

A. INTRODUCTION

This chapter assesses the potential for the Proposed Project to result in incremental shadows long enough to reach any nearby publicly accessible open spaces or other sunlight-sensitive resources. Public open spaces, historic resources, and natural resources are all potentially sunlight-sensitive resources, and, thus, this chapter is closely linked to the information presented in other chapters of the environmental impact statement (EIS), particularly **Chapter 05.04, “Open Space,”** and **Chapter 05.06, “Historic and Cultural Resources.”**

As discussed in **Chapter 02.0, “Project Alternatives,”** there are three feasible alternatives under consideration for implementation of the Proposed Project. These include: Alternative 2 – the Rezoning Alternative; Alternative 3 – the Non-Rezoning Alternative; and Alternative 4 – the Midblock Bulk Alternative. A discussion of Alternative 5 – the Rehabilitation and Infill Alternative, which has been determined to be infeasible, is presented in **Chapter 05.22, “Rehabilitation and Infill Alternative Analysis.”** Refer to **Chapter 04.0, “Analysis Framework,” Table 04.0-4,** for information on the analysis approach for the three feasible alternatives for each technical area.

This analysis of shadows was conducted in accordance with 2021 *CEQR Technical Manual (CTM)* guidance. A shadows assessment should be conducted pursuant to CEQR when a proposed action could result in new structures or addition to existing structures of 50 feet or more, or would be located adjacent to or across the street from a sunlight-sensitive resource. The Proposed Project is expected to result in these conditions under the Rezoning Alternative, Non-Rezoning Alternative, and Midblock Bulk Alternative.

B. PRINCIPAL CONCLUSIONS

The Rezoning Alternative, Non-Rezoning Alternative, and Midblock Bulk Alternative would result in significant shadows impacts on two open space resources: Chelsea Park and PS 33 Playground. Although mitigation measures have not been identified at this time, potential mitigation measures will continue to be explored in consultation with NYC Parks and will be published in the Final EIS (FEIS), if identified. If practicable measures to fully mitigate the impacts cannot be identified, then impacts would remain as unavoidable adverse impacts. Refer to **Section D, “Environmental Effects”** for further information.

C. AFFECTED ENVIRONMENT

First, a preliminary screening assessment must be conducted to ascertain whether shadows resulting from a project could reach any sunlight-sensitive resource at any time of year, and to define the study area for further analysis, if necessary. The *CTM* defines sunlight-sensitive

resources as those resources that depend on sunlight or for which direct sunlight is necessary to maintain the resource's usability or architectural integrity. The following are considered to be sunlight-sensitive resources.¹

- *Public open space* (e.g., parks, playgrounds, plazas, schoolyards, greenways, and landscaped medians with seating). Planted areas within unused portions or roadbeds that are part of the Greenstreets program are also considered sunlight-sensitive resources. The use of vegetation in an open space establishes its sensitivity to shadows. This sensitivity is assessed for both (1) warm-weather dependent features, like wading pools and sandboxes, or vegetation that could be affected by loss of sunlight during the growing season (i.e., March through October); and (2) features, such as benches, that could be affected by a loss of winter sunlight. Uses that rely on sunlight include: passive use, such as sitting or sunning; active use, such as playfields or paved courts; and such activities as gardening, or children's wading pools and sprinklers. Vegetation requiring direct sunlight includes the tree canopy, flowering plants, and plots, particularly plots for food production in community gardens. The amount of sunlight typically considered to be the minimum that plantings and vegetation would need is six to eight hours of direct sunlight. However, certain plantings and vegetation can tolerate partial sun, with a reduced minimum requirement of four to six hours of direct sunlight. Examples of areas that can tolerate partial sun are established tree canopies, shrubs or perennials.
- *Features of historic architectural resources that depend on sunlight for their enjoyment by the public.* Only the sunlight-sensitive features of an architectural resource are considered in a shadows analysis. Sunlight-sensitive features include the following: design elements that are part of a recognized architectural style that depends on the contrast between light and dark (e.g., deep recesses or voids, such as open galleries, arcades, recessed balconies, deep window reveals, and prominent rustication); elaborate, highly carved ornamentation; stained glass windows; exterior building materials and color that depend on direct sunlight for visual character; historic landscapes, such as scenic landmarks, including vegetation recognized as an historic feature of the landscape; and structural features for which the effect of direct sunlight is described as playing a significant role in the structure's importance as an historic landmark.
- *Natural resources where the introduction of shadows could alter the resource's condition or microclimate.* Such resources could include community gardens, surface water bodies, wetlands, or designated resources, such as coastal fish and wildlife habitats.

The preliminary screening assessment consists of three tiers of analysis. The first tier determines a simple radius around the proposed buildings representing the longest shadow that could be cast. If there are sunlight-sensitive resources within the radius, the analysis proceeds to the second tier, which reduces the area that could be affected by project-generated shadows by accounting for a specific range of angles that can never receive shade in New York City due to the path of the sun in the northern hemisphere. If the second tier of analysis does not eliminate the possibility of new shadows on sunlight-sensitive resources, a third tier of screening analysis further refines the area that could be reached by new shadows by looking at specific representative

¹ According to the CTM, city streets, sidewalks, and private open spaces (such as private residential front and back yards, stoops, and vacant lots) are not considered to be sunlight-sensitive resources.

days of the year and determining the maximum extent of shadow over the course of each representative day.

If the third tier of analysis does not eliminate the possibility of new shadows on sunlight-sensitive resources, a detailed shadow analysis is required to determine the extent and duration of the incremental shadow (i.e. the additional, or new, shadow) resulting from the project. The detailed shadow analysis establishes a baseline condition (the No-Action Alternative) that is compared to the future condition resulting from the Proposed Project (the Rezoning Alternative, Non-Rezoning Alternative, and Midblock Bulk Alternative) to illustrate the shadows cast by existing or future buildings and distinguish the additional (incremental) shadows cast by the development of projected development sites. In accordance with the *CTM*, shadows on sunlight-sensitive resources of concern were modeled for four representative days of the year. For the New York City area, the months of interest for an open space resource encompass the growing season (i.e., March through October) and one month between November and February representing a cold-weather month (usually December). Representative days for the growing season are generally the March 21 vernal equinox (or the September 21 autumnal equinox, which is approximately the same), the June 21 summer solstice, and a spring or summer day halfway between the summer solstice and equinoxes, such as May 6 or August 6 (which are approximately the same). For the cold-weather months, the December 21 winter solstice is included to demonstrate conditions when open space users rely most heavily on available sunlight warmth. As these months and days are representative of the full range of possible shadows, they are also used for assessing shadows on sunlight-sensitive historic and natural resources. The *CTM* defines the temporal limits of a shadow analysis period to fall from an hour and a half after sunrise to an hour and a half before sunset.

The detailed analysis provides the data needed to assess the shadow impacts. The effects of incremental shadows on the sunlight-sensitive resources are described, and their degree of significance is considered. The result of the analysis and assessment are documented with graphics, a table of incremental shadow durations, and narrative text. As described in the *CTM*, an incremental shadow is generally not considered significant when its duration is no longer than ten minutes at any time of year and the resource continues to receive substantial direct sunlight. A significant shadow impact generally occurs when an incremental shadow of ten minutes or longer falls on a sunlight-sensitive resource and results in one of the following:

- Vegetation: a substantial reduction in sunlight duration available to sunlight-sensitive features of the resource to less than the time of its minimum sunlight needs (when there would be sufficient sunlight in the future without the project) or a reduction in direct sunlight exposure where the sensitive feature of the resource is already subject to substandard sunlight (i.e., less than the minimum sunlight needs).
- Historic and cultural resources: a substantial reduction in sunlight available for the enjoyment or appreciation of the sunlight-sensitive features of an historic or cultural resource.
- Open space utilization: a substantial reduction in the usability of open space as a result of increased shadow, including information regarding anticipated new users and the open space's utilization rates throughout the affected time periods.
- For any sunlight-sensitive feature of a resource: complete elimination of all direct sunlight on the sunlight-sensitive feature of the resource, when the complete elimination results in

substantial effects on the survival, enjoyment, or, in the case of open space or natural resources, the use of the resource.

In general, a significant adverse shadow impact occurs when the incremental shadow added by a proposed project falls on a sunlight-sensitive resource and substantially reduces or completely eliminates direct sunlight exposure, thereby significantly altering the public's use of the resource or threatening the viability of vegetation or other resources.

First, an assessment of the Project Sites was performed in order to determine which sites and/or which development alternatives required a preliminary screening assessment. As noted above, pursuant to *CTM* guidance, only new development or enlargement that would result in an incremental increase of 50 feet or more compared to the No-Action condition require assessment. In addition, any development site adjacent to, or across the street from, a sunlight sensitive resource requires a preliminary screening, regardless of its height. New structures of greater than 50 feet in incremental height are anticipated at both the Fulton Houses Project Site and Elliott-Chelsea Houses Project Site as part of the Rezoning, Non-Rezoning, and Midblock Bulk Alternatives, and consequently, a preliminary screening assessment of shadows is warranted.

Figure 05.05-1 shows the Project Sites, the surrounding street layout, and all sunlight-sensitive resources (publicly accessible open spaces and Greenstreets, and sunlight-sensitive architectural, natural, historic resources) as well as the Tier 1 longest shadow radius and Tier 2 screening area for the Project Sites.

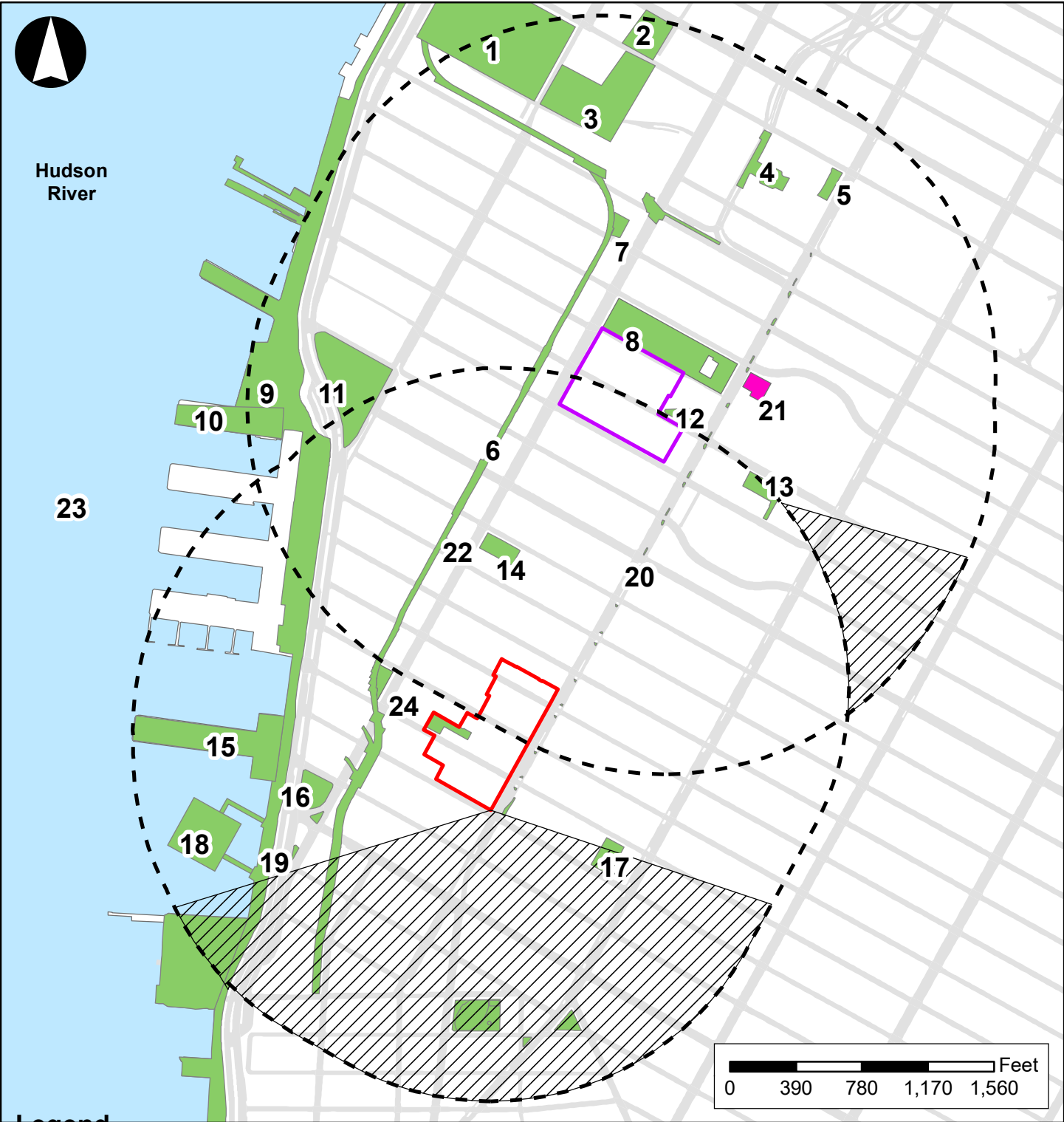
Tier 1 Screening Assessment

According to the *CTM*, the longest shadow that a structure will cast in New York City, except for periods close to dawn or dusk, is 4.3 times its height. The maximum shadow radius for the Project Sites was determined using each site's maximum height based on the Rezoning Alternative for the Elliott-Chelsea Project Site and the Midblock Bulk Alternative for the Fulton Houses Project Site (used for conservative analysis purposes). Using this method, the longest shadow for Fulton Houses Project Site is 1,719.7 feet and the longest shadow for Elliott-Chelsea Houses Project Site is 1,842.6 feet. The maximum shadow radius for the Fulton Houses Project Site and Elliott-Chelsea Houses Project Site were merged to form the longest shadow study area (Tier 1 Assessment).








Within this longest shadow study area, there are a number of potentially sunlight-sensitive open spaces, natural resources, and historic architectural resources. Due to the presence of sunlight-sensitive resources within the Tier 1 screening area, further screening is warranted in order to determine whether any sunlight-sensitive resources could be affected by project-generated shadows.

Tier 2 Screening Assessment

Due to the path of the sun across the sky in the northern hemisphere, no shadow can be cast in a triangular area south of any given project site. In New York City, this area lies between -108 and +108 degrees from true north. The purpose of the Tier 2 screening is to determine whether the sunlight-sensitive resources identified in the Tier 1 screening are located within portions of the



Legend

- | | |
|---|---|
|  Fulton Houses |  Sunlight-Sensitive Historic Resource* |
|  18thStPlaza |  Sunlight-Sensitive Open Space Resource* |
|  Elliott-Chelsea Houses | |
|  Tier I: Longest Shadow Study Area | |
|  Tier II: Area that Cannot be Shaded | |
- * Refer to Table 05.05-1

longest shadow study area that could receive shade from the developments resulting from the Proposed Project.

Table 05.05-1: Sunlight-Sensitive Resources Warranting Further Analysis Based on Tier 1 and 2 Screening

Map No. ¹	Sunlight Sensitive Resource
1	Western Yards Open Space
2	Bella Abzug Park (Hudson Park & Boulevard Phase 1)
3	The Public Square and Gardens at Hudson Yards
4	450 W 33 rd Street
5	401 W 31 st Street
6	The High Line
7	500 W 30 th Street
8	Chelsea Park
9	Hudson River Park Esplanade
10	Pier 62
11	Chelsea Waterside Park
12	PS 33 Playground
13	Penn South Playground
14	Clement Clark Moore Park
15	Pier 57 Rooftop Park
16	14 th Street Park
17	Dr. Gertrude B. Kelly Playground
18	Little Island
19	Greenstreet at W 14 th Street
20	Greenstreet at 9 th Avenue
21	Church of the Holy Apostles
22	Guardian Angels Roman Catholic Church
23	Hudson River
24	18 th Street Plaza

Notes:

¹ Refer to **Figure 05.05-1**.

Figure 05.05-1 provides a base map illustrating the results of the Tier 1 and Tier 2 screening assessments (i.e., the portion of the longest shadow study area lying within -108 degrees from the true north and +108 degrees from true north as measured from southernmost portions of the Project Sites). A total of 24 resources were identified as sunlight-sensitive resources that warranted further assessment, including 21 sunlight-sensitive open spaces, two sunlight-sensitive historic resources, and one sunlight-sensitive natural resource (the Hudson River). A list of all sunlight-sensitive resources that warranted further assessment is provided in **Table 05.05-1**, above.

Tier 3 Screening Assessment

According to the *CTM*, a Tier 3 screening assessment should be performed to determine if, in the absence of intervening buildings, shadows resulting from a proposed action can reach a sunlight-sensitive resource, thereby warranting a detailed shadow analysis. The Tier 3 screening assessment is used to determine if shadows resulting from a proposed action can reach a sunlight-sensitive resource at any time between 1.5 hours after sunrise and 1.5 hours before sunset on representative analysis dates.

Table 05.05-2: Tier 3 Assessment Results – Rezoning Alternative

Map No. ¹	Sunlight Sensitive Resource	March 21/ Sept. 21	May 6/ August 6	June 21	December 21	Number of Analysis Days
		7:36 AM – 4:29 PM	6:27 AM – 5:18 PM	5:57 AM – 6:01 PM	8:51 AM – 2:53 PM	
1	Western Yards Open Space					0
2	Bella Abzug Park (Hudson Park & Boulevard Phase 1)					0
3	The Public Square and Gardens at Hudson Yards					0
4	450 W 33rd Street				Yes	1
5	401 W 31st Street				Yes	1
6	The High Line	Yes	Yes	Yes	Yes	4
7	500 W 30th Street				Yes	1
8	Chelsea Park	Yes	Yes	Yes	Yes	4
9	Hudson River Park Esplanade	Yes	Yes	Yes	Yes	4
10	Pier 62					0
11	Chelsea Waterside Park					0
12	P.S. 33 Playground	Yes	Yes	Yes	Yes	4
13	Penn South Playground			Yes		1
14	Clement Clark Moore Park					0
15	Pier 57 Rooftop Park					0
16	14th Street Park		Yes	Yes		2
17	Dr. Gertrude B. Kelly Playground		Yes	Yes		2
18	Little Island					0
19	Greenstreet at W 14th Street		Yes	Yes		2
20	Greenstreet at 9th Avenue	Yes	Yes	Yes	Yes	4
21	Church of the Holy Apostles	Yes	Yes	Yes		3
22	Guardian Angels Roman Catholic Church					0
23	Hudson River					0
24	18th Street Plaza	Yes			Yes	2

Notes:¹ Refer to **Figure 05.05-1**.

As project-generated shadows could reach a number of sunlight-sensitive resources, a Tier 3 assessment was performed using three-dimensional (3D) computer mapping software. The 3D model was used to calculate and display project-generated shadows on individual representative analysis dates. The model contained 3D representations of the elements in the base map used in the preceding assessments and a 3D model of the projected and potential developments. At this stage of the assessment, surrounding buildings within the study area were not included in the model so that it may be determined whether project-generated shadows would reach any sunlight-sensitive resources.

The Tier 3 analysis showed that of the 24 sunlight-sensitive resources shown in **Table 05.05-1**, 14 could receive incremental shadow on at least one analysis day under the Rezoning Alternative, while 11 could receive incremental shadows from the Non-Rezoning Alternative. **Table 05.05-2** presents a summary of the Tier 3 assessment, showing the sunlight-sensitive resources that could, in the absence of intervening buildings, receive project-generated shadows, and on which analysis

days the new shadows would occur. The results of the Tier 3 analysis for the Project Sites according to the Rezoning Alternative are illustrated in **Figure 05.05-2a** and **Figure 05.05-2b**.

Because the Non-Rezoning Alternative would result in shorter buildings than the Rezoning Alternative, the Tier 3 assessment for the Non-Rezoning Alternative showed less sunlight sensitive resources that could receive shadows from the Proposed Project. As shown in **Table 05.05-3**, the Tier 3 screening for the Non-Rezoning Alternative would not warrant analysis for 401 W. 31st Street, Hudson River Park Esplanade, or the Greenstreet at W. 14th Street. The Non-Rezoning Alternative would also not warrant further analysis of 14th Street Park on May 6/August 6 and Dr. Gertrude B. Kelly Playground on March 21/September 21. Analysis warranted for all other resources during all other dates/times would be the same under the Rezoning and Non-Rezoning Alternatives.

Table 05.05-3: Tier 3 Assessment Results – Non-Rezoning Alternative

Map No. ¹	Sunlight Sensitive Resource	March 21/ Sept. 21	May 6/ August 6	June 21	December 21	Number of Analysis Days
		7:36 AM– 4:29 PM	6:27 AM– 5:18 PM	5:57 AM– 6:01 PM	8:51 AM– 2:53 PM	
1	Western Yards Open Space					0
2	Bella Abzug Park (Hudson Park & Boulevard Phase 1)					0
3	The Public Square and Gardens at Hudson Yards					0
4	450 W 33rd Street				Yes	1
5	401 W 31st Street					0
6	The High Line	Yes	Yes	Yes	Yes	4
7	500 W 30th Street				Yes	1
8	Chelsea Park	Yes	Yes	Yes	Yes	4
9	Hudson River Park Esplanade					0
10	Pier 62					0
11	Chelsea Waterside Park					0
12	P.S. 33 Playground	Yes	Yes	Yes	Yes	4
13	Penn South Playground			Yes		1
14	Clement Clark Moore Park					0
15	Pier 57 Rooftop Park					0
16	14th Street Park			Yes		1
17	Dr. Gertrude B. Kelly Playground			Yes		1
18	Little Island					0
19	Greenstreet at W 14th Street					0
20	Greenstreet at 9th Avenue	Yes	Yes	Yes	Yes	4
21	Church of the Holy Apostles	Yes	Yes	Yes		3
22	Guardian Angels Roman Catholic Church					0
23	Hudson River		Yes	Yes		2
24	18th Street Plaza	Yes			Yes	2

Notes:

¹ Refer to **Figure 05.05-1**

Due to the potential for substantially different shadows from the reorientation of towers and bulk under the Midblock Bulk Alternative, a separate Tier 3 assessment was provided for this alternative. The results of the Tier 3 analysis for the Midblock Bulk Alternative are provided in

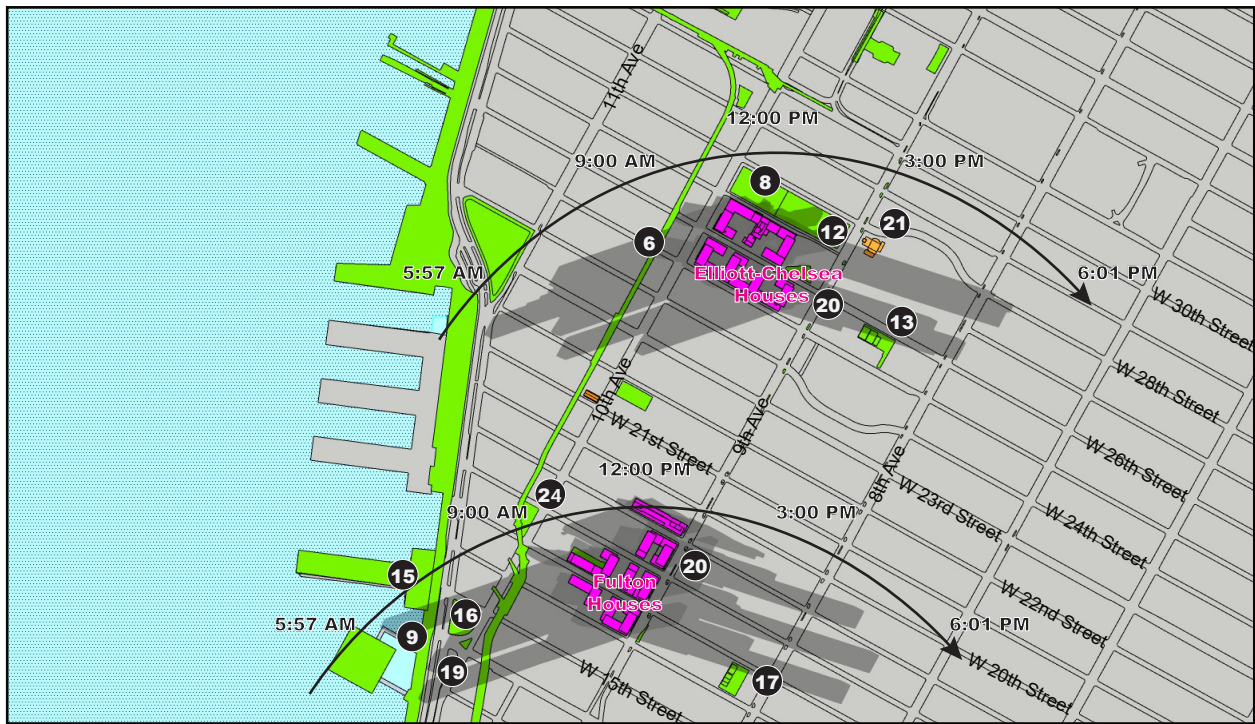


MARCH 21 / SEPTEMBER 21

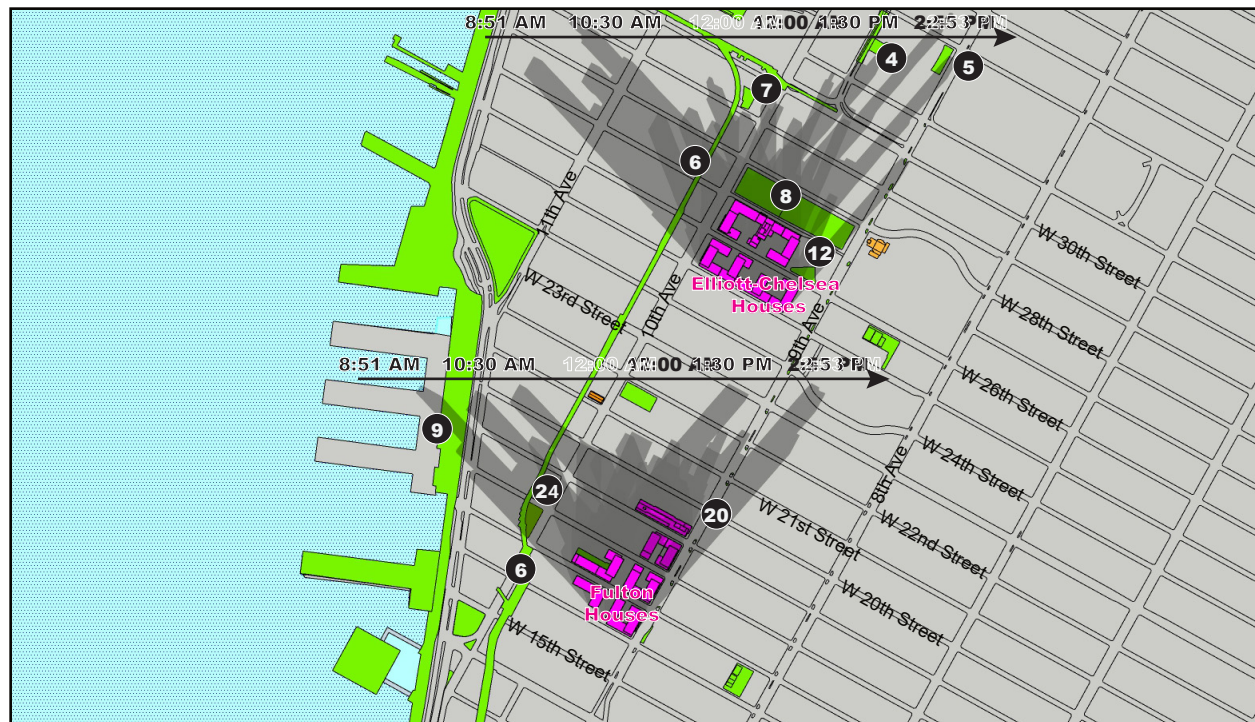


MAY 6 / AUGUST 6

- Proposed Project
- Sunlight-Sensitive Resource (Refer to Table 05.05-2)
- Project-Generated Shadow



JUNE 21



DECEMBER 21

- Proposed Project
- Sunlight-Sensitive Resource (Refer to Table 05.05-2)
- Project-Generated Shadow

Table 05.05-4 below. As mentioned above, the Midblock Bulk Alternative would feature the same design as the Rezoning Alternative at the Elliott-Chelsea Houses Project Site. Therefore, any differences between the Tier 3 analyses for the Rezoning Alternative and the Midblock Bulk Alternative are the result of changes to the site plans at the Fulton Houses Project Site.

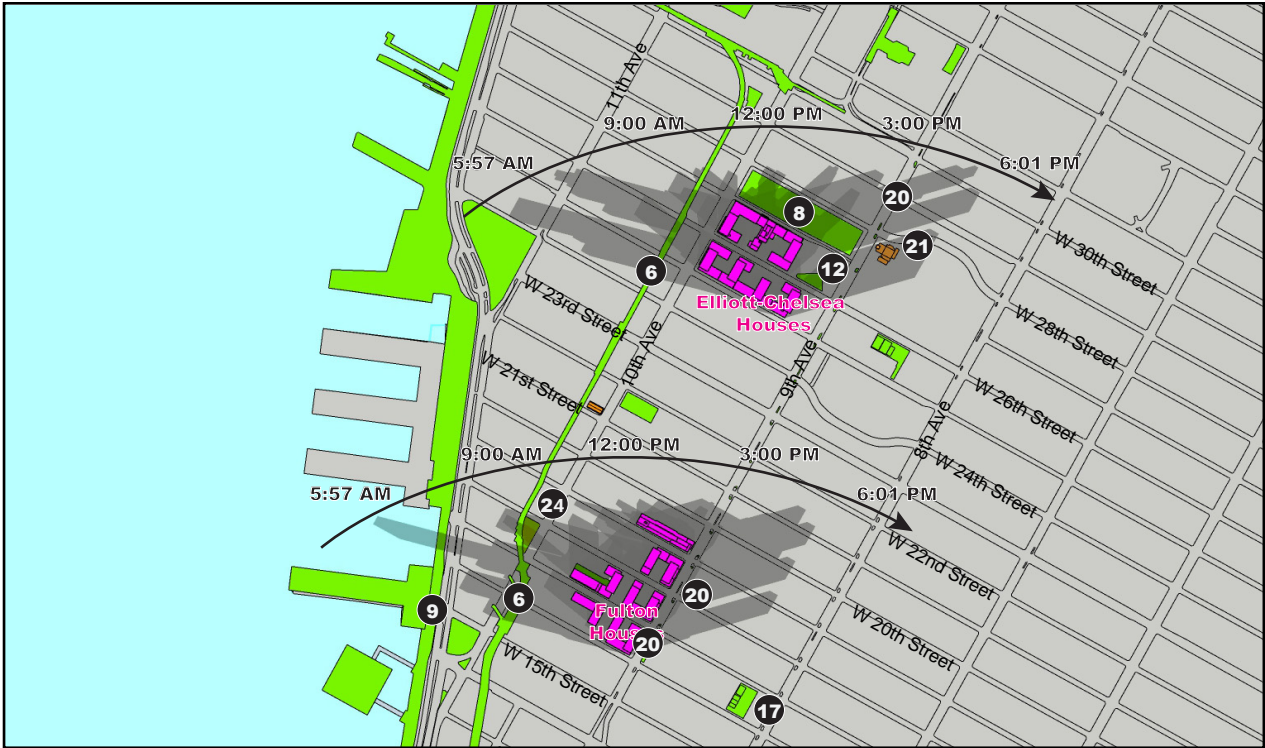
Table 05.05-4: Tier 3 Assessment Results – Midblock Bulk Alternative

Map No. ¹	Sunlight Sensitive Resource	March 21/ Sept. 21	May 6/ August 6	June 21	December 21	Number of Analysis Days
		7:36 AM – 4:29 PM	6:27 AM – 5:18 PM	5:57 AM – 6:01 PM	8:51 AM – 2:53 PM	
1	Yards Open Space					0
2	Ison Park & Boulevard Phase 1)					0
3	The Public Square and Gardens at Hudson Yards					0
4	450 W 33rd Street				Yes	1
5	401 W 31st Street				Yes	1
6	The High Line	Yes	Yes	Yes	Yes	4
7	500 W 30th Street				Yes	1
8	Chelsea Park	Yes	Yes	Yes	Yes	4
9	Hudson River Park Esplanade	Yes	Yes	Yes	Yes	4
10	Pier 62					0
11	Chelsea Waterside Park					0
12	P.S. 33 Playground	Yes	Yes	Yes	Yes	4
13	Penn South Playground			Yes		1
14	Clement Clark Moore Park					0
15	Pier 57 Rooftop Park		Yes	Yes		2
16	14th Street Park		Yes	Yes		2
17	Dr. Gertrude B. Kelly Playground					0
18	Little Island			Yes		1
19	Greenstreet at W 14th Street			Yes		1
20	Greenstreet at 9th Avenue	Yes	Yes	Yes	Yes	4
21	Church of the Holy Apostles	Yes	Yes	Yes		3
22	Guardian Angels Roman Catholic Church					0
23	Hudson River	Yes	Yes	Yes	Yes	4
24	18th Street Plaza	Yes	Yes		Yes	3

Notes:

¹ Refer to **Figure 05.05-1**.

The Tier 3 analysis showed that of the 24 sunlight-sensitive resources shown in **Table 05.05-1**, 16 could receive incremental shadow on at least one analysis day under the Midblock Bulk Alternative. **Table 05.05-4** presents a summary of the Tier 3 assessment, showing the sunlight-sensitive resources that could, in the absence of intervening buildings, receive project-generated shadows, and on which analysis days the new shadows would occur. The results of the Tier 3 analysis for the Midblock Bulk Alternative are illustrated in **Figure 05.05-3a** and **Figure 05.05-3b**.






MARCH 21 / SEPTEMBER 21



MAY 6 / AUGUST 6

- Proposed Project
- Sunlight-Sensitive Resource (Refer to Table 05.05-2)
- Project-Generated Shadow



-  **Proposed Project**
 **Sunlight-Sensitive Resource (Refer to Table 05.05-2)**
 **Project-Generated Shadow**

D. ENVIRONMENTAL EFFECTS

Alternative 1 – No-Action Alternative

Under the No-Action Alternative, there would be no new development and no changes in structure height or building massing within the Project Sites. For the purpose of this shadows analysis, future conditions under the No-Action Alternative are assumed to be the same as existing conditions. The No-Action Alternative is considered to be the basis for comparison for the Rezoning Alternative, Non-Rezoning Alternative, and Midblock Bulk Alternative, which are analyzed below.

Alternative 2 – Rezoning Alternative

Per *CTM* guidance, shadow analyses were performed for the 14 sunlight-sensitive resources identified above on four representative days of the year, indicating the range of shadows over the course of the year as described above in **Section C, “Affected Environment”**. *CTM* guidance defines the temporal limits of a shadow analysis period to fall from 1.5 hours after sunrise to 1.5 hours before sunset. As discussed above, the results of the shadows analysis show the incremental difference in shadow impact between the baseline No-Action Alternative and the Rezoning and Non-Rezoning Alternatives, as well as the Midblock Bulk Alternative.

As shown in **Table 05.05-5**, incremental project-generated shadows from the Rezoning Alternative would reach eight of the 24 sunlight-sensitive resources identified in the Tier 3 assessment, when taking into account the presence of intervening buildings. Increases in shadow coverage would occur at six resources on March 21/September 21; six resources on May 6/August 6; seven resources on June 21; and five resources on December 21. **Figures C.1-1 through C.1-6 in Appendix C.1²** show the extent of incremental shadows from the Rezoning Alternative on sunlight-sensitive resources during each analysis day at the time when the area of the sunlight-sensitive resource shaded by incremental shadows from the Rezoning Alternative is greatest (incremental shadows on Hudson River Park Esplanade, 14th Street Park, and the 9th Avenue Greenstreet are not shown in the figures due to their minimal size, duration, and/or effect, but are discussed qualitatively below).

It should be noted that, per the *CTM*, all times reported herein are Eastern Standard Time (EST) and do not reflect adjustments for daylight savings time that is in effect from mid-March to early November. As such, both the entry and exit times reported in this chapter for March 21/September 21, May 6/August 6, and June 21 need to have one hour added to reflect Eastern Daylight-Savings Time (EDT). To give an example, if the incremental shadow time resulting from the Fulton Houses Project Site on the High Line is from 7:36 AM – 9:36 AM EST, then the incremental shadow time would be 8:36 AM – 10:36 AM EDT. The incremental shadow times would move up an hour, but the duration would remain the same (in this case two hours).

² Due to the high volume of figures and to maintain readability, the full set of detailed shadows figures are provided in **Appendix C.1** instead of within the text of the chapter.

Table 05.05-5: Duration of Incremental Shadows on Sunlight Sensitive Resources – Rezoning Alternative

Sunlight Sensitive Resource	Analysis Day	March 21/Sept. 21	May 6/August 6	June 21	December 21
		7:36 AM - 4:29 PM	6:27 AM - 5:18 PM	5:57 AM - 6:01 PM	8:51 AM - 2:53 PM
The High Line	Shadow Enter-Exit Time	Fulton: 7:36 AM - 9:36 AM EC: 7:36 AM - 11:21 AM	Fulton: 6:56 AM - 9:03 AM EC: 6:27 AM - 9:31 AM	Fulton: 7:45 AM - 8:54 AM EC: 5:57 AM - 9:44 AM	Fulton: 8:51 AM - 9:47 AM EC: 8:51 AM - 12:38 PM
	Incremental Shadow Duration	Fulton: 2 hours EC: 3 hours 45 minutes	Fulton: 2 hours 7 minutes EC: 3 hours 4 minutes	Fulton: 1 hour 9 minutes EC: 3 hours 47 minutes	Fulton: 56 minutes EC: 3 hours 47 minutes
Chelsea Park	Shadow Enter-Exit Time	EC: 9:23 AM - 4:29 PM	EC: 10:02 AM - 5:18 PM	EC: 10:38 AM - 6:01 PM	EC: 8:51 AM - 2:53 PM
	Incremental Shadow Duration	EC: 7 hours 6 minutes	EC: 7 hours 16 minutes	EC: 7 hours 23 minutes	EC: 6 hours 2 minutes
Hudson River Park Esplanade	Shadow Enter-Exit Time	-	-	Fulton: 5:57 AM - 6:11 AM	-
	Incremental Shadow Duration	-	-	Fulton: 14 minutes	-
P.S. 33 Playground	Shadow Enter-Exit Time	EC: 11:23 AM - 3:57 PM	EC: 11:28 AM - 4:18 PM	EC: 12:16 PM - 6:01 PM	EC: 11:21 AM - 2:23 PM
	Incremental Shadow Duration	EC: 4 hours 34 minutes	EC: 4 hours 50 minutes	EC: 5 hours 45 minutes	EC: 3 hours 2 minutes
14th Street Park	Shadow Enter-Exit Time	-	Fulton: 6:11 AM - 6:42 AM	Fulton: 5:57 AM - 6:17 AM	-
	Incremental Shadow Duration	-	Fulton: 31 minutes	Fulton: 20 minutes	-
Greenstreet at 9th Avenue	Shadow Enter-Exit Time	Fulton: 1:48 PM - 4:29 PM EC: 3:15 PM - 4:29 PM	Fulton: 1:17 PM - 5:18 PM EC: 3:27 PM - 5:18 PM	Fulton: 1:12 PM - 6:01 PM EC: 4:18 PM - 6:01 PM	Fulton: 2:15 PM - 2:53 PM
	Incremental Shadow Duration	Fulton: 2 hours 41 minutes EC: 1 hour 14 minutes	Fulton: 4 hours 1 minute EC: 1 hour 51 minutes	Fulton: 4 hours 49 minutes EC: 1 hour 43 minutes	Fulton: 38 minutes
Church of the Holy Apostles	Shadow Enter-Exit Time	EC: 3:39 PM - 4:29 PM	EC: 3:40 PM - 5:18 PM	EC: 3:52 PM - 6:01 PM	-
	Incremental Shadow Duration	EC: 50 minutes	EC: 1 hour 38 minutes	EC: 2 hours 9 minutes	-
18th Street Plaza	Shadow Enter-Exit Time	Fulton: 8:00 AM - 10:13 AM	-	-	Fulton: 8:51 AM - 10:08 AM
	Incremental Shadow Duration	Fulton: 2 hours 13 minutes	-	-	Fulton: 1 hour 17 minutes

Notes:

All times are Eastern Standard Time; Daylight Savings Time was not accounted for per *CTM* guidance.

Table indicates the entry and exit times and total duration of incremental shadow for each sunlight-sensitive resource.

“Fulton” = Fulton Houses Project Site, “EC” = Elliott-Chelsea Houses Project Site.

Sunlight Sensitive Resources**The High Line**

The High Line is an approximately 2.82-acre elevated public park located from Gansevoort Street to W. 30th Street between Washington Street and 11th Avenue, a linear distance of approximately 1.5 miles. The High Line is an elevated former freight rail line transformed into a public park, and offers passive recreation in the form of a continuous walking path, with performance spaces, art installations, vegetation, and seating and viewing areas throughout. The High Line is elevated approximately 30 feet above street level and is accessible via elevators and stairways throughout its length. For most of its length, it extends through midblock areas with buildings along both sides.

Under the Rezoning Alternative, this open space resource would experience incremental shadow coverage during all four analysis days (see **Table 05.05-5**), and would receive incremental shadows from both the Fulton Houses Project Site and Elliott-Chelsea Houses Project Site. Since

the High Line is west of the Project Sites, incremental shadows would primarily be cast in the morning. Incremental shadows cast from the Elliott-Chelsea Houses Project Site under the Rezoning Alternative would range between 3 hours 4 minutes on the May 6/August 6 analysis day (6:27 AM – 9:31 AM [7:27 AM – 10:31 AM EDT]) and 3 hours 47 minutes on the June 21 (5:57 AM – 9:44 AM [6:57 AM – 10:44 AM EDT]) and December 21 (8:51 AM – 12:38 PM) analysis days. As shown in **Figures C.1-1a through C.1-1i**, incremental shadow from the Rezoning Alternative at the Elliott-Chelsea Houses Project Site would be cast on the High Line between W. 24th and W. 28th Streets. The area cast in shadow includes vegetation, walking paths, and seating areas

Incremental shadows cast from the Fulton Houses Project Site as a result of the Rezoning Alternative would range between 56 minutes on the December 21 analysis day (8:51 AM – 9:47 AM) to 2 hours 7 minutes on the May 6/August 6 analysis day (6:56 AM – 9:03 AM [7:56 AM – 10:03 AM EDT]³). As shown in **Figures C.1-1j through C.1-1o**, incremental shadow from the Rezoning Alternative at the Fulton Houses Project Site would be cast on the High Line between W. 15th and W. 18th Streets. The area cast in shadow includes vegetation, walking paths, and seating areas.

Assessment

The High Line would experience incremental shadow coverage from the Rezoning Alternative on both the Fulton and Elliott-Chelsea Houses (FEC) Project Sites on all four analysis days. Incremental shadows on the High Line would be limited in both their duration and scope, as presented in **Figures C.1-1a through C.1-1o**, and they would only occur in the mornings due to the position of the High Line relative to the Project Sites. It also would be limited with respect to overall coverage of the open space.

Incremental shadow coverage from the Fulton Houses Project Site would occur for a duration ranging from 56 minutes on December 21 to 2 hours 7 minutes on May 6/August 6. Throughout the year, the area of the High Line shaded by these incremental shadows would be limited. Incremental shadows would be limited to the observation deck and the walkways to the north extending a maximum of approximately 200 feet on the March 21, May 6, and June 6 analysis days. The observation deck is a leveled seating area, similar to an amphitheater, which faces north along 10th Avenue. Located within the 10th Avenue right-of-way, the observation deck functions as a traffic viewing venue and is the site of some park programming. Incremental shadows on the December 21 analysis day would be cast on an exposed portion of the park passing (consisting of approximately 115 linear feet) over W. 18th Street. During the growing season, shadow coverage from the Fulton Houses Project Site would generally be limited to the small portions of the High Line located between W. 15 and W. 18th Streets, which represents a small part of the total park, and would not be cast on a single part of the park for more than approximately 30 minutes, allowing the open space's sunlight-sensitive resources to receive at least the six- to eight-hour minimum of

³ According to *CTM* guidance, EST is used in shadows analysis when discussing incremental shadow duration. However, for informational purposes and to reflect how the public would experience incremental shadows at the actual times they would enter/exit sunlight-sensitive resources, Eastern Daylight Savings Time (EDT) is also provided for the March 21/September 21, May 6/August 6, and June 21 analysis days.

direct sunlight specified in the *CTM*. Vegetation on the High Line would not be significantly threatened.

Incremental shadow coverage from the Elliott-Chelsea Houses Project Site would occur for a duration ranging from 3 hours 4 minutes on the May 6/August 6 analysis day to 3 hours 47 minutes on the June 21 and December 21 analysis days. Throughout the year, incremental shadows resulting from the Elliott-Chelsea Houses Project Site would cover portions of the park between W. 24th and W. 28th Streets, with a maximum of 300 linear feet of park affected at any one time. These portions of the park contain walkways, planting areas, and some seating areas. Vegetation and park programming would not be noticeably affected by these incremental shadows.

As shadows are not static and move from west to east throughout the day, the park's sunlight-sensitive features would continue to receive direct sunlight on all four representative analysis days, particularly given the distance from the Project Sites to the High Line, which means that incremental shadows from the Project Sites pass through the open space relatively quickly. At no point during any of the representative analysis days would an incremental shadow result in the complete loss of sunlight on the park. It is not expected to affect the utilization or enjoyment of this open space resource.

It should also be noted that most of the park's sunlight-sensitive features would be unaffected by incremental shadows and, thus, the open space would largely contain areas unaffected by project-generated shadows at all times of the day. At their most significant (occurring at 7:36 AM on the March 21 analysis day), incremental shadows from both Project Sites would cover approximately 435 linear feet of the High Line, which constitutes approximately 5.7 percent of the park's total length. In addition, the open space's passive recreational amenities (i.e., bench seating, art, and performances spaces) would continue to receive direct sunlight throughout the majority of the representative analysis days. Additionally, seating locations would continue to be present throughout various portions of the High Line, which can be utilized in the event a given area is shaded and a park user prefers an unshaded area. This is consistent with typical usage of this open space resource, as visitors typically pass along all or significant portions of its extents.

Incremental shadows introduced by the Rezoning Alternative would not negatively affect utilization or enjoyment of the High Line. As mentioned above, no portion of the park would receive incremental shadows for more than approximately 30 minutes, and therefore shadows resulting from the Rezoning Alternative would only affect a single recreational feature for a short period of time. Additionally, although incremental shadows from the Fulton Houses Project Site would be cast on a portion of the park used for programming (i.e., the observation deck), shadows would be limited to the morning hours prior to most park programming.

Regarding vegetation, an "intricate palette of plants that has been selected for the High Line has been chosen based upon a number of important variables, including each plant's adaptability to soil depth, wind, and varying degrees of light exposure."⁴ Over time adjustments are made to the vegetation, reflecting changes to the surrounding built environment and informed by experiences with various species over time. The perpetual evolution of the surrounding built environment was

⁴ *Chelsea Market Expansion EAS*, April 2012. CEQR no. 11DCP120M, page E-9, quoting a communication from Friends of the High Line, dated 2009.

anticipated from the inception of the High Line⁵ and ongoing monitoring and horticultural development of its landscaping is a defining characteristic of the High Line as a living resource in an urban area.⁶ Accordingly, High Line vegetation is not typical of the sunlight-sensitivity of vegetation in some other parks.

As such, incremental shadows would not negatively affect the utilization or enjoyment of this open space resource. The High Line is a unique open space situated in a dense urban environment where the development of taller buildings surrounding the park are inherent to its character, and shadows are not uncommon in this location. Therefore, as the extent and duration of the incremental shadows would (1) not significantly reduce direct sunlight exposure on any of the sunlight-sensitive resources found within this open space, and (2) would not significantly alter the public's use of the park or threaten the viability of vegetation or other resources, incremental shadows on the High Line as a result of the Rezoning Alternative would not be considered a significant adverse impact, in accordance with *CTM* methodology.

Chelsea Park

Chelsea Park is an approximately 4-acre public park located on the block bound by W. 28th Street to the north, 10th Avenue to the west, W. 27th Street to the south, and 9th Avenue to the east and is located directly adjacent to the Elliott-Chelsea Project Site. The park was acquired by the New York City Department of Parks and Recreation (NYC Parks) over 100 years ago. It contains seating areas, picnic areas, and landscaping. It also contains basketball courts, handball courts, a synthetic turf field, and a playground. There is a New York City Department of Health and Mental Hygiene building located in the eastern portion of the park, which is not considered to be part of the open space. Refer to **Figure C.1-2a through Figure C.1-2p** in **Appendix C.1** for a full set of detailed figures illustrating incremental shadows cast on Chelsea Park by the Rezoning Alternative.

As shown in **Table 05.05-5** above, as a result of the Rezoning Alternative, Chelsea Park would receive new incremental shadow coverage from buildings on the Elliott-Chelsea Houses Project Site on all of the four analysis days. Given the location of Chelsea Park directly north and northeast of the Elliott-Chelsea Houses Project Site, shadows from the Rezoning Alternative would be cast on the park throughout the day. Incremental shadows would last for a total of approximately 7 hours 6 minutes (9:23 AM – 4:29 PM [10:23 AM – 5:29 PM EDT]) on March 21/September 21, approximately 7 hours 16 minutes (10:02 AM – 5:18 PM [11:02 AM – 6:18 PM EDT]) on May 6/August 6, approximately 7 hours 23 minutes (10:38 AM – 6:01 PM [11:38 AM – 7:01 PM EDT]) on June 21, and approximately 6 hours 2 minutes (8:51 AM – 2:53 PM) on December 21.

On March 21/September 21, incremental shadows would be cast on portions of Chelsea Park beginning at 9:20 AM [10:20 AM EDT] until the end of the analysis day at 4:29 PM [5:29 PM EDT], a total of 7 hours 9 minutes. This space covered in incremental shadow by the Rezoning Alternative contains the park's turf field, basketball and handball courts. The maximum extent of incremental

⁵ *Designing the Highline: Gansevoort Street to 30th Street*, by Friends of the Highline, 2008, page 31, "New plantings build upon the existing landscape character, working with specific environmental urban conditions and microclimates associated with sun, shade, wet, dry, wind, noise, open and sheltered spaces."

⁶ "The High Line masterclass: join Piet Oudolf for a lesson in prairie planting," *The Telegraph*, 21 Nov 2017. Excerpt: "Plants grow and conditions change," explains the [High Line] Director of Horticulture Andi Pettis, "and new buildings around the High Line change the environment too, casting shade or reflecting heat during the summer".

shadow coverage on this date would occur at approximately 3:36 PM [4:36 PM EDT], as shown in **Figure C.1-2c**.

On May 6/August 6, incremental shadows would be cast on portions of Chelsea Park beginning at 10:02 AM [11:02 AM EDT] until the end of the analysis day 5:18 PM [6:18 PM EDT], a total of 7 hours 16 minutes. This space covered in incremental shadow by the Rezoning Alternative contains the park's turf field, basketball and handball courts. The maximum extent of incremental shadow coverage on this date would occur at approximately 1:35 PM [2:35 PM EDT], as shown in **Figure C.1-2f**.

On June 21, incremental shadows would be cast on portions of Chelsea Park beginning at 10:38 AM until the end of the analysis day 6:01 PM [7:01 PM EDT], a total of 7 hours 23 minutes. This space covered in incremental shadows by the Rezoning Alternative contains the park's turf field, basketball and handball courts, health center building, and seating areas. The maximum extent of incremental shadow coverage on this date would occur at approximately 2:10 PM [3:10 PM EDT], as shown in **Figure C.1-2j**.

On December 21, incremental shadows would be cast on portions of Chelsea Park for the entire analysis day, which begins at 8:51 AM and ends at 2:53 PM. This space covered in incremental shadows by the Rezoning Alternative contains the park's turf field, basketball and handball courts, health center building, and seating areas. The maximum extent of incremental shadow coverage on this date would occur at approximately 1:52 PM, as shown in **Figure C.1-2o**.

Assessment

Chelsea Park would experience incremental shadow coverage from the Rezoning Alternative at the Elliott-Chelsea Houses Project Site on each of the four representative analysis days. The duration would range from 6 hours 2 minutes on December 21 to 7 hours 23 minutes on June 21. The area of incremental shadow coverage on the park would be largest on the December 21 and March 21/September 21 analysis days.

Figure C.1-2p provides an aerial view of Chelsea Park, showing the relative locations of the park's amenities. A synthetic turf play field occupies approximately the western third of the park. East of the turf field are asphalt handball courts and a basketball court. A public restroom is located south of the handball courts. Mature trees are planted in the surrounding areas of the field, handball courts, and basketball court. Per *CTM* guidance, the vegetation within the park could be affected by a loss of sunlight during the growing season, and the active play areas (turf field, handball courts, and basketball court) could be affected by a loss of sunlight throughout the year.

During the growing season (per *CTM* guidance, the period between March and October), shadow coverage would generally be limited to the western and central portions of the park, and would have a relatively small effect on the park's vegetation, which is concentrated in the eastern portion of the park surrounding the handball and basketball courts. Incremental shadows on March 21/September 21 (representing the beginning and end of the growing season) would move from west to east through the park during the analysis day, primarily affecting the artificial turf field in the morning and moving through the vegetated areas of the park in the afternoon, resulting in the complete shading of the vegetation surrounding the handball and basketball courts by

approximately 3:30 PM [4:30 PM EDT]. However, the trees in the park would still receive approximately six hours of direct sunlight throughout the day, which would last from the early morning through the early afternoon, with some intermittent shadow coverage occurring around noon. Per *CTM* guidance, established tree canopies can tolerate partial sunlight, or four to six hours per day. Incremental shadows on May 6/August 6 in the growing season would not reach the vegetation in the eastern portion of the park until approximately 2:15 PM [3:15 PM EDT], providing over seven hours of direct sunlight, which is sufficient for the growth of vegetation. Similarly, on June 21, the vegetated areas of the park would still receive sunlight for most of the day.

As noted above, active uses within the park could be affected by a loss of sunlight (though the park does not contain “warm-weather-dependent” uses, such as spray showers or wading pools, per *CTM* guidance). The artificial turf play field, handball courts, and basketball court in Chelsea Park would all receive incremental shadows on all four analysis days, with the turf field receiving shadows primarily in the morning and early afternoon, and the other courts receiving shadows later in the day. Incremental shadows on active recreational uses during the warmer months surrounding the summer solstice may affect the usability of the open space. However, as shadows are not static and move from west to east throughout the day all of the active uses in the park would continue to receive direct sunlight on all four representative analysis days. At no point during any of the representative analysis days would an incremental shadow result in the complete loss of sunlight on the park.

Incremental shadow coverage on December 21 may affect the utilization or enjoyment of the open space resource. Although impacts to active recreational space are less likely given that temperatures are colder in the winter months and the use of the active recreational space would not be as high (compared to warmer months), shadows may have a substantial effect on the park’s passive features. In particular, benches located in the vicinity of the park’s playground and basketball courts would experience approximately one and a half hours of incremental sunlight loss and would therefore be shaded from noon until the end of the analysis day. On December 21, which is outside the growing season in New York City, shadow coverage would result in the majority of the active uses being shaded in the early afternoon. Given the potential for incremental shadow loss on the park’s passive features, the Rezoning Alternative may affect the utilization or enjoyment of this open space resource.

As noted above, under the No-Action Alternative, shadows cast by the existing Elliott-Chelsea Houses Project Site, including buildings of 12 and 14 stories on the block immediately to the south (Block 724) and buildings of 11 and 21 stories one block to the south (Block 723), also cover portions of Chelsea Park over the course of the day. Under With-Action conditions, there would be differences in the specific shadow durations and coverages due to changes such as larger building volumes, taller heights, and shifts in building footprints. Thus, the Rezoning Alternative reduces the amount of direct sunlight exposure to a resource already receiving a significant amount of shadows from existing buildings.

Therefore, as the extent, time of day and duration of the incremental shadows would (1) significantly reduce direct sunlight exposure on the sunlight-sensitive recreational resources found within this open space; and (2) would alter the public’s use of the park on all four analysis days,

incremental shadows from the Rezoning Alternative on Chelsea Park would be considered a significant adverse impact, in accordance with *CTM* methodology.

Although mitigation measures have not been identified at this time, potential mitigation measures will continue to be explored in consultation with NYC Parks and will be published in the FEIS, if identified. If practicable measures to fully mitigate the impacts cannot be identified, then impacts would remain as unavoidable adverse impacts.

Hudson River Park Esplanade

Hudson River Park Esplanade is a linear waterfront open space owned by the Hudson River Park Trust, running along the Hudson River to the west of the Project Sites from Riverside Park in the north to Battery Park City and Battery Park in the south, with a total area of 528.43 acres. The portion of the esplanade considered to be within the study area for open space (refer to **Chapter 05.04**) has an area of approximately 19.19 acres, and contains a mix of active and passive amenities including running tracks, bike paths, walkways, landscaping, and benches.

As shown in **Table 05.05-5** above, as a result of the Rezoning Alternative, Hudson River Park Esplanade would receive incremental shadows of limited duration from the Rezoning Alternative at the Fulton Houses Project Site on one analysis day. Incremental shadows would reach the esplanade on the June 21 analysis day for approximately 14 minutes: from 5:57 AM to 6:11 AM [6:57 AM to 7:11 AM EDT]. Incremental shadow coverage as a result of the Rezoning Alternative would occur within a limited area containing paved walking paths, bike paths, and landscaping.

Assessment

Hudson River Park Esplanade would experience incremental shadows from the Rezoning Alternative at the Fulton Houses Project Site on one analysis day. Incremental shadow duration would be limited to 14 minutes, and would be confined to a relatively small area of the open space, which is mostly pavement and does not contain sunlight-sensitive recreational uses. Due to the limited size and minimal duration of the incremental shadows cast on Hudson River Park Esplanade, the Rezoning Alternative would not cause an adverse shadows impact on this open space.

PS 33 Playground

PS 33 Playground is part of the Schoolyards to Playgrounds program and owned by the Department of Education. PS 33 Playground is an approximately 0.24-acre playground located on W. 26th Street between 9th and 10th Avenues and is located directly adjacent to the Elliott-Chelsea Project Site. It currently includes amenities such as basketball court, running tracks, playgrounds, and soccer fields.

As shown in **Table 05.05-5** above, the playground would receive incremental shadows from the Rezoning Alternative at the Elliott-Chelsea Houses Project Site on all four analysis days. Given the location of the playground directly northeast of the Elliott-Chelsea Houses Project Site, the playground would mainly receive incremental shadows in the afternoon and evening. Incremental

shadows would last for a total of approximately 4 hours 34 minutes (11:23 AM – 3:57 PM [12:23 PM – 4:57 PM EDT]) on March 21/September 21, approximately 4 hours 50 minutes (11:28 AM – 4:18 PM [2:25 PM – 5:18 PM EDT]) on May 6/August 6, approximately 5 hours 45 minutes (12:16 PM – 6:01 PM [1:16 PM – 7:01 PM EDT]) on June 21, and approximately 3 hours 2 minutes (11:21 AM – 2:23 PM) on December 21. A full set of detailed figures showing incremental shadows cast on PS 33 Playground under the Rezoning Alternative is shown in **Figures C.1-3a through C.1-3l** in **Appendix C.1**.

Assessment

PS 33 Playground would receive incremental shadows from the Rezoning Alternative at the Elliott-Chelsea Houses Project Site on all four analysis days, generally during the midday and afternoon. However, as shown in **Figures C.1-3a through C.1-3l**, the area of incremental shadow cover from the Rezoning Alternative would be relatively moderate compared to the area of the park shaded by buildings in the No-Action Alternative conditions during most times. At their most significant, incremental shadows would cover approximately 70 percent of the resource's total area.

As shown in **Figure C.1-3m**, the only vegetation in the park consists of six trees located on the playground's southern edge along W. 26th Street. Generally, on the three analysis days constituting the growing season (March 21/September 21, May 6/August 6, and June 21), the trees would receive between approximately 2 and 4.5 hours of direct sunlight, with the most substantial shadow coverage occurring on the March 21 analysis day. Per *CTM* guidance, given that the tree canopy consists of mature trees with a height of 25 feet or greater, the vegetation within PS 33 Playground should receive a minimum of approximately 4-6 hours of direct sunlight per day. Therefore, a significant shadows impact to vegetation is possible as a result of the Rezoning Alternative.

As shown in **Figure C.1-3m**, active amenities within the playground include a basketball court in the western portion of the park, a playground and track within the eastern portion of the park, and an artificial turf area in the middle. As shadows move west to the east throughout the day, the basketball court would generally receive incremental shadows first, before moving onto the turf area and playground. Given the movement of shadows from west to east and the orientation of building massing in the Rezoning Alternative, different features of the park would receive incremental shadows throughout the morning. By mid-afternoon, all three features of the playground would receive incremental shadows from the Rezoning Alternative. Although incremental shadows would increase shadow coverage on all four analysis days, shadows are greatest in both duration and coverage on the June 21 analysis day, and least significant on the December 21 analysis day.

Under existing conditions, the playground already receives substantial shadows coverage from existing buildings. This means that incremental shadows cast by the Rezoning Alternative may result in a total loss of sunlight to the playground, particularly during the warm weather months (May 6/August 6 and June 21) and in the afternoon when use of the resource is expected to be high.

Therefore, as the extent, time of day and duration of the incremental shadows would (1) significantly reduce direct sunlight exposure on the sunlight-sensitive resources found within this open space; and (2) would alter the public's use of the playground, incremental shadows from the

Proposed Project on PS 33 Playground would be considered a significant adverse impact, in accordance with *CTM* methodology.

Although mitigation measures have not been identified at this time, potential mitigation measures will continue to be explored in consultation with NYC Parks and will be published in the FEIS, if identified. If practicable measures to fully mitigate the impacts cannot be identified, then impacts would remain as unavoidable adverse impacts.

14th Street Park

14th Street Park is an approximately 0.56-acre park owned by the Hudson River Park Trust. It is located on W. 14th Street and 10th Avenue and includes passive amenities such as walkways, benches, and landscaping. As shown in **Table 05.05-5** above, the park would receive incremental shadows of limited duration from the Rezoning Alternative at the Fulton Houses Project Site on two analysis days. Incremental shadows would reach the park on the May 6/August 6 analysis day for approximately 31 minutes from 6:11 AM to 6:42 AM [7:11 AM to 7:42 AM EDT], and for approximately 20 minutes on the June 21 analysis day from 5:57 AM to 6:17 AM [6:57 AM to 7:17 AM].

Assessment

14th Street Park would experience incremental shadows from the Rezoning Alternative at the Fulton Houses Project Site on two analysis days. However, incremental shadow duration would be limited to 31 minutes on May 6/August 6 and 20 minutes on June 21, and would be confined to a relatively small area of the open space, which contains benches and landscaping. Shadows from the Rezoning Alternative would not affect the vegetation in this park or affect the use or enjoyment of any recreational amenities. Due to the limited size and minimal duration of the incremental shadows cast on 14th Street Park, the Rezoning Alternative would not cause an adverse shadows impact on this open space.

Greenstreet at 9th Avenue

The Parks Department and NYC Department of Transportation (DOT) jointly administer the Greenstreets program, which maintains landscaped areas within the right-of-way of City streets. 9th Avenue is a one-way southbound street with three moving lanes, on-street parking on both sides, and a protected bike lane along the east side. The 9th Avenue Greenstreet consists of small, landscaped traffic islands located near intersections along the east side of 9th Avenue. The amount of vegetation within the Greenstreet is limited.

9th Avenue is located directly east of both the Fulton Houses Project Site and Elliott-Chelsea Houses Project Site, and therefore incremental shadows from both Project Sites would reach the 9th Avenue Greenstreet in the afternoon and evening. As shown in **Table 05.05-5**, above, the Greenstreet would receive incremental shadow coverage on all four representative analysis days.

Incremental shadows cast from the Elliott-Chelsea Houses Project Site as a result of the Rezoning Alternative would occur during the March 21/September 21, May 6/August 6, and June 21 analysis

days. The duration of new shadow coverage would be 1 hour 14 minutes (3:15 PM – 4:29 PM [4:15 PM – 5:29 PM EDT]) on March 21/September 21; 1 hour 51 minutes (3:27 PM – 5:18 PM [4:27 PM – 6:18 PM EDT]) on May 6/August 6, and 1 hour 43 minutes (4:18 PM – 6:01 PM [5:18 PM – 7:01 PM EDT]) on June 21. Incremental shadow from the Rezoning Alternative at the Elliott-Chelsea Houses Project Site would be cast on the 9th Avenue Greenstreet between W. 26th and W. 28th Streets. As shown in **Figure C.1-4a through C.1-4c** in **Appendix C.1**, the area cast in shadow includes small, landscaped traffic islands; there are no recreational amenities within this area.

Incremental shadows cast from the Fulton Houses Project Site as a result of the Rezoning Alternative would be cast on all four analysis days, ranging from 38 minutes on December 21 (2:15 PM – 2:53 PM) to 4 hours 49 minutes on June 21 (1:12 PM – 6:01 PM [2:12 PM – 7:01 PM EDT]). Incremental shadow from the Rezoning Alternative at the Fulton Houses Project Site would be cast on the 9th Avenue Greenstreet between W. 16th and W. 21st Streets. As shown in **Figure C.1-4d through C.1-4k**, the area cast in shadow includes small, landscaped traffic islands; there are no recreational amenities within this area.

Assessment

The Greenstreet would receive incremental shadows from the Fulton Houses Project Site as a result of the Rezoning Alternative on all four analysis days. The landscaped traffic islands between W. 16th and W. 21st Streets that would receive shadows from the Fulton Houses Project Site do not contain any recreational features or amenities, and are mostly planted with flowers and small shrubs (which can tolerate partial sunlight). There are large shrubs planted in the Greenstreet at the intersection of 9th Avenue and W. 20th Street and the intersection of 9th Avenue and W. 21st Street. This segment of the Greenstreet would receive afternoon shadows of under five hours on all analysis days, and would continue to receive adequate sunlight during the growing season (at least the six to eight hours specified in the *CTM*).

The Greenstreet would receive incremental shadows from the Elliott-Chelsea Houses Project Site as a result of the Rezoning Alternative on three analysis days. However, the area affected by these incremental shadows would be minimal, occurring only in the afternoon on the March 21/September 21, May 6/August 6, and June 21 analysis days for durations of under two hours. As shadows are not static and move from west to east throughout the day, the Greenstreet in the vicinity of the Elliott-Chelsea Houses Project Site would continue to receive some direct sunlight on all representative analysis days.

As the 9th Avenue Greenstreet would continue to receive direct sunlight on all analysis days and would receive adequate sunlight during the growing season, and since incremental shadows from the Rezoning Alternative would not affect the use or enjoyment of any amenities, the Rezoning Alternative would not cause an adverse shadows impact to the 9th Avenue Greenstreet.

Church of the Holy Apostles

The Church of the Holy Apostles is an Episcopal parish located on the corner of 9th Avenue and W. 28th Street in the Chelsea neighborhood. The church was constructed between 1845 and 1848 as a place of worship for those who worked along the West Side of Manhattan's Hudson River waterfront. It was designated a landmark by the New York City Landmarks Preservation

Commission (LPC) in 1966. In its designation, LPC has noted that the interesting feature of the church is its spire, which is enhanced by its unusual detail. The church was also listed on the State and National Registers of Historic Places in 1980 and 1972, respectively.

The church is located directly to the east of the Elliott-Chelsea Houses Project Site, and as such it would receive incremental shadows from the Rezoning Alternative in the afternoon and evening. As shown in **Table 05.05-5**, above, the church would receive incremental shadow coverage on the March 21/September 21, May 6/August 6, and June 21 representative analysis days. The duration of new shadow coverage would be 50 minutes (3:39 PM – 4:29 PM [4:39 PM – 5:29 PM EDT]) on March 21/September 21; 1 hour 38 minutes (3:40 PM – 5:18 PM [4:40 PM – 6:18 PM EDT]) on May 6/August 6; and 2 hours 9 minutes (3:40 PM – 6:01 PM [4:40 PM – 7:01 PM EDT]) on June 21. Incremental shadows from the Rezoning Alternative would be cast on the church's southern and western facades, which include stained-glass windows. **Figures C.1-5a through C.1-5d** show the maximum extent of project-generated shadows from the Rezoning Alternative on the church for the three relevant analysis days.

Assessment

The Church of the Holy Apostles would receive incremental shadows from the Rezoning Alternative at the Elliott-Chelsea Houses Project Site on three analysis days (the March 21/September 21, May 6/August 6, and June 21) for brief periods in the late afternoon and evening. **Figure C.1-5e** shows a 3d representation of the historic church looking northeast towards the church's southern and western frontages from the direction of the Elliott-Chelsea Houses Project Site, which would be shaded by the Rezoning Alternative. As shown in the figure, the southern and western frontages of the church, which would receive incremental shadows, both contain stained-glass windows. The church's western façade (facing 9th Avenue) features a single large, arched stained-glass window. The southern façade features several smaller stained-glass windows. The historic church spire was identified as a contributing feature to the LPC historic determination, but is not considered sunlight sensitive per *CTM* guidance as it does not contain any stained glass windows or architectural features, such as ornate carvings or recesses, which rely on sunlight for the public's enjoyment.

On the March 21/September 21 analysis day, incremental shadows from the Rezoning Alternative would briefly cover the western and southern facades at the end of the day, including the stained-glass windows and a portion of the spire. **Figure C.1-5b** shows the maximum extent of incremental shadow coverage on the May 6/August 6 analysis day. On that day, incremental shadow coverage would cover the entire church at the end of the analysis day at 5:18 PM. On the June 21 analysis day, incremental shadow coverage would be at its greatest extent around 5:12 PM, after which shadows from the existing buildings would cover most of the church (as shown in **Figure C.1-5c**).

Though the Church of the Holy Apostles would receive project-generated incremental shadows on three analysis days, and the shadows would reach sunlight-sensitive features of the church (shown in **Figure C.1-5a through C.1-5d**), it is unlikely that the increase in shadow coverage would noticeably affect the use or enjoyment of these sunlight-sensitive features by the public, per *CTM* guidance. The stained-glass windows would receive direct sunlight throughout most of the day on all four analysis days, only receiving incremental shadows briefly in the late afternoon and

evening. The public experience of the stained-glass windows would be largely unaffected. In addition, Holy Eucharist services are held on-site at 9:00 AM and 11:00 AM.⁷ These events and any other church programming occurring in the morning and early afternoon would not be affected by the incremental shadows. The church would not receive incremental shadows on the December 21 analysis day.

Given that the incremental shadows from the Rezoning Alternative would not affect the use or enjoyment of sunlight-sensitive features of the Church of the Holy Apostles, the Rezoning Alternative would not cause an adverse shadows impact on this historic resource.

18th Street Plaza

18th Street Plaza is a planned Privately Owned Public Space (POPS). It is currently under construction and is expected to be completed in early 2025. It will be a 0.22-acre plaza located along 10th Avenue between W. 17th Street and W. 18th Street to the east of the High Line. The open space will include passive amenities such as landscaping, walkways, and benches.

As shown in **Table 05.05-5** above, as a result of the Rezoning Alternative, 18th Street Plaza would receive new incremental shadow coverage from buildings on the Fulton Houses Project Site on the March 21/September 21 and December 21 analysis days. Given the location of the 18th Street Plaza to the west of the Fulton Houses Project Site, shadows from the Rezoning Alternative would be cast on the plaza in the morning hours. Incremental shadows would last for a total of approximately 2 hours 13 minutes (8:00 AM – 10:13 AM [9:00 AM – 11:13 AM EDT]) on March 21/September 21 and approximately 1 hour 17 minutes (8:51 AM – 10:08 AM) on December 21. Incremental shadows cast by the Rezoning Alternative on the 18th Street Plaza are shown in **Figure C.1-6a through C.1-6c**.

Assessment

18th Street Plaza would receive incremental shadows on two analysis days. On the March 21/September 21 analysis day, incremental shadows would cover a portion of the plaza for approximately 2 hours 13 minutes. Given that shadows are not static and would move southwest to northeast throughout the morning, the incremental shadows cast by the Rezoning Alternative at the Fulton Houses Project Site would only cover specific areas of the park for a limited time. As shown in **Figure C.1-6a and C.1-6b**, no more than a maximum of approximately 30 percent of the resource would receive incremental shadows at any given time. All portions of the plaza would receive a minimum of six hours of direct sunlight on this analysis day.

On the December 21 analysis day, 18th Street Plaza would receive incremental shadows for approximately 1 hour 17 minutes in the morning hours. Due to substantial coverage of the resource due to existing shadows on this analysis day, incremental shadows would be limited to a small portion in the north of the resource (see **Figure C.1-6c**). The resource would continue to be covered in shadows for a majority of the day, as under existing conditions.

⁷ Event schedule retrieved from the Church of the Holy Apostles website: <https://holypostlesnyc.org/church/>

18th Street Plaza would receive incremental shadows on only one analysis day within the growing season per *CEQR Technical Manual* methodology (March 21/September 21). Given that all parts of the resource would continue to receive direct sunlight for a minimum of six hours on this analysis day, vegetation within 18th Street Plaza would not be significantly affected by incremental shadows cast by the Rezoning Alternative on the plaza. Additionally, incremental shadows on both analysis days would be limited in duration and scope, and would not create a noticeably different condition than in future No-Action conditions.

Given that the incremental shadows from the Rezoning Alternative would not affect the use or enjoyment of sunlight-sensitive features of the 18th Street Plaza, the Rezoning Alternative would not cause an adverse shadows impact on this open space resource.

Project-Generated Open Space

Pursuant to *CTM* guidance, shadows on project-generated open space are not considered significant. However, as future project-generated open space is included as part of the analysis presented in **Chapter 05.04**, a discussion of how shadows could affect the new open space planned as part of the Rezoning Alternative is provided below.

As discussed in **Chapter 05.04**, the new open space in the Project Sites would be located in building courtyards and in the area between buildings. Refer to **Figures 05.04-7a and 05.04-7b in Chapter 05.04**, for illustrative plans showing the proposed open space associated with the Rezoning Alternative. Though the design of the open space is evolving, and specific features are subject to change, the open space at both Project Sites is expected to include a mix of active and passive amenities, including play areas, seating areas, dog walks, basketball courts, community gardens, and landscaping.

On the March 21/September 21, May 6/August 6, June 21, and December 21 representative analysis days, project-generated shadow coverage on future open space is expected to be greatest during the early to late morning hours (several hours after the start of the analysis period). However, it is anticipated that the majority of the future open space would receive adequate direct sunlight throughout the day (at least the six to eight hour minimum specified in the *CTM*) during the growing season, March to September, and vegetation would not be affected. As the programming for the project-generated open space is not yet finalized, it is not certain what types of features and amenities would experience incremental shadow coverage. However, it is expected that the future open space would be designed and planted with vegetation tolerant of the shading conditions to account for project-generated shadows. No significant adverse impacts would occur as a result of shadows on project-generated open space under the Rezoning Alternative.

Alternative 3 – Non-Rezoning Alternative

For the Non-Rezoning Alternative, shadow analyses were performed for eleven sunlight-sensitive resources identified above (refer to **Table 05.05-6**). The same methodology for shadows analysis was used for the Non-Rezoning Alternative as was used for the Rezoning Alternative, which is described above. The effects of shadows from the Non-Rezoning Alternative on individual sunlight-sensitive resources are described below. For detailed descriptions of each resource, refer to the section on **Alternative 2 – Rezoning Alternative**, above.

As shown in **Table 05.05-6**, below, incremental project-generated shadows from the Non-Rezoning Alternative would reach six of the 24 sunlight-sensitive resources identified in the Tier 3 assessment, when taking into account the presence of intervening buildings. Compared to the Rezoning Alternative, the size and duration of incremental shadow coverage under the Non-Rezoning Alternative would generally be smaller. In contrast to the Rezoning Alternative, 14th Street Park and Hudson River Park Esplanade would not receive incremental shadows under the Non-Rezoning Alternative. **Figures C.1-7 through C.1-12 in Appendix C.1** show the extent of incremental shadows from the Non-Rezoning Alternative on sunlight-sensitive resources during each analysis day at the time when the area of the sunlight-sensitive resource shaded by incremental shadows from the Non-Rezoning Alternative is greatest (incremental shadows on the 9th Avenue Greenstreet are not shown in the figures due to their minimal size, duration, and/or effect, but are discussed qualitatively below).

Table 05.05-6: Duration of Incremental Shadows on Sunlight Sensitive Resources – Non-Rezoning Alternative

Sunlight Sensitive Resource	Analysis Day	March 21/Sept. 21	May 6/August 6	June 21	December 21
		7:36 AM - 4:29 PM	6:27 AM - 5:18 PM	5:57 AM - 6:01 PM	8:51 AM - 2:53 PM
The High Line	Shadow Enter-Exit Time	Fulton: 7:36 AM - 8:15 AM EC: 7:36 AM - 10:02 AM	EC: 6:27 AM - 8:48 AM	EC: 5:57 AM - 8:17 AM	Fulton: 8:51 AM - 9:28 AM EC: 8:51 AM - 11:49 AM
	Incremental Shadow Duration	Fulton: 39 Minutes EC: 2 hours 26 minutes	EC: 2 hours 21 minutes	EC: 2 hours 20 minutes	Fulton: 37 minutes EC: 2 hours 58 minutes
Chelsea Park	Shadow Enter-Exit Time	EC: 9:35 AM - 4:29 PM	EC: 10:11 AM - 5:18 PM	EC: 10:52 AM - 6:01 PM	EC: 8:51 AM - 2:53 PM
	Incremental Shadow Duration	EC: 6 hours 54 minutes	EC: 7 hours 7 minutes	EC: 7 hours 9 minutes	EC: 6 hours 2 minutes
P.S. 33 Playground	Shadow Enter-Exit Time	EC: 1:11 PM - 3:04 PM	EC: 12:36 PM - 4:19 PM, 4:37 PM - 5:18 PM	EC: 1:54 PM - 6:01 PM	EC: 1:42 PM - 2:23 PM
	Incremental Shadow Duration	EC: 1 hour 53 minutes	EC: 4 hours 24 minutes	EC: 4 hours 57 minutes	EC: 41 minutes
Greenstreet at 9th Avenue	Shadow Enter-Exit Time	Fulton: 2:06 PM - 4:29 PM EC: 3:38 PM - 3:53 PM, 4:05 PM - 4:29 PM	Fulton: 1:41 PM - 5:18 PM EC: 4:06 PM - 5:18 PM	Fulton: 1:44 PM - 6:01 PM EC: 4:21 PM - 5:20 PM	Fulton: 2:17 PM - 2:53 PM
	Incremental Shadow Duration	Fulton: 2 hours 23 minutes EC: 39 minutes	Fulton: 3 hours 37 minutes EC: 1 hour 12 minutes	Fulton: 4 hours 17 minutes EC: 59 minutes	Fulton: 36 minutes
Church of the Holy Apostles	Shadow Enter-Exit Time	EC: 4:17 PM - 4:29 PM	EC: 4:31 PM - 5:18 PM	EC: 4:30 PM - 6:01 PM	-
	Incremental Shadow Duration	12 minutes	EC: 47 minutes	EC: 1 hour 31 minutes	-
18th Street Plaza	Shadow Enter-Exit Time	Fulton: 7:36 AM - 8:29 AM	-	-	Fulton: 8:51 AM - 9:51 AM
	Incremental Shadow Duration	Fulton: 53 minutes	-	-	Fulton: 1 hour

Notes:

All times are Eastern Standard Time; Daylight Savings Time was not accounted for per *CTM* guidance.

Table indicates the entry and exit times and total duration of incremental shadow for each sunlight-sensitive resource.

“Fulton” = Fulton Houses Project Site, “EC” = Elliott-Chelsea Houses Project Site.

Sunlight Sensitive Resources

The High Line

In the Non-Rezoning Alternative, the High Line would receive incremental shadow from development on the Project Sites. Compared to the Rezoning Alternative, these shadows would generally cover smaller areas and occur for shorter periods, which would still occur during the

morning. The duration of coverage from the Elliott-Chelsea Houses Project Site would range from 2 hours 20 minutes on June 21 to 2 hours 58 minutes on December 21, while the duration of coverage from the Fulton Houses Project Site would be 37 minutes on December 21 and 39 minutes on March 21/September 21. Incremental shadows under the Non-Rezoning Alternative would generally last for approximately 45-minutes to 1.5-hours shorter than under the Rezoning Alternative (see **Table 05.05-6**). As shown in **Figures C.1-7a through C.1-7i**, the maximum physical area shaded by the Non-Rezoning Alternative would be limited.

Assessment

Incremental shadows coverage of the High Line resulting from the Non-Rezoning Alternative would be limited in duration and size compared to the Rezoning Alternative. As such, the conclusions described above in the **Alternative 2 – Rezoning Alternative** section for the High Line would also apply to the Non-Rezoning Alternative. No significant adverse shadows impacts would occur to the High Line as a result of the Non-Rezoning Alternative.

Chelsea Park

In the Non-Rezoning Alternative, Chelsea Park would receive incremental shadows from the Elliott-Chelsea Houses Project Site on all four analysis days. These incremental shadows would generally cover similar physical areas or slightly smaller areas throughout the year compared to the Rezoning Alternative. The duration of incremental shadow coverage would range from 6 hours 54 minutes on March 21/September 21 to 7 hours 9 minutes on June 21, lasting for approximately the same amount of time as under the Rezoning Alternative on the December 21 analysis day, 10 minutes shorter than under the Rezoning Alternative on the May 6/August 6 analysis day, and 15 minutes shorter than under the Rezoning Alternative on March 21/September 21 and June 21 analysis days. (see **Table 05.05-6**). The maximum extent of incremental shadow coverage on the park would occur at approximately 3:36 PM [4:36 PM EDT] on March 21/September 21, 1:36 PM [2:36 PM EDT] on May 6/August 6, 3:10 PM [4:10 PM EDT] on June 21, and 1:52 PM on December 21. Incremental shadows at these times are shown in **Figures C.1-8a through C.1-8p** in **Appendix C.1**.

Assessment

Incremental shadows coverage of Chelsea Park resulting from the Non-Rezoning Alternative would be smaller in duration and size as compared to the Rezoning Alternative. However, due to the close proximity of the Elliott-Chelsea Houses Project Site to Chelsea Park, the conclusions described above in the **Alternative 2 – Rezoning Alternative** section for Chelsea Park would also apply to the Non-Rezoning Alternative for all four analysis days.

Therefore, as the extent, time of day and duration of the incremental shadows would (1) significantly reduce direct sunlight exposure on the sunlight-sensitive recreational resources found within this open space; and (2) would alter the public's use of the park, incremental shadows from the Rezoning Alternative on Chelsea Park would be considered a significant adverse impact, in accordance with *CTM* methodology.

Although mitigation measures have not been identified at this time, potential mitigation measures will continue to be explored in consultation with NYC Parks and will be published in the FEIS, if identified. If practicable measures to fully mitigate the impacts cannot be identified, then impacts would remain as unavoidable adverse impacts.

PS 33 Playground

In the Non-Rezoning Alternative, PS 33 Playground would receive incremental shadows from the Elliott-Chelsea Houses Project Site on all four analysis days. The duration of the shadow coverage in the Non-Rezoning Alternative would range from 41 minutes on December 21 to 4 hours 57 minutes on June 21, as shown in **Table 05.05-6**. The duration of shadow coverage on the playground would range from approximately 1.5 hours to two hours less than in the Rezoning Alternative. The full set of detailed images illustrating incremental shadows on the park on each analysis day is shown in **Figures C.1-9a through C.1-9h**.

Assessment

Incremental shadows coverage of PS 33 Playground in the Non-Rezoning Alternative would be less than in the Rezoning Alternative. However, due to the close proximity of the Elliott-Chelsea Houses Project Site to PS 33 Playground, the conclusions described above in the **Alternative 2 – Rezoning Alternative** section for PS 33 Playground would also apply to the Non-Rezoning Alternative for all four analysis days.

Therefore, as the extent, time of day and duration of the incremental shadows would (1) significantly reduce direct sunlight exposure on the sunlight-sensitive resources found within this open space; and (2) would alter the public's use of the playground, incremental shadows from the Rezoning Alternative on Chelsea Park would be considered a significant adverse impact, in accordance with *CTM* methodology.

Although mitigation measures have not been identified at this time, potential mitigation measures will continue to be explored in consultation with NYC Parks and will be published in the FEIS, if identified. If practicable measures to fully mitigate the impacts cannot be identified, then impacts would remain as unavoidable adverse impacts.

Greenstreet at 9th Avenue

In the Non-Rezoning Alternative, the 9th Avenue Greenstreet would receive incremental shadows from the Fulton Houses Project Site on all four analysis days, and from the Elliott-Chelsea Houses Project Site on March 21/September 21, May 6/August 6 and June 21 (refer to **Table 05.05-6**). The duration of shadows cast from the Non-Rezoning Alternative at the Fulton Houses Project Site would range from 36 minutes on December 21 to 4 hours 17 minutes on June 21. The duration of shadows cast from the Non-Rezoning Alternative at the Elliott-Chelsea Houses Project Site would be 39 minutes on March 21/September 21 and 1 hour 12 minutes on May 6/August 6. The duration of incremental shadow coverage would generally be approximately 15 to 30 minutes shorter compared to the Rezoning Alternative (the duration on June 21 would be approximately the same under both alternatives), and the physical shaded area would generally be smaller

compared to the Rezoning Alternative. Incremental shadows cast by the Non-Rezoning on the Greenstreet at 9th Avenue are illustrated in **Figure C.1-10a through C.1-10k**.

Assessment

Incremental shadows coverage of the 9th Avenue Greenstreet in the Non-Rezoning Alternative would be equal to or less than in the Rezoning Alternative. As such, the conclusions described above in the **Alternative 2 – Rezoning Alternative** section for the 9th Avenue Greenstreet would also apply to the Non-Rezoning Alternative. No significant adverse shadows impacts would occur to the 9th Avenue Greenstreet as a result of the Non-Rezoning Alternative.

Church of the Holy Apostles

In the Non-Rezoning Alternative, the Church of the Holy Apostles would receive incremental shadows from the Elliott-Chelsea Houses Project Site on three analysis days: March 21/September 21, May 6/August 6 and June 21 (refer to **Figure C.1-11a through C.1-11c**). The duration would be 12 minutes on March 21/September 21, 47 minutes on May 6/August 6 and 1 hour 31 minutes on June 21. The duration of new shadow coverage on the church would be approximately 40 minutes shorter on the March 21/September 21, May 6/August 6, June 21 analysis days, compared to the Rezoning Alternative, as shown in **Table 05.05-6**.

Assessment

Incremental shadows coverage of the Church of the Holy Apostles in the Non-Rezoning Alternative would be less than in the Rezoning Alternative. As such, the conclusions described above in the **Alternative 2 – Rezoning Alternative** section for this resource would also apply to the Non-Rezoning Alternative. No significant adverse shadows impacts would occur to the Church of the Holy Apostles as a result of the Non-Rezoning Alternative.

18th Street Plaza

In the Non-Rezoning Alternative, the 18th Street Plaza would receive incremental shadow from development on the Fulton Houses Project Site on the March 21/September 21 and December 21 analysis days. Compared to the Rezoning Alternative, these shadows would generally cover smaller areas and occur for shorter periods, which would still occur during the morning. Incremental shadows would occur for 53 minutes (7:36 AM - 8:29 AM EST [8:36 AM - 9:29 AM EDT]) on the March 21/September 21 analysis day and for 1 hour (8:51 AM - 9:51 AM [9:51 AM - 10:51 AM]) on the December 21 analysis day. As shown in **Figures C.1-12a and C.1-12b**, the physical area shaded by the Non-Rezoning Alternative would be limited.

Assessment

Incremental shadows coverage of the 18th Street Plaza resulting from the Non-Rezoning Alternative would be limited in duration and size compared to the Rezoning Alternative. As such, the conclusions described above in the **Alternative 2 – Rezoning Alternative** section for the 18th Street Plaza would also apply to the Non-Rezoning Alternative. No significant adverse shadows impacts would occur to the 18th Street Plaza as a result of the Non-Rezoning Alternative.

Project-Generated Open Space

As discussed in **Chapter 05.04**, the new open space in the Project Sites under the Non-Rezoning Alternative would be located in building courtyards and in the area between buildings. Refer to **Figures 05.04-10a and 05.04-10b in Chapter 05.04**, for illustrative plans showing the proposed open space associated with the Non-Rezoning Alternative. Though the design of the open space is evolving, and specific features are subject to change, the open space at both Project Sites is expected to include a mix of active and passive amenities, including play areas, seating areas, dog walks, basketball courts, community gardens, and landscaping.

On the March 21/September 21, May 6/August 6, June 21, and December 21 representative analysis days, project-generated shadow coverage on future open space is expected to be greatest during the early to late morning hours (several hours after the start of the analysis period). However, it is anticipated that the majority of the future open space would receive adequate direct sunlight throughout the day (at least the six to eight hour minimum specified in the *CTM*) during the growing season, March to September, and vegetation would not be affected. As the programming for the project-generated open space is not yet finalized, it is not certain what types of features and amenities would experience incremental shadow coverage. However, it is expected that the future open space would be designed and planted with vegetation tolerant of the shading conditions to account for project-generated shadows. No significant adverse impacts would occur as a result of shadows on project-generated open space in the Non-Rezoning Alternative.

Alternative 4 – Midblock Bulk Alternative

For the Midblock Bulk Alternative, detailed shadow analyses were performed for 11 sunlight-sensitive resources identified above (refer to **Table 05.05-6**).⁸ The same methodology for shadows analysis was used for the Midblock Bulk Alternative as for the Rezoning Alternative and Non-Rezoning Alternative, which is described above. The effects of shadows from the Midblock Bulk Alternative on individual sunlight-sensitive resources are described below. For detailed descriptions of each resource, refer to the section on **Alternative 2 – Rezoning Alternative**, above.

As shown in **Table 05.05-7**, below, incremental project-generated shadows from the Midblock Bulk Alternative would reach 11 of the 24 sunlight-sensitive resources identified in the Tier 3 assessment (which is provided in **Figures 05.05-3a and 05.05-3b**), when taking into account the presence of intervening buildings. Because of the reorientation of bulk and height in the Midblock Bulk Alternative, incremental shadows vary in size and duration as compared to the Rezoning Alternative and the Non-Rezoning Alternative. In contrast to shadows resulting from the Fulton Houses Project Site as under the Rezoning Alternative, Hudson River Park would receive incremental shadows under the Midblock Bulk Alternative. **Figures C.1-13 through C.1-15** show the extent of incremental shadows from the Midblock Bulk Alternative on sunlight-sensitive

⁸ The Tier 3 Assessment found that, in the absence of any intervening buildings, 16 resources could potentially receive incremental shadows as a result of the Midblock Bulk Alternative. However, once intervening buildings are accounted for (as is the case in a detailed shadows analysis), only 11 resources received incremental shadows from the Midblock Bulk Alternative. For this reason, only 11 resources are analyzed in this section. The five resources identified in the Tier 3 assessment that are excluded from the detailed shadows analysis are 450 W. 33rd Street, 401 W. 31st Street, 500 W. 30th Street, Penn South Playground, and the Greenstreet at W. 14th Street.

resources during each analysis day at the time when the area of the sunlight-sensitive resource shaded by incremental shadows from the Midblock Bulk Alternative is greatest (incremental shadows on the Hudson River Park Esplanade, Pier 57 Rooftop Park, 14th Street Park, Little Island, 9th Avenue Greenstreet, and Hudson River are not shown in the figures due to their minimal size, duration, and/or effect, but are discussed qualitatively below).

Table 05.05-7: Duration of Incremental Shadows on Sunlight Sensitive Resources – Midblock Bulk Alternative

Sunlight Sensitive Resource	Analysis Day	March 21/Sept. 21	May 6/August 6	June 21	December 21
		7:36 AM - 4:29 PM	6:27 AM - 5:18 PM	5:57 AM - 6:01 PM	8:51 AM - 2:53 PM
The High Line	Shadow Enter-Exit Time	Fulton: 7:36 AM - 10:00 AM EC: 7:36 AM - 11:21 AM	Fulton: 6:27 AM - 9:20 AM EC: 6:27 AM - 9:31 AM	Fulton: 7:16 AM - 9:28 AM EC: 5:57 AM - 9:44 AM	Fulton: 8:51 AM - 9:50 AM EC: 8:51 AM - 12:38 PM
	Incremental Shadow Duration	Fulton: 2 hours 24 minutes EC: 7:36 AM - 11:21 AM	Fulton: 3 hours 3 minutes EC: 6:27 AM - 9:31 AM	Fulton: 2 hours 12 minutes EC: 5:57 AM - 9:44 AM	Fulton: 59 minutes EC: 8:51 AM - 12:38 PM
Chelsea Park	Shadow Enter-Exit Time	EC: 9:23 AM - 4:29 PM	EC: 10:02 AM - 5:18 PM	EC: 10:38 AM - 6:01 PM	EC: 8:51 AM - 2:53 PM
	Incremental Shadow Duration	EC: 7 hours 6 minutes	EC: 7 hours 16 minutes	EC: 7 hours 23 minutes	EC: 6 hours 2 minutes
Hudson River Park Esplanade	Shadow Enter-Exit Time	Fulton: 7:59 AM - 8:18 AM	-	Fulton: 5:57 AM - 6:10 PM	-
	Incremental Shadow Duration	Fulton: 19 minutes	-	Fulton: 13 minutes	-
P.S. 33 Playground	Shadow Enter-Exit Time	EC: 11:23 AM - 3:57 PM	EC: 11:28 AM - 4:18 PM	EC: 12:16 PM - 6:01 PM	EC: 11:21 AM - 2:23 PM
	Incremental Shadow Duration	EC: 4 hours 34 minutes	EC: 4 hours 50 minutes	EC: 5 hours 45 minutes	EC: 3 hours 2 minutes
Pier 57 Rooftop Park	Shadow Enter-Exit Time	-	Fulton: 6:27 AM - 6:29 AM	-	-
	Incremental Shadow Duration	-	Fulton: 2 minutes	-	-
14th Street Park	Shadow Enter-Exit Time	-	Fulton: 6:27 AM - 6:31 AM	Fulton: 5:57 AM - 6:15 AM	-
	Incremental Shadow Duration	-	Fulton: 4 minutes	Fulton: 18 minutes	-
Little Island	Shadow Enter-Exit Time	-	-	Fulton: 5:57 AM - 6:00 AM	-
	Incremental Shadow Duration	-	-	Fulton: 3 minutes	-
Greenstreet at 9th Avenue	Shadow Enter-Exit Time	Fulton: 2:01 PM - 4:29 PM EC: 3:15 PM - 4:29 PM	Fulton: 1:35 PM - 5:14 PM EC: 3:27 PM - 5:18 PM	Fulton: 1:35 PM - 6:01 PM EC: 4:18 PM - 6:01 PM	Fulton: 2:19 PM - 2:53 PM
	Incremental Shadow Duration	Fulton: 2 hours 28 minutes EC: EC: 1 hour 14 minutes	Fulton: 3 hours 29 minutes EC: 1 hour 51 minutes	Fulton: 4 hours 26 minutes EC: 1 hour 43 minutes	Fulton: 34 minutes
Church of the Holy Apostles	Shadow Enter-Exit Time	EC: 3:39 PM - 4:29 PM	EC: 3:40 PM - 5:18 PM	EC: 3:52 PM - 6:01 PM	-
	Incremental Shadow Duration	EC: 50 minutes	EC: 1 hour 38 minutes	EC: 2 hours 9 minutes	-
Hudson River	Shadow Enter-Exit Time	Fulton: 7:36 AM - 7:50 AM	-	Fulton: 5:57 AM - 6:10 AM	Fulton: 8:51 AM - 8:55 AM
	Incremental Shadow Duration	Fulton: 14 minutes	-	Fulton: 13 minutes	Fulton: 4 minutes
18th Street Plaza	Shadow Enter-Exit Time	Fulton: 7:36 AM - 10:36 AM	Fulton: 8:55 AM - 9:28 AM	-	Fulton: 8:51 AM - 10:06 AM
	Incremental Shadow Duration	Fulton: 3 hours	Fulton: 33 minutes	-	Fulton: 1 hour 15 minutes

Notes:

All times are Eastern Standard Time; Daylight Savings Time was not accounted for per *CTM* guidance

Table indicates the entry and exit times and total duration of incremental shadow for each sunlight-sensitive resource.

“Fulton” = Fulton Houses Project Site, “EC” = Elliott-Chelsea Houses Project Site.

Sunlight Sensitive Resources

The High Line

In the Midblock Bulk Alternative, the High Line would receive incremental shadow from development on the Fulton Houses Project Site on all four analysis days. Compared to the Rezoning Alternative, these shadows would generally cover slightly larger areas and occur for longer periods, which would still occur during the morning. The duration of coverage from the Midblock Bulk Alternative would range from 59 minutes on the December 21 analysis day (8:51 AM – 9:50 AM) to 3 hours 3 minutes on the May 6/August 6 analysis day (6:27 AM – 9:20 AM [7:27 AM – 10:20 AM EDT]). The duration of incremental shadows under the Midblock Bulk Alternative would generally last for approximately the same duration to one hour longer than under the Rezoning Alternative (see **Table 05.05-7**). As shown in **Figures C.1-13a through C.1-13f**, the physical area shaded by Midblock Bulk Alternative would be similar to coverage under the Rezoning Alternative.

Since site plans for the Midblock Bulk Alternative are the same as under the Rezoning Alternative at the Elliott-Chelsea Project Site, incremental shadow coverage and duration on the High Line would be the same as under the Rezoning Alternative. As described above, incremental shadows from the Midblock Bulk Alternative at the Elliott-Chelsea Houses Project Site would range between 3 hours 4 minutes on the May 6/August 6 analysis day (6:27 AM – 9:31 AM [7:27 AM – 10:31 AM EDT]) and 3 hours 47 minutes on the June 21 (5:57 AM – 9:44 AM [6:57 AM – 10:44 AM EDT]) and December 21 (8:51 AM – 12:38 PM) analysis days.

Assessment

Incremental shadows coverage of the High Line resulting from the Midblock Bulk Alternative at the Fulton Houses Project Site would be larger in duration and size compared to the Rezoning Alternative. However, increases in incremental shadow duration and coverage would not result in shadows that are substantially different from shadows introduced by the Rezoning Alternative.

Incremental shadow coverage would occur for a duration ranging from 59 minutes on December 21 to 3 hours 3 minutes on May 6/August 6. Throughout the year, the area of the High Line shaded by these incremental shadows would be limited. During the growing season, shadow coverage would generally be limited to the small portions of the High Line located between W. 15 and W. 18th Streets, which represents a small part of the total park, and would not be cast on a single part of the park for more than approximately 30 minutes, allowing the open space's sunlight-sensitive resources to receive at least the six- to eight-hour minimum of direct sunlight specified in the *CTM*. Vegetation on the High Line would not be significantly threatened. Additionally, park programming and services, including art and performance areas, are not located in this portion of the park.

As shadows are not static and move from west to east throughout the day, the park's sunlight-sensitive features would continue to receive direct sunlight on all four representative analysis days, particularly given the distance from the Project Sites to the High Line, which means that incremental shadows pass through the open space relatively quickly. At no point during any of the representative analysis days would an incremental shadow result in the complete loss of sunlight on the park. It is not expected to affect the utilization or enjoyment of this open space resource.

It should also be noted that most of the park's sunlight-sensitive features would be unaffected by incremental shadows and, thus, the open space would largely contain areas unaffected by project-generated shadows at all times of the day. In addition, the open space's passive recreational amenities (i.e., bench seating, art, and performances spaces) would continue to receive direct sunlight throughout the majority of the representative analysis days.

Incremental shadow introduced by the Midblock Bulk Alternative would not negatively affect utilization or enjoyment of the High Line. As under the Rezoning Alternative, incremental shadows would be limited to the observation deck and the walkways to the north extending a maximum of approximately 200 feet on the March 21, May 6, and June 6 analysis days. Incremental shadows on the December 21 analysis day would be cast on an exposed portion of the park (consisting of approximately 115 linear feet) passing over 18th Street. These portions of the park contain walkways, planting areas, and some seating areas. However, as mentioned above, no portion of the park would receive incremental shadows for more than approximately 30 minutes, and therefore shadows resulting from the Rezoning Alternative would only affect a single recreational feature for a short period of time.

As described in the Rezoning Alternative adjustments are periodically made to the vegetation within the High Line, reflecting changes to the surrounding built environment and informed by experiences with various species over time. The perpetual evolution of the surrounding built environment was anticipated from the inception of the High Line and ongoing monitoring and horticultural development of its landscaping is a defining characteristic of the High Line as a living resource in an urban area. Accordingly, High Line vegetation is not typical of the sunlight-sensitivity of vegetation in some other parks.

For a more detailed assessment of incremental shadows resulting from the Midblock Bulk Alternative on Chelsea Park at the Elliott-Chelsea Houses Project Site, refer to the analysis provided in the Rezoning Alternative section. As described above, because the Midblock Bulk Alternative would not significantly alter the public's use of the park or threaten the viability of vegetation or other resources, incremental shadows on the High Line at the Elliott-Chelsea Houses Project Site would not be considered a significant adverse impact, in accordance with *CTM* guidance.

As such, incremental shadows would not negatively affect the utilization or enjoyment of this open space resource. As described above, the High Line is a unique open space situated in a dense urban environment where the development of taller buildings surrounding the park are inherent to its character, and shadows are not uncommon in this location. Therefore, as the extent and duration of the incremental shadows would (1) not significantly reduce direct sunlight exposure on any of the sunlight-sensitive resources found within this open space, and (2) would not significantly alter the public's use of the park or threaten the viability of vegetation or other resources, incremental shadows on the High Line as a result of the Midblock Bulk Alternative would not be considered a significant adverse impact, in accordance with *CTM* methodology.

Chelsea Park

As shown in **Table 05.05-7** above, incremental shadows resulting from the Midblock Bulk Alternative would occur only at the Elliott-Chelsea Houses Project Site. Since site plans for the

Midblock Bulk Alternative are the same as under the Rezoning Alternative at the Elliott-Chelsea Project Site, incremental shadow coverage and duration on Chelsea Park would be the same as under the Rezoning Alternative. As described above, incremental shadows would last for a total of approximately 7 hours 6 minutes (9:23 AM – 4:29 PM [10:23 AM – 5:29 PM EDT]) on March 21/September 21, approximately 7 hours 16 minutes (10:02 AM – 5:18 PM [11:02 AM – 6:18 PM EDT]) on May 6/August 6, approximately 7 hours 23 minutes (10:38 AM – 6:01 PM [11:38 AM – 7:01 PM EDT]) on June 21, and approximately 6 hours 2 minutes (8:51 AM – 2:53 PM) on December 21.

Assessment

For a detailed assessment of incremental shadows resulting from the Midblock Bulk Alternative on Chelsea Park, refer to the analysis provided in the Rezoning Alternative section. As described above, because the Midblock Bulk Alternative would significantly alter the public's use of the playground, incremental shadows from the Proposed Project on Chelsea Park would be considered a significant adverse impact, in accordance with *CTM* methodology. As noted above, potential mitigation measures will continue to be explored in consultation with NYC Parks and will be published in the FEIS, if identified. If practicable measures to fully mitigate the impacts cannot be identified, then impacts would remain as unavoidable adverse impacts.

Hudson River Park Esplanade

As shown in **Table 05.05-7** above, as a result of the Midblock Bulk Alternative, Hudson River Park Esplanade would receive incremental shadows of limited duration on two analysis days. Incremental shadows would reach the esplanade on the March 21/September 21 analysis day for 19 minutes (7:59 AM – 8:18 AM [8:59 AM – 9:18 AM]) and on the June 21 analysis day for approximately 14 minutes (5:57 AM to 6:11 AM [6:57 AM – 7:11 AM]). As under the Rezoning Alternative, incremental shadow coverage as a result of the Midblock Bulk Alternative would occur within a limited area containing paved walking paths, bike paths, and landscaping.

Assessment

Hudson River Park Esplanade would experience incremental shadows from the Midblock Bulk Alternative on two analysis days. Incremental shadow duration would be limited to a maximum of 19 minutes, and would be confined to a relatively small area of the open space, which is mostly pavement and does not contain sunlight-sensitive recreational uses. Due to the limited size and minimal duration of the incremental shadows cast on the Hudson River Park Esplanade, the Midblock Bulk Alternative would not cause an adverse shadows impact on this open space.

PS 33 Playground

As shown in **Table 05.05-7** above, incremental shadows resulting from the Midblock Bulk Alternative would occur only at the Elliott-Chelsea Houses Project Site. Since site plans for the Midblock Bulk Alternative are the same as under the Rezoning Alternative at the Elliott-Chelsea Project Site, incremental shadow coverage and duration on PS 33 Playground would be the same as under the Rezoning Alternative. As described above, incremental shadows would last for a total

of approximately 4 hours 34 minutes (11:23 AM – 3:57 PM [12:23 PM – 4:57 PM EDT]) on March 21/September 21, approximately 4 hours 50 minutes (11:28 AM – 4:18 PM [12:28 PM – 5:18 PM]) on May 6/August 6, approximately 5 hours 45 minutes (12:16 PM – 6:01 PM [1:16 PM – 7:01 PM EDT]) on June 21, and approximately 3 hours 2 minutes (11:21 AM – 2:23 PM) on December 21.

Assessment

For a detailed assessment of incremental shadows resulting from the Midblock Bulk Alternative on PS 33 Playground, refer to the analysis provided in the Rezoning Alternative section. As described above, because the Midblock Bulk Alternative would significantly reduce direct sunlight exposure and would alter the public's use of the playground, incremental shadows from the Proposed Project on PS 33 Playground would be considered a significant adverse impact, in accordance with *CTM* methodology. As noted above, potential mitigation measures will continue to be explored in consultation with NYC Parks and will be published in the FEIS, if identified. If practicable measures to fully mitigate the impacts cannot be identified, then impacts would remain as unavoidable adverse impacts.

Pier 57 Rooftop Park

Pier 57 Rooftop Park is a 2.0-acre park located atop the Pier 57 building located at 25 11th Avenue along the Hudson River. The park features benches and landscaping.

As shown in **Table 05.05-7** above, as a result of the Midblock Bulk Alternative, Pier 57 Rooftop Park would receive incremental shadows of very limited duration on only one analysis day. Incremental shadows would reach the park on the May 6/August 6 analysis day for approximately 2 minutes (6:27 AM – 6:29 AM [7:27 AM – 7:29 AM EDT]).

Assessment

Pier 57 Rooftop Park would experience very brief incremental shadows from the Midblock Bulk Alternative on only one analysis day. Due to the limited size and minimal duration of incremental shadows cast on Pier 57 Rooftop Park, the Midblock Bulk Alternative would not cause an adverse shadows impact on this open space.

14th Street Park

As shown in **Table 05.05-7** above, 14th Street Park would receive incremental shadows of limited duration from the Midblock Bulk Alternative on two analysis days. Incremental shadows would reach the park on the May 6/August 6 analysis day for approximately 4 minutes from 6:27 AM to 6:31 AM (7:27 AM to 7:31 AM EDT), and for approximately 18 minutes on the June 21 analysis day from 5:57 AM to 6:15 AM (6:57 AM to 7:15 AM EDT).

Assessment

14th Street Park would experience incremental shadows from the Midblock Bulk Alternative at the Fulton Houses Project Site on two analysis days. However, incremental shadow duration would be limited to four minutes on May 6/August 6 and 18 minutes on June 21, and would be confined to a relatively small area of the open space, which contains benches and landscaping. As under the Rezoning Alternative, shadows from the Midblock Bulk Alternative would not affect the vegetation in this park or affect the use or enjoyment of any recreational amenities. Due to the limited size and minimal duration of the incremental shadows cast on 14th Street Park, the Midblock Bulk Alternative would not cause an adverse shadows impact on this open space.

Little Island

Little Island is a 2.4-acre park built at Pier 55 within the Hudson River just west of W 13th Street. The park opened in 2021 and is characterized by its sloping design supported by 132 concrete “tulips” capping the concrete piles installed in the river that support the park surface. It features walkways and benches throughout landscaped areas of the park, an amphitheater for public performances, and a seating area for food and beverage vendors.

As shown in **Table 05.05-7** above, Little Island would receive minimal incremental shadows as a result of the Midblock Bulk Alternative on one analysis day. Incremental shadows would reach the park on the June 21 analysis day for 3 minutes, from 5:57 AM to 6:00 AM (6:57 AM to 7:00 AM EDT).

Assessment

Little Island would experience incremental shadows from the Midblock Bulk Alternative on one analysis day, and would be limited to three minutes. Incremental shadows would be limited to a small portion of the park in the early morning hours prior to opening hours. Due to the limited size and duration of the incremental shadows on Little Island, the Midblock Bulk Alternative would not cause an adverse shadows impact on the open space.

Greenstreet at 9th Avenue

As shown in **Table 05.05-7**, incremental shadows cast from the Fulton Houses Project Site as a result of the Midblock Bulk Alternative would be cast on all four analysis days, ranging from 34 minutes on December 21 (2:19 PM – 2:53 PM) to 4 hours 26 minutes on June 21 (1:35 PM – 6:01 PM [2:35 PM – 7:01 PM EDT]). As under the Rezoning Alternative, incremental shadow from the Midblock Bulk Alternative at the Fulton Houses Project Site would be cast on the 9th Avenue Greenstreet between W. 16th and W. 21st Streets.

Because site plans at the Elliott-Chelsea Project Site are the same as under the Rezoning Alternative, incremental shadow coverage and duration resulting from development at the Elliott-Chelsea site would be the same as under the Rezoning Alternative. As described above, incremental shadows resulting from the Midblock Bulk Alternative at the Elliott-Chelsea Project Site would occur during the March 21/September 21, May 6/August 6, and June 21 analysis days.

The duration of new shadow coverage would be 1 hour 14 minutes (3:15 PM – 4:29 PM [4:15 PM – 5:29 PM EDT]) on March 21/September 21; 1 hour 51 minutes (3:27 PM – 5:18 PM [4:27 AM – 6:18 PM EDT]) on May 6/August 6, and 1 hour 43 minutes (4:18 PM – 6:01 PM [5:18 PM – 7:01 PM EDT]) on June 21. As shown in **Figures C.1-14a through C.1-14h** in **Appendix C.1**, the area cast in shadow includes small, landscaped traffic islands; there are no recreational amenities within this area.

Assessment

The Greenstreet would receive incremental shadows from the Midblock Bulk Alternative at the Fulton Houses Project Site on all four analysis days. The landscaped traffic islands between W. 16th and W. 21st Streets that would receive shadows from the Fulton Houses Project Site do not contain any recreational features or amenities, and are mostly planted with flowers and small shrubs (which can tolerate partial sunlight). There are large shrubs planted in the Greenstreet at the intersection of 9th Avenue and W. 20th Street and the intersection of 9th Avenue and W. 21st Street. As under the Rezoning Alternative, this segment of the Greenstreet would receive afternoon shadows of under five hours on all analysis days, and would continue to receive adequate sunlight during the growing season (at least the six to eight hours specified in the *CTM*).

For a detailed assessment of incremental shadows resulting from the Midblock Bulk Alternative on the 9th Avenue Greenstreet at the Elliott-Chelsea Houses Project Site, refer to the analysis provided in the Rezoning Alternative section. As the 9th Avenue Greenstreet would continue to receive direct sunlight on all analysis days and would receive adequate sunlight during the growing season, and since incremental shadows from the Midblock Bulk Alternative would not affect the use or enjoyment of any amenities, the Midblock Bulk Alternative would not cause an adverse shadows impact to the 9th Avenue Greenstreet.

Church of the Holy Apostles

As shown in **Table 05.05-7** above, incremental shadows on Church of the Holy Apostles resulting from the Midblock Bulk Alternative would occur only at the Elliott-Chelsea Houses Project Site. Since site plans for the Midblock Bulk Alternative are the same as under the Rezoning Alternative at the Elliott-Chelsea Project Site, incremental shadow coverage and duration on Church of the Holy Apostles would be the same as under the Rezoning Alternative. As described above, the duration of new shadow coverage would be 50 minutes (3:39 PM – 4:29 PM [4:39 PM – 5:29 PM EDT]) on March 21/September 21; 1 hour 38 minutes (3:40 PM – 5:18 PM [4:40 PM – 6:18 PM EDT]) on May 6/August 6; and 2 hours 9 minutes (3:40 PM – 6:01 PM [4:40 PM – 7:01 PM EDT]) on June 21. Incremental shadows from the Rezoning Alternative would be cast on the church's southern and western facades, which include stained-glass windows.

Assessment

For a detailed assessment of incremental shadows resulting from the Midblock Bulk Alternative on Church of the Holy Apostles, refer to the analysis provided in the Rezoning Alternative section. As described above, because the Midblock Bulk Alternative would not affect the use or enjoyment

of sunlight-sensitive features of the Church of the Holy Apostles, the Midblock Bulk Alternative would not cause an adverse shadows impact on this historic resource.

The Hudson River

As defined in the *CTM*, the Hudson River is a surface water body and aquatic resource that is sunlight sensitive due to the potential presence of aquatic vegetation and wildlife. As shown in **Table 05.05-7**, the Hudson River would experience incremental shadows in the early morning hours on three analysis days, ranging from 4 minutes on the December 21 analysis day (8:51 AM – 8:55 AM) to 14 minutes on the March 21/September 21 analysis day (7:36 AM – 7:50 AM [8:36 AM – 8:50 AM EDT]). Incremental shadows would occur on a small portion of the river east of W 16th Street on the March 21/September 21 analysis day, a portion of the river just north of Little Island on the June 21 analysis day, and a portion of the river just south of Pier 61 on the December 21 analysis day.

Assessment

Incremental shadows on the Hudson River resulting from the Midblock Bulk Alternative would be limited in both duration and scope, with the maximum duration of incremental shadows at approximately 14 minutes on the March 21/September 21 analysis day. Since the river would continue to receive direct sunlight for the majority of the day, the Midblock Bulk Alternative would not have an adverse shadows impact on the Hudson River.

18th Street Plaza

As shown in **Table 05.05-7** above, as a result of the Midblock Bulk Alternative, 18th Street Plaza would receive new incremental shadow coverage from buildings on the Fulton Houses Project Site on the March 21/September 21, May 6/August 6, and December 21 analysis days. Given the location of the 18th Street Plaza to the west of the Fulton Houses Project Site, shadows from the Midblock Bulk Alternative would be cast on the plaza in the morning hours. Incremental shadows would last for a total of approximately 3 hours (7:36 AM – 10:36 AM [8:36 AM – 11:36 AM EDT]) on March 21/September 21, approximately 33 minutes (8:55 AM - 9:28 AM EST [9:55 AM - 10:28 AM EDT]) on May 6/August 6, and approximately 1 hours 15 minutes (8:51 AM – 10:06 AM [9:51 AM - 11:06 AM EDT]) on December 21. Incremental shadows cast by the Midblock Bulk Alternative on the 18th Street Plaza are shown in **Figures C.1-15a through C.1-15d** in **Appendix C.1**.

Assessment

18th Street Plaza would receive incremental shadows on three analysis days. On the March 21/September 21 analysis day, incremental shadows would cover portions of the plaza for approximately 3 hours during the morning. After reaching their maximum amount of coverage at 9:30 AM (with approximately 60 percent of the park covered by incremental shadows [refer to **Figure C.1-15b**]) shadows would continue to move east and exit the resource entirely at 10:36 AM. The southern tip of the park would receive incremental shadows for the longest period of time (approximately 80 minutes from the start of the analysis day until approximately 9:55 AM).

However, no part of plaza north of its southern tip would experience incremental shadows for longer than approximately 30 minutes as shadows from the Midblock Bulk Alternative move west to east throughout the morning. Therefore, with the exception of the southern end of the park (which would receive approximately 3 hours of direct sunlight throughout the day), the remainder of the park would receive approximately 4-5 hours of direct sunlight throughout the analysis day.

Incremental shadows on the May 6/August 6 analysis day would be limited in duration, occurring for only 33 minutes, but would affect approximately 60 percent of the resource at their maximum coverage, which would occur at approximately 9:15 AM (refer to **Figure C.1-15c**). All parts of the park would receive a minimum of six hours of direct sunlight on this analysis day.

On the December 21 analysis day, 18th Street Plaza would receive incremental shadows for approximately 1 hour 15 minutes in the morning hours. Due to substantial coverage of the resource due to existing shadows on this analysis day, incremental shadows would be limited to a small portion in the north of the resource (see **Figure C.1-15d**). The resource would continue to be covered in shadows for a majority of the day, as under existing conditions.

18th Street Plaza would receive incremental shadows on two analysis days within the growing season per *CTM* methodology (March 21/September 21 and May 6/August 6). On the March 21/September 21 analysis day, the resource would receive less than the minimum six hours of direct sunlight for vegetation identified in the *CEQR Technical Manual*. However, the 18th Street Plaza would feature similar vegetation and planters used on the High Line, meaning that the plaza would feature native plant species which can thrive in a dense urban environment where shadows are not uncommon. Therefore, although the resource would receive less than six hours of sunlight on the March 21/September 21 analysis day (with the southern end of the receiving the least amount of direct sunlight), it is likely that the vegetation would not be substantially affected by the loss of sunlight. Additionally, the plaza would receive at least six to eight hours of direct sunlight on the May 6/August 6 and June 21 analysis days, which are the other two days constituting the growing season per *CTM* methodology.

Therefore, as the extent and duration of the incremental shadows would (1) not significantly reduce direct sunlight exposure on any of the sunlight-sensitive resources found within this open space, and (2) would not significantly alter the public's use of the park or threaten the viability of vegetation or other resources, incremental shadows on 18th Street Plaza as a result of the Midblock Bulk Alternative would not be considered a significant adverse impact, in accordance with *CTM* methodology.

Project-Generated Open Space

Pursuant to *CTM* guidance, shadows on project-generated open space are not considered significant. However, as future project-generated open space is included as part of the analysis presented in **Chapter 05.04**, a discussion of how shadows could affect the new open space planned as part of the Midblock Bulk Alternative is provided below.

As discussed in **Chapter 05.04**, the new open space in the Project Sites would be located in building courtyards and in the area between buildings. Refer to **Figures 05.04-8a and 05.04-8b in Chapter 05.04**, for illustrative plans showing the proposed open space associated with the

Midblock Bulk Alternative. Though the design of the open space is evolving, and specific features are subject to change, the open space at both Project Sites is expected to include a mix of active and passive amenities, including play areas, seating areas, dog walks, basketball courts, community gardens, and landscaping. The project-generated open space on the Project Sites is accessory, i.e. private, open space.

On the March 21/September 21, May 6/August 6, June 21, and December 21 representative analysis days, project-generated shadow coverage on future open space is expected to be greatest during the early to late morning hours (several hours after the start of the analysis period). However, it is anticipated that the majority of the future open space would receive adequate direct sunlight throughout the day (at least the six to eight hour minimum specified in the *CTM*) during the growing season, March to September, and vegetation would not be affected. As the programming for the project-generated open space is not yet finalized, it is not certain what types of features and amenities would experience incremental shadow coverage. However, it is expected that the future open space would be designed and planted with vegetation tolerant of the shading conditions to account for project-generated shadows. No significant adverse impacts would occur as a result of shadows on project-generated open space under the Midblock Bulk Alternative.