Closures and Staging

Temporary curb lane and sidewalk closures are anticipated adjacent to construction sites, similar to other construction projects in New York City, and these would be expected to have dedicated gates, driveways, or ramps for access by trucks making deliveries. At each construction site, flaggers would be present to manage the access and movements of trucks. Moving lanes of traffic are expected to be available at all times along streets adjacent to construction sites, except for the segments of Vanderbilt Avenue that would be permanently closed to traffic in the No-Action and With-Action conditions, as these streets could be used as staging areas during the construction of adjacent development sites. As described above, detailed MPT plans for each construction site would be submitted for approval to DOT OCMC.

18.4.1.2 Parking

It is expected that most of the workers (approximately 70 percent) would travel to construction sites via public transit. For those workers who would drive, it is not anticipated that any workers would be able to park on streets in the vicinity of construction sites given that on-street parking for the general public is highly restricted. However, off-street parking is available at a number of nearby lots and garages in the East Midtown Rezoning area. During the second quarter of 2022, when peak construction activities are expected, With-Action construction conditions would generate a net increase in demand of approximately 82 parking spaces during the weekday Midday period. This represents an increase in demand of 440 parking spaces from construction workers, a reduction in demand of 600 parking spaces from existing buildings that would be displaced during construction, and an increase in demand of 242 parking spaces from completed projects within the rezoning area (Appendix 5 includes a summary of parking demand on a site-by-site basis). During this same timeframe, there would be no net change in parking capacity since none of the sites under construction or that would be operational at this point in time would displace public parking facilities or provide new public parking.

As discussed in Chapter 12, "Transportation," within a ¼-mile radius of the rezoning area, there would be 4,162 available spaces, 2,555 available spaces, and 2,381 available spaces during the weekday Midday period in the 2012 Existing, 2033 No-Action operational, and 2033 With-Action operational conditions, respectively. Based on the extent of available parking spaces, there would be sufficient off-street parking capacity to accommodate all of the projected demand during the weekday Midday period. As such, construction activities would not result in a significant adverse parking impact.

18.4.1.3 Transit

As described previously, the majority of the construction workers would be expected to use public transit to travel to and from work. The construction sites are located in an area that is well served by public transportation. A total of 8 subway stations/complexes, 16 local bus routes, 54 express bus routes, and 1 commuter rail station are located in the vicinity of the rezoning area. During peak construction activities in the second quarter of 2022, new transit trips would be generated by construction workers and completed projects in the rezoning area. Table 18-4 and Table 18-5 summarize the incremental transit trips during peak construction activities in the second quarter of 2022 for the weekday 6:00–7:00 a.m. and 3:00–4:00 p.m. construction peak hours, respectively. The incremental trips during the peak construction activities include incremental operational trips from completed projects in the rezoning area and accounts for existing trips to land uses that would be displaced by construction sites. As shown in the tables, there would be a net increase of 1,642 and 344 transit trips during the AM and PM construction peak hours, respectively.

TABLE 18-4: 2022 CONSTRUCTION WEEKDAY AM TRANSIT TRIPS

Projected Site #	2022 Peak Construction Person Trips											
	Construction Workers			Incremental Operational Sites			Displaced Existing Land Uses			Total		
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
1	327		327				0	0	0	327	0	327
2				0	0	0				0	0	0
3				0	0	0				0	0	0
4				0	0	0				0	0	0
5	99		99				-1	-4	-5	98	-4	94
6	141		141				0	0	0	141	0	141
7*	419		419				-2	-11	-13	417	-11	406
8	14		14				0	0	0	14	0	14
9				-7	-39	-46				-7	-39	-46
11	176		176				0	-1	-1	176	-1	175
18				0	0	0				0	0	0
19	531		531				0	0	0	531	0	531
Totals	**1,707**	**0**	**1,707**	**-7**	**-39**	**-46**	**-3**	**-16**	**-19**	**1,697**	**-55**	**1,642**

Note:
*Includes adjacent open space construction on Vanderbilt Avenue

TABLE 18-5: 2022 CONSTRUCTION WEEKDAY PM TRANSIT TRIPS

Projected Site #	2022 Peak Construction Person Trips											
	Construction Workers			Incremental Operational Sites			Displaced Existing Land Uses			Total		
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
1		327	327				-128	-128	-256	-128	199	71
2				6	6	12				6	6	12
3				0	0	0				0	0	0
4				103	105	208				103	105	208
5		99	99				-177	-179	-356	-177	-80	-257
6		141	141				-271	-278	-549	-271	-137	-408
7*		419	419				-153	-157	-310	-153	262	109
8		14	14				-20	-20	-40	-20	-6	-26
9				257	249	506				257	249	506
11		176	176				-19	-19	-38	-19	157	138
18				17	17	34				17	17	34
19		531	531				-287	-287	-574	-287	244	-43
Totals	**0**	**1,707**	**1,707**	**383**	**377**	**760**	**-1,055**	**-1,068**	**-2,123**	**-672**	**1,016**	**344**

Note:
*Includes adjacent open space construction on Vanderbilt Avenue

During the PM construction peak hour, it is unlikely that this level of incremental trips would exceed 200 or more riders at a single subway station or 50 or more riders on an individual bus route, which are the thresholds recommended by the *CEQR Technical Manual* for a detailed quantified analysis. For this reason, no significant adverse impacts to transit elements would be expected in the PM construction peak hour. Although this threshold would be exceeded during the AM construction peak hour, incremental trips during the peak construction activities would be spread among several projected development sites within the rezoning area and therefore would be distributed between numerous subway stations, bus routes and commuter rail at Grand Central Terminal. Since this would result in nominal increases in transit demand at individual station entrances and bus routes outside of the typical AM commuter peak period, it is unlikely that peak construction activities would result in a significant adverse impact to transit services.

Construction of the subway station improvements described in Chapter 19, "Mitigation," could result in the temporary closures to existing street stairways or other station elements, which would not affect conditions at transit elements during the commuter peak periods. If certain subway station elements need to be closed to the public for extended durations, adequate circulation and access to transit services would be maintained through the coordination of the Metropolitan Transportation Authority (MTA) New York City Transit (NYCT) and the DOT. Additionally, any temporary relocation of bus stops adjacent to construction sites would be coordinated with and approved by the DOT and MTA NYCT to ensure that proper access is maintained.

18.4.1.4 Pedestrians

During peak construction activities in the second quarter of 2022, new pedestrian trips would be generated by construction workers and completed projects in the rezoning area. Table 18-6 and Table 18-7 summarize the incremental transit trips during peak construction activities in the second quarter of 2022 for the weekday 6:00-7:00 a.m. and 3:00-4:00 p.m. construction peak hours, respectively. The incremental trips during the peak construction activities include incremental operational trips from completed projects in the rezoning area and accounts for existing trips to land uses that would be displaced by construction sites. As shown in the tables, there would be a net increase of 2,196 pedestrian trips during the AM construction peak hour and a net decrease of 1,463 pedestrian trips during the PM construction peak hour.

As there would be a net reduction in pedestrian trips during the PM peak hour, there would not be any significant adverse pedestrian impacts during this time period. The 2,196 incremental pedestrian trips during the AM construction peak hour would be distributed throughout the area and occur outside of the typical commuter peak period. Table 18-6 shows that the highest concentration of trips would occur at Projected Development Site 19, which would have 758 trips in the AM construction peak hour. Pedestrian trips at this site and other projected development sites would be widely dispersed among sidewalks, corners and crosswalks in the area. Therefore, it is unlikely that single pedestrian element would experience 200 or more peak-hour trips, which is the threshold recommended by the *CEQR Technical Manual* for a detailed quantified analysis. No significant adverse impacts to pedestrian conditions would be expected during the AM construction peak hour. At locations where temporary sidewalk closures are required during construction activities, adequate protection or temporary sidewalks and appropriate signage would be provided in accordance with DOT requirements.

TABLE 18-6: 2022 CONSTRUCTION WEEKDAY AM PEDESTRIAN TRIPS

Projected Site #	2022 Peak Construction Person Trips											
	Construction Workers			Incremental Operational Sites			Displaced Existing Land Uses			Total		
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
1	466		466				0	0	0	466	0	466
2				0	0	0				0	0	0
3				0	0	0				0	0	0
4				0	0	0				0	0	0
5	142		142				-2	-15	-17	140	-15	125
6	201		201				0	0	0	201	0	201
7*	599		599				-7	-41	-48	592	-41	551
8	20		20				0	0	0	20	0	20
9				-26	-146	-172				-26	-146	-172
11	251		251				0	-4	-4	251	-4	247
18				0	0	0				0	0	0
19	758		758				0	0	0	758	0	758
Totals	**2,437**	**0**	**2,437**	**-26**	**-146**	**-172**	**-9**	**-60**	**-69**	**2,402**	**-206**	**2,196**

Note:
*Includes adjacent open space construction on Vanderbilt Avenue

TABLE 18-7: 2022 CONSTRUCTION WEEKDAY PM PEDESTRIAN TRIPS

Projected Site #	2022 Peak Construction Person Trips											
	Construction Workers			Incremental Operational Sites			Displaced Existing Land Uses			Total		
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
1		466	466				-296	-296	-592	-296	170	-126
2				44	44	88				44	44	88
3				3	3	6				3	3	6
4				71	76	147				71	76	147
5		142	142				-395	-400	-795	-395	-258	-653
6		201	201				-748	-768	-1,516	-748	-567	-1,315
7*		599	599				-349	-360	-709	-349	239	-110
8		20	20				-59	-59	-118	-59	-39	-98
9				349	319	668				349	319	668
11		251	251				-69	-70	-139	-69	181	112
18				21	21	42				21	21	42
19		758	758				-491	-491	-982	-491	267	-224
Totals	**0**	**2,437**	**2,437**	**488**	**463**	**951**	**-2,407**	**-2,444**	**-4,851**	**-1,919**	**456**	**-1,463**

Note:
*Includes adjacent open space construction on Vanderbilt Avenue

18.4.2 Air Quality

According to the *CEQR Technical Manual*, a quantitative assessment of air quality for construction activities is likely not warranted if the project's construction activities:

1. Are considered short term, which for air quality assessments has generally been accepted as two years or less.
2. Are not located near sensitive receptors.
3. Do not involve construction of multiple buildings where there is a potential for cumulative effects from different buildings under simultaneous construction before the final build-out.
4. The pieces of diesel equipment that would operate in a single location at peak construction are limited in number.

If a project does not meet one or more of the criteria above, a quantitative air quality assessment would be required.

This project does not screen out any of these four points—since construction activities at multiple sites could last from three to four years at each building—and it has the potential for cumulative effects from several buildings under simultaneous construction. As a result, a quantitative air quality assessment was performed. The methodologies and results of this analysis are described in detail in Section 18.6.2.

18.4.3 Noise and Vibration

According to the *CERQ Technical Manual*, an assessment of noise for construction activities is likely not warranted if the project's construction activities:

- Are considered short term.
- Are not located near sensitive receptors.
- Do not involve construction of multiple buildings where there is a potential for on-site receptors on buildings to be completed before the final build-out.
- The pieces of diesel equipment that would operate in a single location at peak construction are limited in number.

This project does not screen out any of these four points—since construction activities at multiple sites could last from three to four years at each proposed East Midtown Rezoning development building—and therefore has the potential for cumulative noise impacts from several buildings under simultaneous construction. As a result, a quantitative construction noise assessment was performed. The methodologies and results of this analysis are described in detail in Section 18.7.2.

18.4.4 Other Technical Areas

18.4.4.1 Land Use and Neighborhood Character

According to the *CEQR Technical Manual*, a construction impact analysis for land use and neighborhood character is typically needed if construction would require continuous use of property for an extended duration, thereby having the potential to affect the nature of the land use and character of the neighborhood. A land use and neighborhood character assessment for construction impacts examines construction activities that would occur on the site (or portions of the site) and their duration. The analysis determines whether the type and duration of the activities would affect neighborhood land use patterns or neighborhood character. For example, a single property might be used for staging for several years, resulting in a "land use" that would be industrial in nature. Depending upon the nature of existing land uses in the surrounding area, the use of a single piece of property for an extended duration and its compatibility with neighboring properties may be assessed to determine whether it would have a significant adverse impact on the surrounding area.

Construction of the 19 projected development sites would be spread out over a period of 16-1/2 years, throughout an approximately 70-block rezoning area. Throughout the construction period (as required by City regulations), access to residences, businesses and institutions in the area surrounding the development sites would be maintained. In addition, measures would be implemented to control noise, vibration, emissions and dust on construction sites, including the erection of construction fencing incorporating sound reducing measures. Since none of these impacts would be continuous or ultimately permanent, they would not create significant impacts on land use patterns or neighborhood character in the area. Therefore, while construction of the new buildings resulting from the Proposed Action would cause temporary impacts, particularly related to noise, it is expected that such impacts in any given area would be relatively short term, even under the worst-case construction sequencing and therefore not create a neighborhood character impact. Therefore, no significant construction impacts to land use and neighborhood character are expected.

18.4.4.2 Socioeconomic Conditions

According to the *CEQR Technical Manual*, construction impacts to socioeconomic conditions are possible if the proposed project would entail construction of a long duration that could affect access to and thereby viability of a number of businesses and if the failure of those businesses has the potential to affect neighborhood character. During the construction period, construction activities would be dispersed throughout the 70-block proposed rezoning area and would not affect access to particular businesses over an extended duration. Therefore, construction impacts to socioeconomic conditions are not expected.

18.4.4.3 Open Space

According to the *CEQR Technical Manual*, construction impacts to open space are possible if the open space is taken out of service for a period of time during the construction process. No open space resources would be disrupted during the construction resulting from the Proposed Action, nor would any access to publically accessible open space be impeded during construction within the proposed rezoning area. In addition, measures would be implemented to control noise, vibration, emissions and dust on construction sites, including the erection of construction fencing incorporating sound reducing measures. Since none of these impacts would be continuous or ultimately permanent, they would not create significant impacts on open space in the area. Therefore, while construction of the new buildings due to the Proposed Action would cause temporary impacts, particularly related to noise, it is expected that such impacts in any given area would be relatively short term, even under the worst-case construction sequencing and therefore not create an open space impact. Therefore, no significant construction impacts to open space are expected.

18.4.4.4 Historic and Cultural Resources

According to the guidelines in the *CEQR Technical Manual*, construction impacts may occur on historic and cultural resources if in-ground disturbances or vibration associated with the project's construction could undermine the foundation or structural integrity of nearby resources.

As discussed in Chapter 6, "Historic and Cultural Resources," the LPC reviewed, at DCP's request, the identified projected and potential development sites that could experience new/additional in-ground disturbance as a result of the Proposed Action, and concluded that none of the lots comprising those sites have any archaeological significance. As such, the Proposed Action is not expected to result in any significant adverse impacts to archaeological resources.

The Proposed Action would result in development on both projected and potential development sites that are located within 90 feet of a designated or listed historic resource; however, these resources would not be adversely affected by construction because they would be subject to protection from construction-related damage under the DOB's TPPN #10/88. However, there are also 24 NYCL- and/or S/NR-eligible resources located within 90 feet of the projected and potential development sites for which TPPN #10/88 would not apply and, therefore, the Proposed Action could potentially result in construction-related impacts to these eligible resources. Possible measures that may address these impacts are discussed in Chapter 19, "Mitigation."

18.4.4.5 Hazardous Materials

According to the guidelines in the *CEQR Technical Manual,* any impacts from in-ground disturbance that are identified in hazardous materials studies should be identified in this chapter as well. Institutional controls such as (E) designation or restrictive designation should be disclosed here as well. If the impact identified in hazardous material studies is fully mitigated or avoided, no further analysis of the effect from construction activities on hazardous materials is needed.

Any potential construction-related hazardous materials impacts would be avoided by the inclusion of (E) designations for all of the RWCDS development sites, which are not under the control of the applicant. As detailed in Chapter 8, "Hazardous Materials," to ensure that the Proposed Action would not result in significant, adverse hazardous materials impacts, (E) designations would be mapped on all 19 projected development sites and 20 potential developments sites as part of the Proposed Action. As discussed in Chapter 8, an (E) designated site is designated on a zoning map within which no change of use or development requiring a DOB permit may be issued without approval of the Mayor's Office of Environmental Remediation (OER). These sites require the OER's review to ensure protection of human health and the environment from any known or suspected hazardous materials associated with the site. The (E) designation requires that the fee owner conduct a testing and sampling protocol and remediation, where appropriate, to the satisfaction of the OER before the issuance of the permit by the DOB. The environmental requirements for the (E) designation also include a mandatory construction-related health and safety plan, which must be approved by the OER.

In addition, demolition of interiors, portions of buildings or entire buildings are regulated by the DOB requiring abatement of asbestos prior to any intrusive construction activities including demolition. Occupational Safety and Health Administration (OSHA) regulates construction activities to prevent excessive exposure of workers to contaminants in the building materials including lead paint. New York State Solid Waste regulations control where demolition debris and contaminated materials associated with construction are handled and disposed. Adherence to these existing regulations would prevent impacts from construction activities at any of the projected development sites in the proposed rezoning area.

18.5 PROBABLE IMPACTS OF THE PROPOSED ACTION

18.5.1 Transportation

18.5.1.1 Traffic

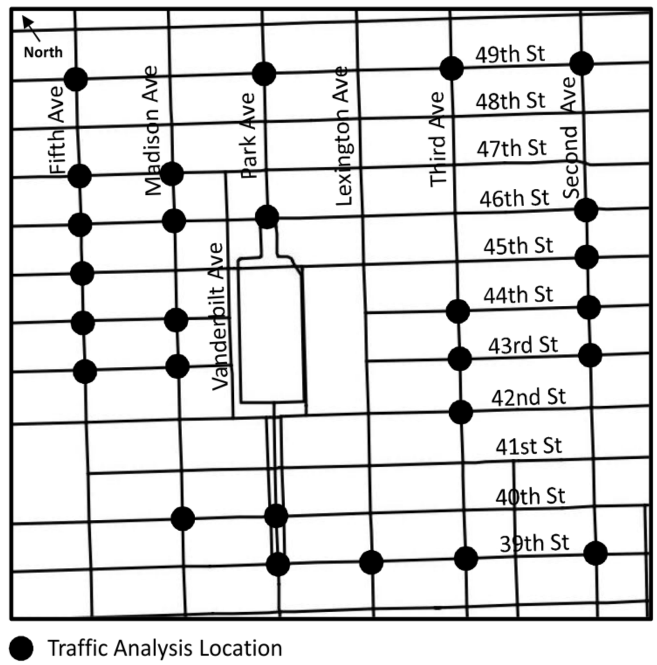
Traffic volumes for the 6:00–7:00 a.m. construction peak hour were developed from automatic traffic recorder and manual turning movement counts collected in 2012. These data indicate that background traffic volumes from 6:00–7:00 a.m. are approximately 30 percent lower than 8:00–9:00 am volumes, which is the AM peak hour analyzed in Chapter 12, "Transportation." Baseline traffic volumes during peak construction activities in the second quarter of 2022 were then established by applying a background growth rate and traffic volumes associated with No-Action development projects.

Vehicles generated by construction activities were assigned to the street network to determine the critical intersections most likely to be used by concentrations of project-generated trips. Autos used by workers to commute to construction sites were assigned to nearby off-street parking facilities with available spaces, and trucks making deliveries to construction sites were assigned using DOT-designated truck routes in the area, which include First, Second, Third, and Lexington Avenues, and 42nd, 57th, and 59th Streets.

Vehicle trips associated with existing buildings that would be displaced during construction and completed projects within the rezoning area were also included in the project-generated traffic volumes, along with those vehicles that would be rerouted because of the closure of segments of Vanderbilt Avenue between East 44th and East 47th Streets.

Based on the net change between 2022 No-Action and 2022 Construction traffic volumes, 27 intersections would experience an increase of 50 or more PCEs during the 6:00–7:00 a.m. construction peak hour, which are shown in Figure 18-3 and located within an area bounded by East 49th Street to the north, East 39th Street to the south, Second Avenue to the east and Fifth Avenue to the west. These intersections were analyzed using the traffic analysis methodology and impact criteria described in Chapter 12, "Transportation." Significant adverse impacts from project-generated trips were identified at nine intersections:

FIGURE 18-3: TRAFFIC STUDY AREA



- Second Avenue @ East 44th Street
- Second Avenue @ East 46th Street
- Second Avenue @ East 49th Street
- Third Avenue @ East 39th Street
- Third Avenue at East 42nd Street
- Park Avenue at East 39th Street
- Madison Avenue @ East 44th Street
- Fifth Avenue @ 43rd Street
- Fifth Avenue @ 47th Street

Chapter 19, "Mitigation" addresses practicable measures to address these impacts.

18.5.2 Air Quality

Construction activities could affect air quality because of engine emissions from on-site construction equipment and dust-generating activities. In general, much of the heavy equipment used in construction has diesel-powered engines, which produce relatively high levels of nitrogen oxides and particulate matter. Gasoline engines produce relatively high levels of carbon monoxide. Construction activities also generate fugitive dust emissions. As a result, the air pollutants analyzed for construction activities include nitrogen dioxide (NO_2), particulate matter with an aerodynamic diameter of less than or equal to 10 micrometers (PM_{10}), particulate matter with an aerodynamic diameter of less than or equal to 2.5 micrometers ($PM_{2.5}$), and carbon monoxide (CO).

Since ultra-low-sulfur diesel (ULSD) would be used for all diesel engines related to construction activities under the Proposed Action, sulfur oxides (SO_x) emitted from those construction activities would be negligible, and an analysis of SOx emissions is not warranted. For more details on a description of air pollutants and standards, see Chapter 13, "Air Quality."

As stated above, construction activity, in general, and large-scale construction in particular, has the potential to adversely affect air quality as a result of diesel emissions. The main component of diesel exhaust that has been identified as having an adverse effect on human health is fine particulates. To ensure that the construction of the proposed project results in the lowest feasible diesel particulate (DPM) emissions, an emissions reduction program would have to be implemented.

The evaluation performed in this section assumes a combination of emission reduction measures that are mandated by law and are common practice in large-scale New York City construction projects, and follow the requirements included in NYC Law 77 and the NYC Air Pollution Control Code. These include the following:

- **Fugitive dust control plans** – In compliance with the NYC Air Pollution Control Code regarding control of fugitive dust, contractors would be required to ensure that all trucks carrying loose material use water as a dust suppression measure, that wheel-washing stations be established for all trucks exiting the construction site; that trucks hauling loose material be equipped with tight-fitting tailgates and their loads securely covered prior to leaving the site, that streets adjacent to the site be cleaned as frequently as needed by the construction contractor, and that water sprays be used for all transfer of spoils to ensure that materials are dampened as necessary to avoid the suspension of dust into the air. These measures would be expected to reduce dust generation by more than 50 percent.
- **Clean Fuel** – Ultra Low Sulfur Diesel (ULSD) would be used exclusively for all diesel engines related to construction activities under the Proposed Action. This is a federal requirement since 2010, which enables the use of tailpipe reduction technologies that reduce diesel particulate matter (DPM) and SOx emissions.
- **Diesel Equipment Reduction** – Hoists and small equipment such as lifts, compressors, welders, and pumps would be expected to use electric engines that operate on grid power instead of diesel power engines. This is a common practice that has been achieving wider use as technology improves.

- **Restrictions on Vehicle Idling** – This would be required in compliance with the local law restricting unnecessary idling. On-site vehicle idle time would be restricted to three minutes for all equipment and vehicles that are not using their engines to operate a loading, unloading, or processing device (e.g., concrete mixing trucks) or otherwise required for the proper operation of the engine.

In addition, the evaluation assumes the following measure:

- **Best Available Tailpipe Reduction Technologies for Diesel Engines** – NYC Local Law 77 (which currently only applies to publically funded City projects), requires nonroad diesel engines with a power rating of 50 horsepower (hp) or greater, and controlled truck fleets (i.e., truck fleets under long-term contract, such as concrete mixing and pumping trucks) to utilize the best available tailpipe technology for reducing DPM emissions. The use of DPF in Tier 3 (model year 2000-2008 or newer) construction diesel equipment achieves the same emission reductions as a newer Tier 4 engine. Given the timeframe of the developments to be constructed under the Proposed Action (2016-2033), equipment meeting the more restrictive Tier 4 standards (model year 2008–2015 or newer) would be expected to be in wide use and comprise the bulk of the contractors' fleets. However, in order to better ensure the use of Tier 4 engines and Tier 3 engines equipped with DPF, the zoning text amendment could require this as a condition of construction work on sites developed pursuant to the rezoning; the City Planning Commission is currently considering a modification to the proposed zoning text amendment which would implement this as a requirement. The combination of Tier 4 and Tier 3 engines with DPF would achieve DPM reductions of approximately 90 percent when compared to older uncontrolled engines.

Overall, these emissions control measures would be expected to significantly reduce diesel particulate matter (DPM) emissions, and as recommended in the *CEQR Technical Manual*, all the necessary measures would be implemented to ensure that the New York City Air Pollution Control Code regulating construction-related dust emissions is followed.

18.5.2.1 Air Quality Analysis Methodologies

The analysis included the evaluation of the peak cumulative emissions for each proposed building site during the full 2016–2033 period by quarter. The quarter with the highest $PM_{2.5}$ emissions from all building sites under construction was selected as the period with the highest potential $PM_{2.5}$ effects.

A dispersion analysis—considering the on-site (construction equipment and fugitive dust) and off-site (trucks and other motor vehicles) to determine potential air quality effects during the peak emission construction period for the proposed building sites under simultaneous construction—was performed for all applicable pollutants.

The following sections provide additional details relevant only to the construction air quality analysis methodology. For a review of the applicable regulations, standards and criteria, and benchmarks for stationary and mobile source air quality analyses, refer to Chapter 13, "Air Quality."

The analysis was performed following the EPA and *CEQR Technical Manual* suggested procedures and analytical tools (as further discussed below) to determine source emission rates. The estimated emission rates were then used as input to an air quality dispersion model to determine potential impacts.

18.5.2.2 Emission Estimation Process

a. Construction Data

The construction analyses used an emission estimation method and a modeling approach that was been previously used for evaluating air quality impacts of construction projects in New York City. Because the level of construction activities would vary from month to month, the approach includes a determination of worst-case emission periods based on an estimated quarterly construction work schedule, the number of each equipment type, and rated horsepower of each unit.

Given the lack of a specific developer, and detailed construction data for the proposed building sites; the worst-case short-term emissions (e.g., maximum daily emissions) and the maximum annual emissions (based on a 12-month rolling average) were determined based on the construction schedule, and equipment used, in a typical large (over 2 million gross square feet) midtown building that had a recently approved FEIS by the DCP.

Using this large midtown prototypical building as a benchmark, the magnitude and duration of each phase of construction for each proposed building site was scaled to this prototypical building by the magnitude of construction, and duration of activities for each phase of each proposed building site. The scaling system evaluated the four main phases of construction: demolition, foundations, tower core/exterior, and interior finishes.

For each proposed building site, the magnitude of demolition, foundation, tower core construction, and interior finishes was determined by the rezoning envelope and existing buildings at the site. The coefficient relating to each proposed site was developed based on the magnitude and schedule of the prototypical midtown building, and these coefficients were applied to the emissions estimates for such building.

The specific construction information used to calculate emissions generated from the construction process of the prototypical building included, but is not limited to, the following:

- The number of units and fuel-type of construction equipment to be used
- Rated horsepower for each piece of equipment

- Utilization rates for equipment
- Hours of operation on-site
- Excavation and processing rates
- Average distance traveled on-site by dump trucks

b. Engine Exhaust Emissions

The sizes, the types, and the number of construction equipment were based on the construction activities schedule of the prototypical building. Emission factors for NO_x, PM_{10}, $PM_{2.5}$, and CO from the combustion of ULSD fuel for on-site construction equipment were developed using the latest EPA NONROAD Emission Model (Version 2009). The model is based on source inventory data accumulated for specific categories of off-road equipment. The emission factors for each type of equipment were calculated from the output files for the NONROAD model (i.e., calculated from regional emissions estimates). However, these emission factors were not applied to trucks.

Emission rates from combustion of fuel for on-site dump trucks, concrete trucks, and other heavy trucks were developed using the EPA MOBILE6.2 Emission Model. New York City restrictions placed on idling times were employed for the dump trucks and other heavy trucks. Short-term and annual emission rates were adjusted from the peak-hour emissions by applying usage factors for each equipment unit. Usage factors were determined using the construction equipment schedule.

c. Fugitive Emission Sources

Road dust emissions from vehicle travel were calculated using equations from EPA's AP-42, Section 13.2.2 for unpaved roads. PM_{10} emissions were estimated for dump trucks traveling in and out of the construction area. Average vehicle weights (i.e., unloaded going in and loaded going out) were used in the analysis and a reasonably conservative round trip distance was estimated for on-site travel. Dust control measures (described previously) would provide at least a 50-percent reduction in PM_{10} emission. Also, since on-site travel speeds would be restricted to 5 miles per hour, on-site travel for trucks would not be a significant contributor to $PM_{2.5}$ fugitive emissions.

Particulate matter emissions could also be generated by material handling activities (i.e., loading/drop operations for debris). Estimates of PM_{10} and $PM_{2.5}$ emissions from these activities were developed using EPA's AP-42 Sections 13.2.4. Excavation rates used for the analysis were based on information obtained from the typical midtown building used as a basis for all others.

d. Construction Activity Emissions Intensity Assessment

Overall, construction of the proposed rezoning is expected to occur over a period of almost two decades. To determine which construction periods constitute the worst-case periods for the pollutants of concern, construction-related emissions were calculated throughout the duration of construction on a quarterly basis using peak daily emissions for $PM_{2.5}$.

$PM_{2.5}$ was selected as the worst-case pollutant because, as compared to other pollutants, $PM_{2.5}$ has the highest ratio of emissions to affect criteria. Therefore, $PM_{2.5}$ was used for determining the worst-case periods for analysis of all pollutants. Generally, emission patterns of other pollutants would follow $PM_{2.5}$ emissions, since most pollutant emissions are proportional to diesel engines by horsepower. CO emissions may have a somewhat different pattern, but generally would also be highest during periods when the highest activity would occur. Based on the resulting multiyear profiles by quarter, a worst-case period was identified for the modeling of annual and short-term (i.e., 24-hour and 8-hour) averaging periods.

The second quarter of 2022 was identified as the worst-case scenario. Figure 18-4 provides the cumulative average daily $PM_{2.5}$ emissions for all development sites from 2016 to 2033 by quarter, and Figure 18-5 the cumulative Annual $PM_{2.5}$ emissions for all development sites from 2016 to 2033 by quarter.

Seven of the proposed rezoning sites were expected to be under different stages of construction during the second quarter of 2022: sites 1, 5, 6, 7, 8, 11, and 19. The emissions for each phase of construction (demolition, foundations, tower core and exterior, and interiors) for each one of these sites were developed for each pollutant and their respective short- and long-term periods. These emissions were used as inputs for the impact assessment.

18.5.2.3 Impacts Assessment

The effects of construction emissions on the surrounding environment for the relevant air pollutants were quantified using dispersion computer models. Due to the proximity of several sites under simultaneous construction, the impact analysis included Project Development Sites 5, 6, 7, 8, and 11 for the on-site dispersion analysis. The emissions from the construction activities during second quarter of 2022 were used as the worst-case modeling scenario.

In order to address the possible cumulative effects from off-site emissions (trucks and general traffic), the intersection of Fifth Avenue and 46^{th} Street was selected for the off-site modeling analysis. This intersection has the highest incremental traffic volumes from the No-Action scenario, and it is the closest to the above-mentioned sites.

The impact assessment results included the cumulative on-site and off-site effects of these five buildings.

FIGURE 18-4: PROJECTED AVERAGE DAILY CONSTRUCTION $PM_{2.5}$ EMISSIONS PROFILE (CUMULATIVE FOR ALL SITES)

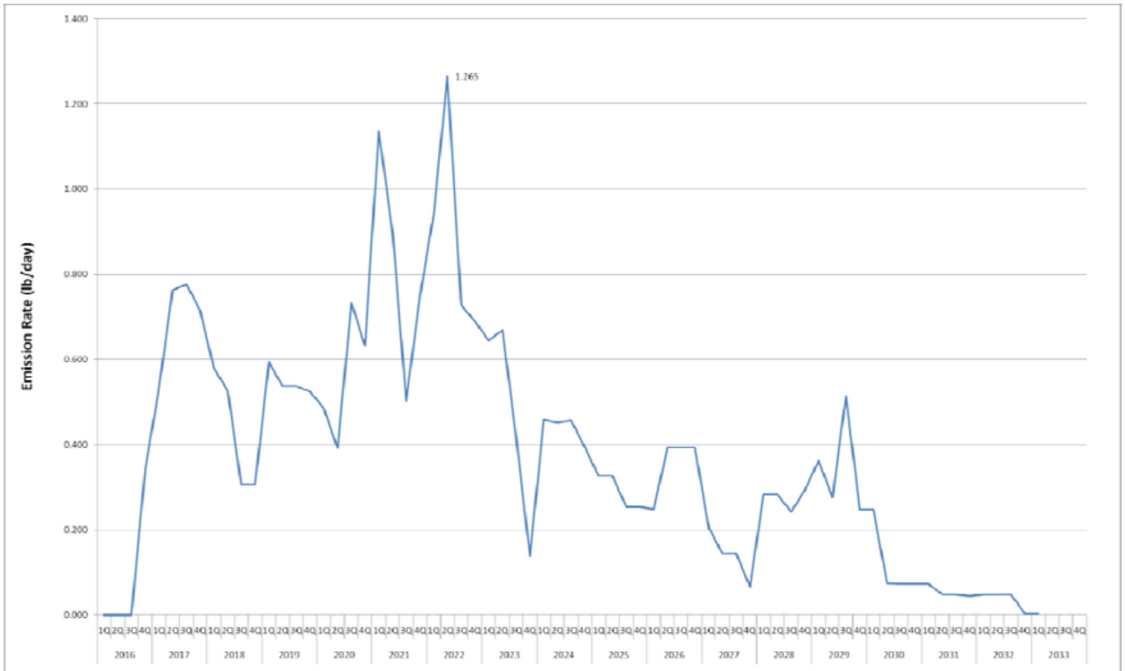
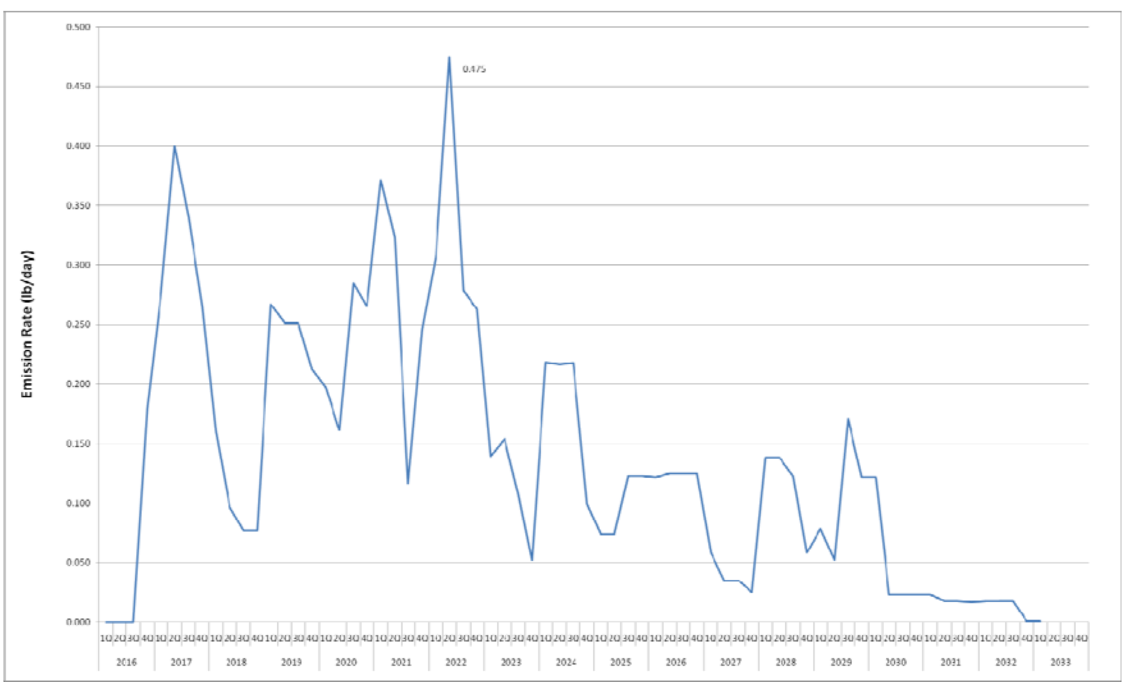


FIGURE 18-5: PROJECTED ANNUAL CONSTRUCTION $PM_{2.5}$ EMISSIONS PROFILE (CUMULATIVE FOR ALL SITES)



a. On-site Dispersion Modeling

Potential impacts from on-site construction equipment were evaluated using the EPA/AMS AERMOD dispersion model (version 12060), which became the EPA and the New York State Department of Environmental Conservation (NYSDEC) preferred model on December 9, 2006. The AERMOD model was designed as a replacement to the EPA Industrial Source Complex (ISC3) model and is 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; it also includes handling of terrain interactions. The AERMOD model calculates pollutant concentrations based on hourly meteorological data.

b. Source Simulation

During construction, various types of construction equipment would be used at different locations throughout the site. Some of the equipment is mobile and would operate throughout the site, while some would remain stationary on-site at distinct locations during short-term periods (i.e., daily and hourly). Stationary emission sources include (but are not limited to) air compressors, cranes, and concrete pumps. Equipment such as excavators, bobcats, concrete trowels, and dump trucks would operate throughout the site.

Given the lack of a specific developer and specific building design for the proposed rezoning sites, all construction equipment sources were simulated as area sources for the purpose of the modeling analysis; their emissions were distributed evenly across each construction site.

c. Receptor Locations

AERMOD was used to predict maximum pollutant concentrations at nearby locations of likely public exposure ("receptors"). Discrete receptors were placed along sidewalks and residential buildings and other general-public uses. Sidewalk receptors were placed in the middle of the sidewalk and spaced 25 feet apart with a height of 1.8 meters (6 feet). For sidewalks in front of the construction areas, where a typical 10-foot wooden fence was erected, the height was adjusted to account for the vertical difference. Residential receptors were placed at the nearest windows facing the construction site. These residential receptors were located at ground level (sidewalk) and elevated portions of the building façade. The elevated receptors represented operable windows and potential air intakes of buildings adjacent to the proposed sites.

d. Meteorological Data

The meteorological data set consisted of the latest five years of data that are available: surface data collected at LaGuardia Airport (2008–2012) and concurrent upper air data collected at Brookhaven, New York.

e. Off-site Dispersion Modeling

The analysis of off-site mobile source impacts included the impacts of construction-phase vehicles on the roadway network as well as the effects of anticipated changes in street configurations as a result of lane closures during the peak construction year.

The intersection of Fifth Avenue and 46th Street was selected due to proximity to the sites evaluated and the highest incremental number of vehicles from the No-Action scenario.

The CAL3QHC dispersion model was applied for the CO analysis, and the CAL3QHCR version was applied for both the $PM_{2.5}$ analyses. The analysis was conducted for both the construction year 2022 and No-Action scenarios to estimate the increments caused by off-site construction activities. The modeling procedures and assumptions for this analysis follow the mobile source air quality analysis methodology described in Chapter 13, "Air Quality."

In order to evaluate the potential cumulative effect of the on-site and off-site emissions, this off-site analysis placed receptors on the same locations used on the AERMOD on-site dispersion analysis.

f. Background Concentrations

Where needed to determine potential air quality impacts from the construction of the project, background ambient air quality data for criteria pollutants were added to the predicted off-site concentrations. The background data represent the latest available five years of data and were obtained from a nearby NYSDEC monitoring station that best represents the area surrounding the site. These background concentrations are provided in Table 18-8. Short-term concentrations (i.e., 24- and 8-hour averages) represent the second-highest most-recent measured concentrations. The annual concentration represents the maximum value of the 5-year data set. For $PM_{2.5}$, background concentrations are not considered, since impacts are determined on an incremental basis only.

TABLE 18-8: BACKGROUND POLLUTANT CONCENTRATIONS

Pollutant	Monitoring Station	Averaging Period	Background Concentration	Ambient Standard
NO_2	Botanical Garden	Annual	39.5 μg/m^3	100 μg/m^3
CO	CCNY	1-hour	2.7 ppm	35 ppm
	CCNY	8-hour	1.7 ppm	9 ppm
PM_{10}	Division Street	24-hour	48 μg/m^3	150 μg/m^3

Source: NYSDEC Air Quality Report Ambient Monitoring System, 2011

18.5.2.4 Probable Impacts of the Proposed Project

This section provides a summary of the projected air quality impacts from the construction activities of the proposed project. The impact analysis included the cluster of Projected Development Sites 5, 6, 7, 8, and 11 located between Vanderbilt and Fifth Avenues and 43rd to 48th Streets. The peak emissions for CO, NO_2 and $PM_{2.5}$ were predicted to occur during the second quarter of 2022.

a. NO_2, PM_{10}, and CO Concentrations

Table 18-9 presents the maximum predicted total concentration (including background) for several criteria pollutants due to the proposed construction activities for the proposed project, including the on-site (construction equipment and activities) and off-site (trucks and autos). The maximum concentrations from on-site construction sources were predicted at receptors near the Project Development Sites 6, 7, and 8. In the case of PM_{10} emissions, the peak period was identified as the second quarter of 2023, due to the fact that demolition dust and foundations are responsible for the bulk of PM_{10} fugitive emissions; an analysis for both quarters (second quarters of 2022 and 2023) were performed for this pollutant, and the worst case (second quarter of 2023) is reported.

TABLE 18-9: MAXIMUM PREDICTED TOTAL CONCENTRATIONS FOR CONSTRUCTION ACTIVITIES

Pollutant	Averaging Period	Background	On-site Increment (Modeled Result)	Off-site Increment (Modeled Result)	Total Level (Background + Modeled Results)	NAAQS
NO_2	Annual	39.5 µg/m³	25.7 µg/m³	—	65.2 µg/m³	100 µg/m³
CO	1-hour	2.7 ppm	7.0 ppm	1.2 ppm	10.9 ppm	35 ppm
	8-hour	1.7 ppm	4.4 ppm	0.9 ppm	7.0 ppm	9 ppm
PM_{10}	24-hour	48 µg/m³	41.9 µg/m³	—	89.9 µg/m³	150 µg/m³

As indicated in Table 18-9, the maximum predicted total concentrations of NO_2, PM_{10}, and CO would not result in any concentrations that exceed the NAAQS. This was true for all averaging periods—both short term and annual—and for each pollutant modeled in the analysis using worst-case emissions. Therefore, no significant adverse air quality impacts are predicted from the on-site construction sources due to these pollutants.

b. $PM_{2.5}$ Concentrations

The air quality analysis was also performed to predict the concentrations of $PM_{2.5}$ from construction activities. Concentrations of $PM_{2.5}$ were modeled for the 24-hour averaging period (a measure of daily exposure) and the annual averaging period (a measure of long-term exposure). The results of the $PM_{2.5}$ analysis are presented in Table 18-10 and summarized below.

TABLE 18-10: MAXIMUM $PM_{2.5}$ INCREMENTS (µg/m³)

Pollutant	Averaging Period	On-site Increment	Off-site Increment	Total Increment Level	DEP Criteria
$PM_{2.5}$	24 hour	1.69	0.07	1.76	2.0
	Annual Localized	0.23	0.002	0.232	0.30
	Annual Neighborhood	–	–	0.018	0.10

24-Hour Average (Short-Term) Concentrations

The maximum predicted 24-hour average (i.e., short term) $PM_{2.5}$ incremental concentration from the proposed construction activities was modeled for comparison with the DEP 24-hour average interim guidance criteria for a discrete receptor location.

The maximum predicted incremental concentration was equal to 1.764 µg/m³ on the sidewalk of 45th Street (north side) between Madison and Fifth Avenue, which is between proposed Project Development Sites 6 and 8. As indicated, all receptors, including residential receptors, would be below the current 24-hour interim guidance criteria of 2 µg/m³ for the maximum predicted value.

As stated previously, the maximum predicted concentration for any location would be below the current 24-hour interim guidance criterion of 2 µg/m³. Therefore, an analysis of the potential frequency of predicted impacts is not warranted.

The maximum incremental impacts discussed above were computed based on periods with the highest emissions. Therefore, during other construction time periods with lesser emissions, the potential 24-hour incremental exposures would be less.

Annual Analysis Period

In addition to the 24-hour average short-term concentrations discussed above, an analysis was performed to predict annually averaged $PM_{2.5}$ concentrations. These concentrations were modeled for comparison to the City's annual average interim guidance values for discrete and neighborhood-scale receptors (see Chapter 13, "Air Quality").

The maximum predicted annual average $PM_{2.5}$ incremental concentration (for a discrete receptor location) occurred at a sidewalk receptor and was equal to 0.232 µg/m³, which is less than the interim guidance threshold of 0.3 µg/m³.

The maximum predicted annual $PM_{2.5}$ incremental concentration was also modeled using a 1 kilometer grid of receptors for comparison with the City's annual average neighborhood-scale interim guidance criterion of 0.1 µg/m³. The annual average neighborhood-scale concentration increment from the construction activities was predicted to be 0.018 µg/m³, which is less than the 0.1 µg/m³ criterion.

The results of this quantitative analysis indicated that the proposed project would not result in any concentrations of NO_2, PM_{10}, and CO that exceed the NAAQS. In addition, the maximum predicted incremental concentrations of $PM_{2.5}$ would not exceed the City's applicable interim guidance criteria. Therefore, no significant adverse air quality impacts are expected from the construction-related sources.

18.5.3 Noise

Noise exposure on adjacent land uses during the construction of the Proposed Action could result from noise generated from construction equipment operation and from construction delivery vehicles traveling to and from the various construction sites. Noise and vibration levels at a given location are dependent on the kind and number of pieces of construction equipment being operated at one time, the acoustical utilization factor of the equipment (i.e., the percentage of time a piece of equipment is operating at full house power), the distance between a noise sensitive receptor site and the construction activity and any shielding effects (from structures such as buildings, walls, or barriers) along the sound transmission path between each noise source and each receptor. Noise levels caused by construction activities would vary widely, depending on the construction phase and the location of the construction equipment relative to a given receptor location. The most significant construction noise sources are jackhammers, excavators with ram hoes, drill rigs, rock drills, impact wrenches, tower cranes, and paving breakers, as well as the movements of delivery trucks.

Noise from construction activities and some construction equipment is regulated by the New York City Noise Control Code and by the EPA. The New York City Noise Control Code, as amended December 2005 and effective July 1, 2007, requires the adoption and implementation of a noise mitigation plan for each construction site, limits construction (absent special circumstances as described below) to weekdays between the hours of 7:00 a.m. and 6:00 p.m., and sets noise limits for certain specific pieces of construction equipment. Construction activities occurring after hours (weekdays between 6:00 p.m. and 7:00 a.m., and on weekends) may be authorized in the following circumstances: (1) emergency conditions; (2) public safety; (3) construction projects by or on behalf of City agencies; (4) construction activities with minimal noise impacts; and (5) where there is a claim of undue hardship resulting from unique site characteristics, unforeseen conditions, scheduling conflicts, and/or financial considerations. Furthermore, the EPA mandates that certain classifications of construction equipment meet specified noise emissions standards. A quantified construction noise analysis was performed to quantify the magnitude, time of occurrence, and duration of the potential exceedances of the CEQR impact criteria, and determine the practicability and feasibility of implementing control measures that would reduce or eliminate any identified significant adverse noise impacts.

18.5.3.1 Construction Noise Impact Criteria

The *CEQR Technical Manual* states that significant noise impacts due to construction would occur "only at sensitive receptors that would be subjected to high construction noise levels for an extensive period of time." For impact determination purposes, the significance of adverse noise impacts is based on duration, intensity, area of impact and whether predicted incremental noise levels at sensitive receptor locations would be greater than the impact thresholds shown in the *CEQR Technical Manual*. In addition, the *CEQR Technical Manual* states that the impact criteria for vehicular mobile noise sources, using existing noise levels as the baseline, should be used for assessing construction impacts. As recommended in the *CEQR Technical Manual*, this study uses the criteria to define a significant adverse noise impact as follows:

- If the existing noise levels are less than 60 decibels, A-weighted equivalent sound level for one hour (dBA $L_{eq(1)}$) and the analysis period is not a nighttime period, the threshold for a significant impact would be an increase of at least 5 dBA $L_{eq(1)}$. For the 5 dBA threshold to be valid, the resulting noise level with the proposed project would have to be equal to or less than 65 dBA.
- If the existing noise level is equal to or greater than 62 dBA $L_{eq(1)}$, or if the analysis period is a nighttime period (defined in the CEQR criteria as being between 10:00 p.m. and 7:00 a.m.), the incremental significant impact threshold would be 3 dBA $L_{eq(1)}$.
- If the existing noise level is 61 dBA $L_{eq(1)}$, the threshold would reflect an incremental increase of 4 dBA, since an increase higher than this would result in a noise level higher than the 65 dBA $L_{eq(1)}$ threshold).

18.5.3.2 Noise Analysis Methodology

Construction activities for the proposed project would be expected to result in increased noise levels as a result of (1) the operation of construction equipment on-site; and (2) the movement of construction-related vehicles to and from the site (i.e., worker trips, and material and equipment trips) on the surrounding roadways. The effect of each of these noise sources was evaluated. The results presented below show the effects of construction activities (i.e., noise due to both on-site construction equipment and construction-related vehicles operation) and the total cumulative impacts due to operational effects (caused by project-generated vehicular trips) and construction effects (as construction proceeds on uncompleted components of the project).

Noise from the operation of construction equipment on-site at a specific receptor location near a construction site is calculated by computing the sum of the noise produced by all pieces of equipment operating at the construction site. For each piece of equipment, the on-site noise level at a receptor site is a function of the following parameters:

- The noise emission level characteristics of the each type of equipment operating at the site
- The total number of pieces of each type of equipment operating simultaneously
- A usage factor; which accounts for the percentage of time the equipment is operating at full power
- The distance between the piece of equipment and the receptor
- Shielding between the sound source-receptor path

Similarly, noise generated by off-site traffic moving to and from a given construction site is calculated by determining the sum of the noise generated by the traffic movement of construction related vehicles traveling past the noise sensitive receptor site. For each adjacent roadway the off-site traffic noise is a function of the following parameters:

- The sound emission levels of each of the vehicles (i.e. automobile, heavy truck, medium duty truck, bus, etc.) moving past the receptor.
- The number of each vehicle types moving past the receptor site.
- The travel speed
- The distance between receptor and the roadway
- Ground efforts and general topography in the area
- Shielding by buildings or other obstructions along the sound source path which will reduce noise levels.

a. Construction Noise Modeling

Noise effects from construction activities were evaluated using the Roadway Construction Noise Model (RCNM), a computerized model developed by Federal Highway Administration (FHWA) for noise prediction of construction equipment noise. The RCNM was developed based on the most comprehensive database of sound emission data of construction equipment ever developed in the United States as part of the Central Artery Tunnel project in Boston Massachusetts. The RCNM provides a construction noise screening tool to predict construction noise levels and determine compliance with CEQR noise exposure threshold limits for a wide variety of construction noise projects of varying complexity. The RCNM incorporates a large database of construction equipment sound pressure emission levels at a reference distance of 50 feet. Sound level adjustments due to distance, shielding and equipment usage are applied to all equipment identified to operate on a given construction site. Input data used with the RCNM are derived from CAD drawings that defined site work areas, identify the location of each piece of on-site equipment, adjacent building footprints, locations of streets and locations of sensitive receptors. For each analysis period, the geographic location and operational characteristics, including equipment usage rates (percentage of time equipment with full-horse power is used) for each piece of construction equipment operating at the development site, as well as noise control measures, were input to the model. In addition, shielding from both adjacent buildings and the project building as it is constructed, were accounted for in the model. The model produced A-weighted $L_{eq(1)}$ noise levels at each receptor location, for the analysis period, which showed the noise level at each receptor location, as well as the contribution from each noise source. Table 18-11summarizes the maximum noise emission limits of each type of construction equipment as described in DEP's Chapter 28 of the Citywide Construction Noise Mitigation and Subchapter 5 of the New York City Noise Control Code. Construction-noise level estimates using the

RCNM were determined using these maximum sound emission levels and usage factors for all equipment operating on site for each of the projected development sites evaluated for construction noise impacts.

TABLE 18-11: CONSTRUCTION EQUIPMENT NOISE EMISSION LEVELS (dBA)

Equipment Description List	Impact Device (Yes/No)	Usage Factor (%)	Spec. 721.560 Lmax @ 50 feet (dBA, slow)	Actual Measured Lmax @ 50 feet (dBA, slow)
All Other Equipment > 5HP	No	50	85	n/a
Auger Drill Rig	No	20	85	84
Backhoe	No	40	80	78
Bar Bender	No	20	80	80
Blasting	Yes	n/a	94	n/a
Boring Jack Power Unit	No	50	80	83
Chain Saw	No	20	85	84
Clam Shovel (dropping)	Yes	20	93	87
Compactor (ground)	No	20	80	83
Compressor (air)	No	40	80	78
Concrete Batch Plant	No	15	83	83
Concrete Mixer Truck	No	40	85	79
Concrete Pump Truck	No	20	82	81
Concrete Saw	No	20	90	90
Crane	No	16	85	81
Dozer	No	40	85	82
Drill Rig Truck	No	20	84	79
Drum Mixer	No	50	80	80
Dump Truck	No	40	84	76
Excavator	No	40	85	81
Flat Bed Truck	No	40	84	74
Front End Loader	No	40	80	79
Generator	No	50	82	81
Generator (<25KVA, VMS signs)	No	50	70	73
Gradall	No	40	85	83
Grader	No	40	85	85
Grapple (on backhoe)	No	40	85	87
Horizontal Boring Hydr. Jack	No	25	80	82
Hydra Break Ram	Yes	10	90	90
Impact Pile Driver	Yes	20	95	101
Jackhammer	Yes	20	85	89
Man Lift	No	20	85	75
Mounted Impact Hammer (hoe ram)	Yes	20	90	90
Pavement Scarafier	No	20	85	90
Paver	No	50	85	77
Pickup Truck	No	40	55	75
Pneumatic Tools	No	50	85	85

TABLE 18-11: CONSTRUCTION EQUIPMENT NOISE EMISSION LEVELS (dBA) (CONTINUED)

Equipment Description List	Impact Device (Yes/No)	Usage Factor (%)	Spec. 721.560 Lmax @ 50 feet (dBA, slow)	Actual Measured Lmax @ 50 feet (dBA, slow)
Pumps	No	50	77	81
Refrigerator Unit	No	100	82	73
Rivet Buster/chipping gun	Yes	20	85	79
Rock Drill	No	20	85	81
Roller	No	20	85	80
Sand Blasting	No	20	85	96
Scraper	No	40	85	84
Shears (on backhoe)	No	40	85	96
Slurry Plant	No	100	78	78
Slurry Trenching Machine	No	50	82	80
Soil Mix Drill Rig	No	50	80	80
Tractor	No	40	84	84
Vacuum Excavator (Vac-truck)	No	40	85	85
Vacuum Street Sweeper	No	10	80	82
Ventilation Fan	No	100	85	79
Vibrating Hopper	No	50	85	87
Vibratory Concrete Mixer	No	20	80	80
Vibratory Pile Driver	No	20	95	101
Warning Horn	No	5	85	83
Water Jet deleading	No	20	85	92
Welder / Torch	No	40	73	74

Sources: Citywide Construction Noise Mitigation, Chapter 28, Department of Environmental Protection of New York City, 2007; Transit Noise and Vibration Impact Assessment, Federal Transit Administration (FTA), May 2006; and Subchapter 5 of the New York City Noise Control Code.

b. Mobile Source Noise Modeling

Noise levels generated by traffic movements were calculated using the Traffic Noise Model Version 2.5 (TNM). The TNM is a computerized model developed for the FHWA that takes into account various factors due to traffic flow, including traffic volumes, vehicle mix (i.e., percentage of autos, light-duty trucks, heavy-duty trucks, buses), sources/receptor geometry, and shielding (buildings, berms, and sound walls) and access attenuation from pavement types. The TNM is recommended in the *CEQR Technical Manual* for determining the effects of traffic noise.

c. Analysis Periods

Construction activity associated with the Proposed Action would be spread out over a 16-year period and be dispersed throughout the rezoning area and vicinity. A screening analysis was performed to determine the one analysis quarter with the greatest construction activity and therefore, the loudest construction period. The construction activities would take place between 2016 and 2033. The screening analysis was based on an anticipated construction activity schedule shown in Figure 18-4. The number of worker's, types and number of pieces of equipment, and number of construction vehicles anticipated to be operating during each quarter of the construction period was determined. To be conservative, the construction activity screening analysis for each analysis quarter assumed that both on-site construction activities and off-site construction-related traffic movements occurred simultaneously. The analysis findings identified the second quarter of the year 2022 as the peak construction time period. The second quarter of 2022 yielded the greatest overlapping construction activities and therefore, likely the worst case (loudest) construction noise condition for any single time period over the 16 year construction phase.

As shown in Table 18-2, the maximum number of autos, trucks, and PCEs would occur in the second quarter of 2022. Moreover, as indicated in Table 18-2, during the second quarter of 2022, there would be a net increase of 428 PCEs during the 6:00–7:00 a.m. time period. All other time periods during the day would have a net decrease in PCEs when accounting for existing trips to land uses that would be displaced by construction sites. Development Sites 5, 6 and 7 located between East 43rd and East 45th Streets and Vanderbilt and Fifth Avenues are the three primary development buildings in various phases of construction during the second quarter of 2022. The anticipated construction activities at these three projected development sites would occur over an approximately 7-year period between 2019 and the end of 2025. Construction activities for each phase would be expected to overlap with the average construction completion time period of 3.5 years per development site. The construction noise impact assessment therefore was focused on noise sensitive land uses in the immediate vicinity of Proposed Development Sites 5, 6 and 7.

d. Noise Reduction Measures

The construction noise analysis assumes that development constructed under the Proposed Action would commit to a proactive approach to minimize noise during construction activities by submitting a Noise Mitigation Plan prior to the start of construction (in accordance with the requirements of the New York City Noise Control Code). These requirements are promulgated by DEP and became effective in 2007 and are described in Chapter 28, Title 15 of the Rules of the City of New York. A construction contractor would be required to enclose the site with a portable free-standing noise barrier that would provide shielding from construction noise generated on the site. The barriers would break the line-of-sight between noise sources on the site. The barriers should have a minimum height of 8 feet and consist of ¾-inch plywood.

There are a wide variety of other measures that, when found to be feasible and practicable, would minimize construction noise exposure and therefore reduce potential noise impacts. For example, a construction contractor could use equipment that would produce maximum noise emission levels below the requirements of the New York City Noise Control Code. The construction noise analysis did not assume specific abatement measures beyond a perimeter barrier fence; however, potential noise-reducing measures, if found to be feasible, could include both source controls and path controls, as outlined below.

- Generally, construction contractors would schedule and perform noisy work during times of highest ambient noise levels (for example, between 7:00 a.m. and 10:00 a.m.).
- Dominant noisier equipment—such as tower cranes, loading and unloading trucks, concrete pumps, concrete trucks, and trash hauling trucks—would minimize banging, clattering, and buzzing.
- Minimize the use of impact devices, such as jackhammers, pavement breakers, impact wrenches, pneumatic tools, and hoe rams, and only necessary equipment would be on-site.
- Where practicable and feasible, construction sites would be configured to minimize back-up alarm noise.
- Contractors and subcontractors would properly maintain their equipment and have quality mufflers installed.
- Noisier equipment—such as tower cranes, concrete pumps, concrete trucks, and delivery trucks—would be located away from sensitive receptors.
- During the early construction phases of work, delivery and dump trucks, as well as many construction equipment operations, would be located and take place below grade to take advantage of shielding benefits.

e. Receptor Sites

A total of 13 ground-level receptor sites were evaluated for construction noise impact assessment. Figure 18-6 depicts the noise receptor locations at ground level and Table 18-12 lists the noise receptor sites and their associated land uses. The receptor sites selected for detailed analysis are representative of locations where maximum noise impact due to construction activity would be expected. The construction noise impact assessment therefore was focused on noise sensitive land uses in the immediate vicinity of Projected Development Sites 5, 6, and 7, which were identified as the dominate area where most of the construction activity is projected to occur during the second quarter of 2022. Noise measurements were collected at six locations adjacent to these development sites. These measurement sites are identified as R4, R5, R6, R11, R12 and R13 in Figure 18-6. In addition to the measurement sites, construction noise levels were estimated at nine additional receptor locations, identified as Sites A to I in Figure 18-6 at building façades near or adjacent to projected development sites. These additional receptor locations are either directly adjacent to the development site or on streets where construction trucks would pass nearby.

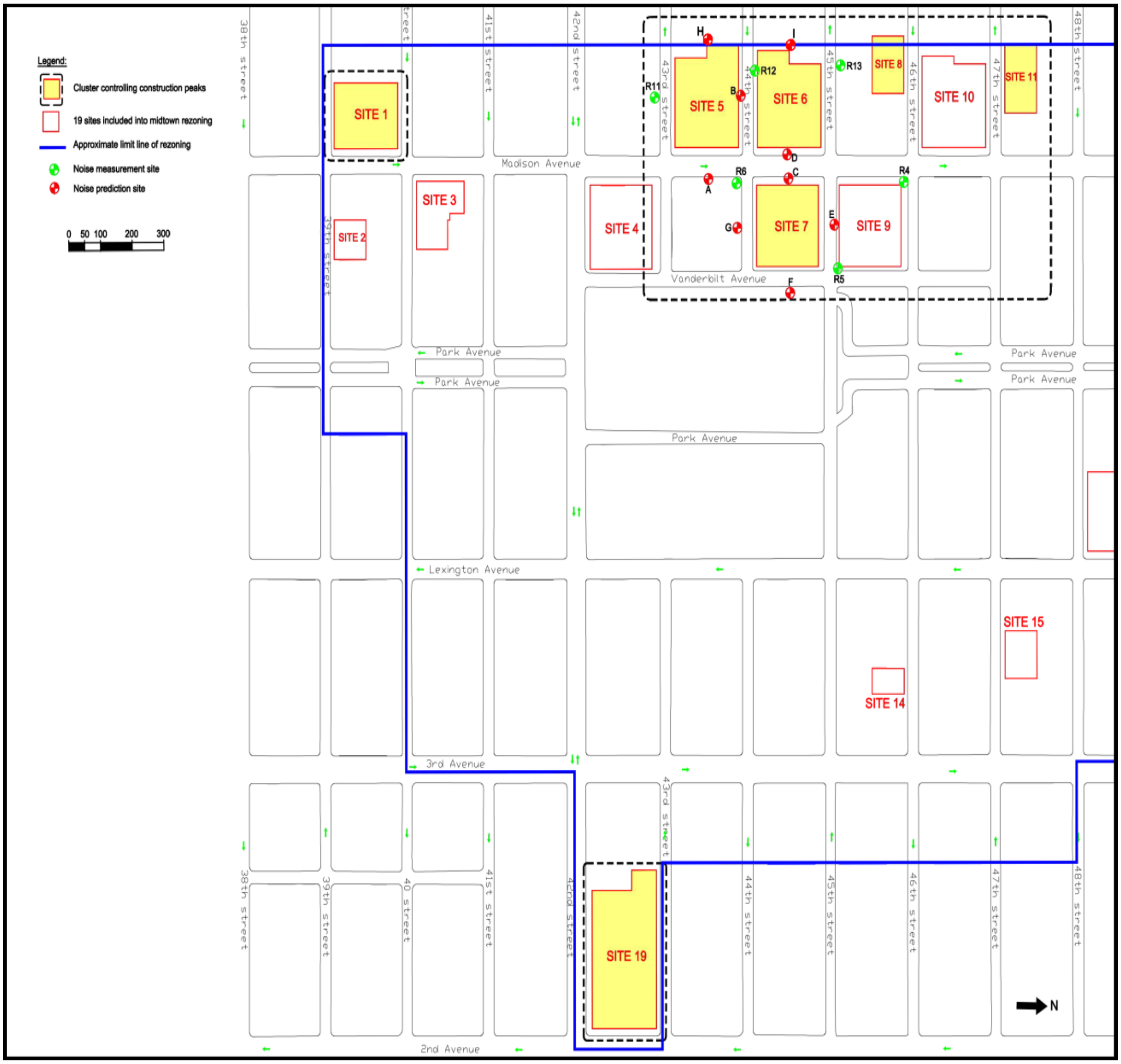
Each measurement receptor location is adjacent to a commercial property. The nine prediction-only receptor sites are adjacent commercial buildings. All noise measurements were collected at approximately 5 feet above the ground level with the noise meter mounted on a tripod. At analysis locations, noise receptors were placed at multiple elevations with TNM. Figure 18-6 shows the noise receptor locations at ground level and Table 18-12 lists the noise receptor sites and their associated land uses. The receptor sites selected for detailed analysis are representative of locations where maximum project impacts due to construction noise would be expected.

TABLE 18-12: CONSTRUCTION NOISE RECEPTOR LOCATIONS

Receptor	Location	Adjacent Land Use
4	Southeast corner of Madison Avenue and West 46th Street	Commercial
5	Northwest corner of Madison Avenue and West 45th Street	Commercial
6	Southeast corner of Madison Avenue and West 44th Street	Commercial
11	West 43rd Street between Fifth and Madison Avenues	Commercial
12	West 44th Street between Fifth and Madison Avenues	Commercial
13	West 45th Street between Fifth and Madison Avenues	Commercial-Mixed Use
A	Madison Avenue between West 43rd and West 44th Streets	Commercial
B	West 44th Street between Fifth and Madison Avenues	Commercial
C	Madison Ave between West 44th and West 45th Streets (east curb)	Commercial
D	Madison Ave between West 44th and West 45th Streets (west curb)	Commercial
E	West 45th Street between Madison and Vanderbilt Avenues	Commercial
F	Vanderbilt Avenue between West 44th and West 45th Streets	Commercial
G	West 44th Street between Madison and Vanderbilt Avenues	Commercial
H	Mid-building facing the western-most façade of Projected Development Site 5 between 43rd and 44th Streets, looking toward Fifth Avenue	Commercial
I	Mid-building facing the western-most façade of Projected Development Site 6 between 44th and 45th Streets, looking toward Fifth Avenue	Commercial

Notes: Receptor sites 4 through 6 and 11 through 13 are noise monitoring locations. Receptor sites "A" through "I" are prediction sites.

FIGURE 18-6: NOISE RECEPTOR LOCATIONS



18.5.3.3 Determining Existing Noise Levels

The TNM and the RCNM were used to determine existing noise levels at the 15 analysis sites. At ground-level receptor locations, existing $L_{eq(1)}$ noise levels were calculated using the TNM based on existing traffic components and adjusted by baseline measured values at monitoring receptor locations. Existing noise levels at the six monitoring receptor sites were measured for 20-minute periods during the peak construction time period of 6:00 to 7:00 a.m. The measured existing noise levels are provided in the third column of Table 18-13 (details of all noise monitoring data collected is provided in Appendix 5).

Because the RCNM does not calculate noise levels at elevated receptor locations, noise levels from construction activities at elevated receptors where determined using the sound drop-off rate as determined by the TNM at these above-ground receptors. Summary tables show the detailed existing noise calculations at each receptor location are provided in Appendix 5.

18.5.3.4 Construction Noise Analysis Results

Using the methodology described previously, and considering the noise abatement measures for source and path controls specified above, noise analyses were performed to determine maximum one-hour equivalent ($L_{eq(1)}$) noise levels that would be expected to occur during each day during second quarter of 2022.

Table 18-13 provides a summary of the following (see Appendix 5 for the complete analysis results):

- Existing noise levels
- Maximum predicted total noise levels (i.e., cumulative noise levels), which are the sum of noise due to construction activities and street traffic movements at ground level and at intermediate elevations adjacent to existing buildings
- Maximum predicted increases in noise levels based upon comparing the total noise levels with existing noise levels and future 2022 No-Action noise levels.
- A quantitative construction noise analysis was performed to quantify the magnitude of construction-related noise exposure for the peak-construction time period of the second quarter of 2022. Table 18-13 summarizes the construction noise analysis findings at the 15 representative sites. CEQR noise level exceedances of 5 dBA or greater are shown in bold text in Table 18-13. Projected noise-level exposure under construction activities were determined based on the difference between total noise levels at a particular site caused by construction activity and those estimated under existing and future 2022 No-Action conditions. Elevated receptor sites were modeled at locations where an existing building was identified across the street from a projected development site (R4, R5, R6, R11, R13, A, E, F and G) or at a building façade adjoining or adjacent to nearby existing commercial buildings (Receptors H and I). Additionally, ground-level receptor sites (B, C, D, and R12) were modeled at sidewalk locations along the perimeter boundary of Projected Development Sites 5, 6, and 7.

TABLE 18-13: CONSTRUCTION NOISE ANALYSIS RESULTS (dBA)

Noise Receptor	Receptor Height (in stories)	Existing (dBA)	2022 No-Action (dBA)	2022 – Q2(1) Total Leq(hr) (dBA)	2022 – Q2(1) With-Action Minus Existing Change (dBA)	2022 – Q2(1) With-Action Minus No-Action Change (dBA)
4	at-grade	73.1	73.1	76.1	3.0	2.8
	25th Floor	72.2	72.2	75.4	3.2	3.0
	50th Floor	71.6	71.6	74.8	3.2	3.0
5	at-grade	73.2	73.7	73.9	0.7	0.2
	25th Floor	72.8	73.3	73.9	1.1	0.6
	50th Floor	72.3	72.7	73.5	1.2	0.8
6	at-grade	72.2	72.4	79.1	**6.9**	**6.7**
	13th Floor	72.6	72.8	79.5	**6.9**	**6.7**
	26th Floor	72.1	72.3	79.0	**6.8**	**6.6**
11	at-grade	68.0	68.1	80.1	**12.1**	**12.0**
	20th Floor	72.1	72.2	83.8	**9.9**	**9.8**
	40th Floor	71.5	71.6	83.3	**10.1**	**10.0**
12(2)	at-grade	68.2	68.4	78.9	**10.7**	**10.5**
13	at-grade	70.8	71.0	76.5	**5.7**	**5.5**
	19th Floor	70.9	71.1	76.7	**6.0**	**5.8**
	38th Floor	70.7	70.8	76.5	**6.0**	**5.9**
A	at-grade	72.2	72.4	77.1	4.9	4.7
	13th Floor	73.1	73.3	78.1	**5.1**	4.9
	26th Floor	72.7	72.8	77.7	**5.1**	**5.0**
B(2)	at-grade	68.2	68.4	80.5	**12.3**	**12.1**
C(2)	at-grade	72.2	72.4	78.1	**5.9**	**5.7**
D(2)	at-grade	72.2	72.5	80.6	**8.4**	**8.1**
E	at-grade	73.2	73.7	75.2	2.0	1.5
	25th Floor	72.8	73.2	75.0	2.3	1.9
	50th Floor	72.0	72.5	74.3	2.4	1.9
F	at-grade	73.2	73.6	77.7	4.5	4.1
	25th Floor	76.0	76.3	80.3	4.1	3.8
	50th Floor	75.6	76.0	80.0	4.2	3.8
G	at-grade	72.2	72.4	80.2	**8.0**	**7.8**
	13th Floor	73.2	73.4	80.9	**7.5**	**7.3**
	26th Floor	73.0	73.1	80.7	**7.4**	**7.3**
H	at-grade	64.0	64.0	76.4	**12.4**	**12.4**
	25th Floor	65.0	65.0	78.3	**13.3**	**13.3**
	50th Floor	65.0	65.0	78.3	**13.3**	**13.3**
I	at-grade	64.0	64.0	78.0	**14.0**	**14.0**
	5th Floor	65.0	66.0	79.0	**14.0**	**13.0**
	10th Floor	67.0	68.0	79.0	**12.0**	**11.0**

(1) Total noise level from both traffic and construction activities. Shaded cells represent locations where there is a projected impacts.
(2) This site is a ground-level sidewalk receptor location adjacent to projected development building with no elevated receptors.

The noise analysis findings show no significant differences between comparing 2022 With-Action noise levels against either the existing or future 2022 No-Action conditions. Under both scenarios, noise level increases of 5 dBA or greater are projected at receptor sites 6, 11, 12, 13, A, B, C, D, G, H, and I Noise levels above the CEQR limits, at these 11 locations were determined to be caused principally from noise generated by on-site construction activities rather than from off-site traffic movements. Projected noise-level increases during the peak construction period (i.e., second quarter of 2022) is projected to result in noise level increases ranging from 2 to 14 dBA. Construction noise impacts projected at Receptor Sites 12, B, C, and D would be limited to ground-level sidewalk areas where pedestrians walking past Projected Development Sites 5, 6, and 7 and noise levels at these locations would range from 79 to 81 dBA. Noise-level exceedances near adjacent existing commercial buildings are projected to occur at receptors R6, R11, R13, A, G, H and I. Noise-level exceedances reported at receptor R11 would occur adjacent to a commercial building located at 6 East 43rd Street. Projected ground-level and elevated noise levels adjacent to R11 would likely be about 12 dBA higher than future No-Action noise levels with noise levels approaching 82 dBA on some floors resulting in annoyance to the people working inside this building and all other adjacent buildings on West 43rd Street between Fifth and Madison Avenues that have a direct line-of-sight to the construction activities at Projected Development Site 5. The largest incremental change in noise level is projected to occur at ground level and elevated receptor points adjacent to Receptor Site I where noise from construction activities is expected to increase by upwards of 14 dBA over background ambient conditions without construction activities. Although the high exterior noise exposure predicted at Sites R11, H and I are appreciably above the CEQR impact limits, the existing double pane glass windows and closed ventilation system at these commercial buildings would provide substantial sound attenuation thereby maintaining interior noise levels below or near the CEQR 50 dBA L_{10} impact threshold. Occupants inside these existing commercial buildings would from time to time likely experience minor annoyance, its limited duration would not constitute a significant adverse impact. The potential does exist for similar noise-level increases at these and/or other receptor locations in the immediate vicinity of Project Development Sites 5, 6, and 7 during other construction quarters bordering this peak construction period (i.e., second quarter of 2022). At the time the DEIS was prepared, it was believed that an evaluation of construction noise exposure during the quarters covering the time period of 2021 to 2023 was necessary to disclose whether a significant adverse construction noise impact would actually occur. Upon further review between Draft and Final EIS, it was determined that the additional evaluation was not necessary since the analysis already presented was decidedly conservative—in assuming that during the second quarter of 2022, selected as the construction peak year for assessment in this chapter, there would be five sites that are already completed and operational (Project Development Sites, 2, 3, 4, 9, and 18) and of the seven sites that are under construction (Project Development Sites, 1, 5, 6, 7, 8, 11, and 19), three would be located in close proximity of one another (Projected Development Sites 5, 6, and 7)—and that an evaluation of the duration of construction noise exposure was not needed to determine the potential for significant adverse construction noise impacts. Therefore, if the peak construction scenario conservatively assumed for the purposes of this analysis is realized, the Proposed

Action would result in a significant adverse construction noise impact. Mitigation measures that may address these impacts are discussed in Chapter 19, "Mitigation."

18.5.4 Vibration

18.5.4.1 Introduction

Construction activities have the potential to result in vibration levels that may in turn result in structural or architectural damage, and/or annoyance or interference with vibration-sensitive activities. In general, vibration levels at a location are a function of the source strength (which in turn is dependent upon the construction equipment and methods utilized), the distance between the equipment and the location, the characteristics of the transmitting medium, and the building construction type at the location. Construction equipment operation causes ground vibrations that spread through the ground and decrease in strength with distance. Vehicular traffic, even in locations close to major roadways, typically does not result in perceptible vibration levels unless there are discontinuities in the roadway surface. With the exception of the case of fragile and possibly historically significant structures or buildings, generally construction activities do not reach the levels that can cause architectural or structural damage, but can achieve levels that may be perceptible and annoying in buildings very close to a construction site. An assessment has been prepared to quantitatively assess potential vibration impacts of construction activities on structures and residences near the project site.

18.5.4.2 Construction Vibration Criteria

For purposes of assessing potential structural or architectural damage, the determination of a significant impact was based on the vibration impact criterion used by LPC of a peak particle velocity (PPV) of 0.50 inches per second. For non-fragile buildings, vibration levels below 0.60 inches per second would not be expected to result in any structural or architectural damage.

For purposes of evaluating potential annoyance or interference with vibration-sensitive activities, vibration levels greater than 65 vibration decibels (VdB) would have the potential to result in significant adverse impacts if they were to occur for a prolonged period of time.

18.5.4.3 Analysis Methodology

For purposes of assessing potential structural or architectural damage, the following formula was used:

$$PPV_{equip} = PPV_{ref} \text{ x } (25/D)^{1.5}$$

where: PPV_{equip} is the peak particle velocity in inches per second of the equipment at the receiver location;

PPV_{ref} is the reference vibration level in inches per second at 25 feet; and

D is the distance from the equipment to the received location in feet.

For purposes of assessing potential annoyance or interference with vibration sensitive activities, the following formula was used:

$$L_v(D) = L_v(ref) - 30\log(D/25)$$

where: $L_v(D)$ is the vibration level in VdB of the equipment at the receiver location; $L_v(ref)$ is the reference vibration level in VdB at 25 feet; and
D is the distance from the equipment to the receiver location in feet.

Table 18-14 shows vibration source levels for typical construction equipment.

TABLE 18-14: VIBRATION SOURCE LEVELS FOR CONSTRUCTION EQUIPMENT

Equipment		PPV (ref) (in/sec)	Approximate Lv (ref) (VdB)
Pile Driver (sonic)	upper range	0.734	105
	Typical	0.170	93
Hydromill (slurrywall)	In soil	0.008	66
	In rock	0.017	75
Clam shovel drop (slurry wall)		0.202	94
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: Transit Noise and Vibration Impact Assessment, FTA-VA-90-1003-06, May 2006.

18.5.4.4 Construction Vibration Analysis Results

The buildings and structures of most concern with regard to the potential for structural or architectural damage due to vibration are those immediately adjacent to or across the street from the proposed development site. Seven receptor sites identified as R5, R6, R11, R13, A, G and F in Figure 18-5 are all existing commercial buildings located immediately adjacent to Projected Development Sites 5, 6 and 7, and therefore a vibration monitoring program would be implemented to ensure that the 0.50 inches/second PPV threshold limit for structural damage to occur is not exceeded. Receptor location R4 the distance between construction equipment and receiving buildings or structures is large enough to avoid vibratory levels that would result in architectural or structural damage. Receptor locations B, C, D and R12 are locations at the development site boundary and are not vibration sensitive.

The buildings of most concern with regard to potential damage from vibration generated during construction activities are those buildings located immediately adjacent or across the street from a proposed development site. Commercial buildings adjacent to Projected Development Sites 5 and 6 between Madison and Fifth Avenues would be the nearest structures that could experience elevated vibration levels. No pile driving or blasting is expected as part of construction resulting from the Proposed Action. The types of construction activities that are expected to occur during the peak construction time period are on the lower end of vibration generating equipment. These include vibratory roller, hoe ram, bulldozer and loaded trucks with the largest peak particle velocity (PPV) of 0.20 inches per second, which is well below the 0.50 inches per second PPV vibration limit for structural damage.

In terms of potential annoyance, the vibration generated from vibratory roller would have the most potential to produce vibration levels above the 65 VdB threshold limit extending outward for approximately 230 feet from the source. However this type of construction activity would generate vibration for limited periods of time at a particular location and therefore would not result in any significant adverse impact due to vibration.