

A. INTRODUCTION

With the Proposed Actions, new buildings and open spaces would be developed in the Project Area. These new buildings would cast shadows on existing open spaces as well as the proposed new open spaces. This chapter examines the extent of incremental shadows (additional shadows beyond existing shadows) cast by the reasonable worst-case development scenario with the Proposed Actions. The analysis focuses on sun-sensitive resources, which are defined in the 2001 *City Environmental Quality Review (CEQR) Technical Manual* as public open spaces, historic resources with significant sunlight-dependent features, and natural features.

For purposes of this shadows analysis, the reasonable worst-case development scenario is assumed to include the maximum heights of all buildings permitted under the proposed rezoning. It should be noted that the reasonable worst-case development scenario assuming the maximum building height for all buildings in Subdistrict A could never be achieved within the floor area ratio (FAR) requirements of the proposed Special Manhattanville Mixed-Use Zoning District. Within Subdistrict A (Academic Mixed-Use Area), the maximum heights of the buildings also include mechanical space on the roofs. For Subdistricts B, C, and the Other Areas, the maximum height of any potential development is conservatively assumed to be the greatest permitted within each subdistrict. Exhaust stacks, which are planned for certain buildings along Broadway and Twelfth Avenue within Subdistrict A, are also considered in this analysis.

In accordance with CEQR criteria, an analysis of shadows is conducted to determine whether a proposed action would cause an impact on open spaces, natural features, or sun-sensitive historic resources. According to the *CEQR Technical Manual*, a shadows analysis is required for any action that would result in new structures or additions to existing structures that would be located near sun-sensitive resources (particularly actions that propose buildings 50 feet in height or taller). The Proposed Actions would add up to 24 new buildings (and reuse of one existing building—the former Warren Nash Service Station building) to the Project Area, ranging in height from 80 to 320 feet (including mechanical space), and would result in an increase in shadows falling on nearby open spaces. Therefore, a detailed shadows analysis, which included four representative days of the year, was conducted. These four representative days are discussed in further detail below.

As described in the detailed discussion below, the Proposed Actions would result in significant adverse shadow impacts on the I.S. 195 Playground during the March/September and December analysis periods with the full build-out in 2030. No other significant adverse shadow impacts are anticipated with the Proposed Actions.

PRINCIPAL CONCLUSIONS

All the conclusions presented in this section are based on the full build-out of the Proposed Actions in 2030.

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The Proposed Actions would create a series of open spaces linking West 125th to West 133rd Streets, and along the line of West 132nd Street between Broadway and Old Broadway. These open spaces would receive incremental shadows from the Academic Mixed-Use Development buildings throughout the year. Although new open space resources created as part of the Proposed Actions would be affected by shadow, this shadowing is not considered to be significant or adverse, as the open spaces are created as part of the Proposed Actions.

Proposed Actions' Open Space 1a (the Small Square). This open space would receive shadows from the Proposed Actions' buildings throughout all four analysis days. However, for approximately 2½ hours during the early afternoon on the June 21 and May 6/August 6 analysis days, more than half the Small Square would be in sunlight.

Proposed Actions' Open Space 1b (the Grove). This open space would receive shadows from the Proposed Actions' buildings from early morning until early afternoon on all four analysis days. Shadows from existing buildings across West 125th Street would fall on the Grove for most of the afternoon hours in the fall, winter, and spring months.

Proposed Actions' Open Space 1c (the Square). Shadows from the Proposed Actions' buildings would cover much of this open space throughout the four analysis days, except for the midday hours in late spring and summer, when shadows are shorter than at other times of the year. On the June 21 analysis day, more than half the Square would be in sunlight between 11:15 AM and 2:45 PM. On the May 6/August 6 analysis day, more than half the open space would be in sunlight between 11:30 AM and 2:30 PM.

Proposed Actions' Open Space 1d (North–South Midblock Open Areas). On all four analysis days, these two open spaces would be mostly or completely covered by shadows from the Proposed Actions' buildings from early morning to midday, then again from mid-afternoon to sundown.

Proposed Actions' Open Space 1e (East–West Midblock Open Area). This open space runs along the north side of proposed building 15, which would cast shadows on the open space for nearly the entire analysis period on all four analysis days.

The shadows from the proposed buildings that are cast on the Proposed Actions' open spaces are not considered a significant adverse impact because these open spaces would not exist without the Proposed Actions. Further, the landscape design of these proposed open spaces would take into account the shadow conditions, and vegetation would be selected for its shade tolerance. The open spaces would include benches, lighting, and movable tables and chairs. Therefore, even with extensive shadows during the fall through spring months, the new open spaces would be a beneficial resource for this neighborhood, which is underserved in terms of open space. The popularity of certain other open space resources in the City that are in densely developed areas and are heavily shadowed—Paley Park, Tudor City Greens, the Museum of Modern Art garden, Rockefeller Center Plaza, etc.—demonstrates that open spaces in significant shadow can still serve as useful community amenities.

The Proposed Actions' incremental shadows would also fall on other nearby open spaces, as summarized below.

West Harlem Waterfront Park. Buildings in Subdistrict B and the Academic Mixed-Use Area would cast incremental shadows on the West Harlem Waterfront park between St. Clair Place and West 133rd Street for around an hour in the early morning throughout the year. These incremental shadows would be very small and would add to shadows already cast by the

elevated Route 9A and Amtrak viaducts. They are not considered significant adverse impacts on the West Harlem Waterfront park because the park would receive full sunlight from late morning to evening for most of the year. No significant adverse impacts on this open space are expected.

I.S. 195 Playground. Existing buildings, including 3333 Broadway, the buildings along the west side of Broadway between West 132nd and West 133rd Streets, and buildings across Broadway to the east, all currently cast shadows on the I.S. 195 Playground, north of West 133rd Street, throughout the year. On all four analysis days, incremental shadows would remove the last remaining sunlight from the playground in the mid-afternoon and late afternoon hours. On the May 6 and June 21 analysis days, large portions of the playground would receive sunlight for much of the morning and afternoon hours. Therefore, a significant adverse impact is not expected on these analysis days. However, during the March 21 and December 21 analysis days, incremental shadows would cover significantly more area during the late morning and early afternoon hours, when the playground is in use. Furthermore, the increased incremental shadows would occur during the fall, winter, and early spring months, when cooler temperatures would likely make sunlight more valuable to users of the playground. Given these factors, it is expected that the incremental shadows created by the Proposed Action in the 2030 Build year would cause significant adverse impacts on the March 21 and December 21 analysis days.

The Broadway Malls. Buildings in the Academic Mixed-Use Area and the Other Area East of Broadway would cast shadows on portions of Broadway's landscaped median between West 135th and West 136th Streets for most of the December 21 analysis day. However, no significant adverse impacts are expected because the adjacent malls to the north between West 136th and West 137th Streets and between West 137th and West 138th Streets would be mostly or completely in sunlight during the same period. These adjacent malls are visible and accessible to any users of the malls between West 135th and West 136th Streets that would be affected by the incremental shadows. Therefore, the incremental shadows would not reduce the overall usability of the Broadway Malls due to their limited effects over the course of the year.

Manhattanville Houses Open Spaces. From March through September in the late afternoon, the Proposed Actions' buildings in the Academic Mixed-Use Area would cast shadows on the open spaces of the Manhattanville Houses, located east of Broadway. The incremental shadows, which would be relatively small, would last for ½ to 2¼ hours, depending on the analysis day. Because of the short duration and small size of the incremental shadows, no significant adverse impacts on the open spaces at the Manhattanville Houses during any of the analysis periods are anticipated. Although the Proposed Actions would remove the last of the sunlight on two areas of the open spaces during the late afternoon hours between September and March, the largest, centrally located open space would remain unaffected by the Proposed Actions.

Riverside Park. Riverside Park, which is southwest of the Project Area, would receive incremental shadows from the buildings in the Academic Mixed-Use Area in the early morning from March through September. The largest incremental shadows are projected for the beginning of the analysis period in the early morning. However, they would still be very small considering the total size of Riverside Park. Further, these shadows would decrease in size rapidly and move off the open space by 9:00 AM, and Riverside Park would receive ample sunlight for the remainder of the day. Therefore, no significant adverse impacts would occur on Riverside Park.

There are no sun-sensitive historic resources within the shadow sweep of the Proposed Actions' buildings. Only a very small portion of the Hudson River, a natural feature, is in the study area.

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Therefore, no significant adverse impacts would occur on historic resources or natural features due to shadows from the Proposed Actions.

B. METHODOLOGY

The new shadows that would be created by the Proposed Actions' buildings on each study area's open spaces are described in the following section for each analysis year and illustrated in this chapter's accompanying figures. Following the guidelines of the *CEQR Technical Manual*, this analysis considers shadows on four representative days of the year: March 21, which is the equivalent of September 21 (both dates are the equinoxes); May 6, which is the equivalent of August 6 (the midpoints between the summer solstice and the equinox); June 21 (the summer solstice and longest day of the year); and December 21 (the winter solstice and shortest day of the year). To identify potential impacts, CEQR focuses on uses and users of the open space, landscaping and vegetation, and—if there are historic resources—features or details that are both sunlight-dependent and make such resources significant. The CEQR methodology does not consider shadows and incremental increases in shadows within 1½ hours of sunrise or sunset. Therefore, the analysis period is between 1½ hours after sunrise and 1½ hours before sunset.

The *CEQR Technical Manual* identifies the following situations when a proposed action may result in a significant shadow impact:

- Substantial reduction in sunlight where a sensitive use is already subject to substandard sunlight (i.e., less than the minimum time necessary for survival);
- Reduction in sunlight available to a sensitive use from more to less than the minimum time necessary for its survival;
- Substantial reduction in sunlight to a sun-sensitive use or feature; and
- Substantial reduction in the usability of the open space.

This shadows analysis of the reasonable worst-case development scenario is conservative because except for considering the West Harlem Waterfront park (which is under construction and projected to be completed in 2008), the analysis assumes that no new structures would be built in the Project Area in the future without the Proposed Actions (see Chapter 2, "Procedural and Analytical Framework," for details of known No Build projects). In addition, the analysis assumes that the Proposed Actions' buildings would be at the maximum heights (including mechanical space) allowed under the proposed rezoning. It should be noted that the reasonable worst-case development scenario assuming the maximum building height for all buildings in Subdistrict A could never be achieved within the maximum 6 FAR requirement of the proposed Special Manhattanville Mixed-Use Zoning District. The analysis also assumes 100 percent coverage for mechanical space for all buildings in Subdistrict A, instead of assuming some setbacks from the roof line. The heights of the three-dimensional building models in the analysis therefore include the maximum mechanical envelopes.

C. SHADOW SCREENING

A shadow screening analysis was performed following the guidelines of the *CEQR Technical Manual* to identify sun-sensitive resources in the shadow sweep of the buildings that would be created as a result of the Proposed Actions. The shadow sweep is defined based on the potential maximum length of the shadows. A building has a maximum shadow length factor of 4.3 times its height. This occurs at the beginning and end of the analysis period on December 21, when

shadows are cast to the northwest and northeast, respectively. Toward midday, when the sun is higher in the sky, the shadow length factor is 2.07. Since the tallest proposed building would be approximately 320 feet in height (including mechanical space on the roof), it would have a maximum shadow length of approximately 1,376 feet at the beginning and end of the December 21 analysis period, and approximately of 663 feet at noon. Since the Proposed Actions’ buildings would have varying heights, these calculations were made for each proposed structure. All sun-sensitive resources within the area of the potential shadow sweep of the projected buildings were identified (see Table 7-1 and Figure 7-1).

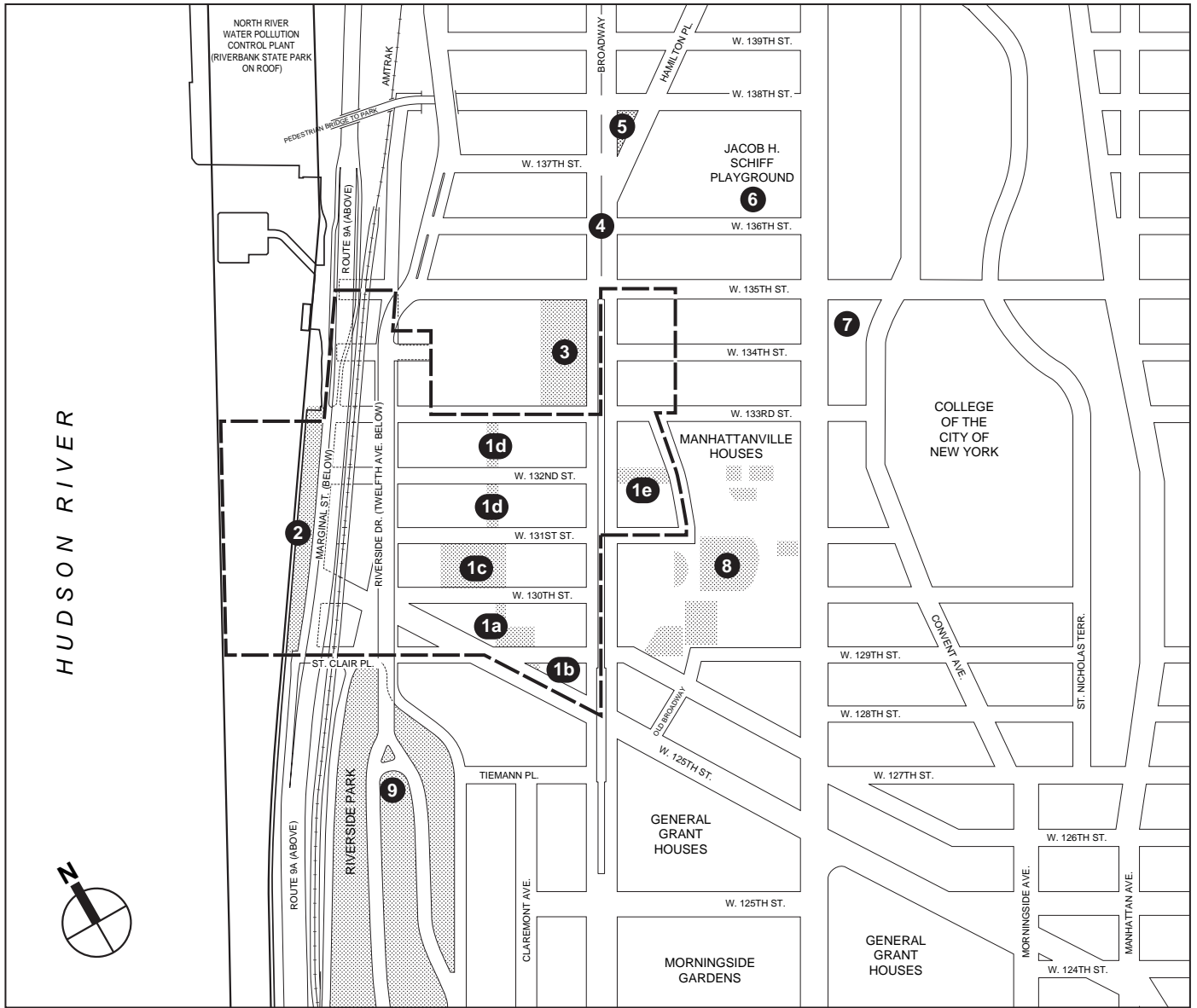
**Table 7-1
Shadows Screening: Open Spaces Within Maximum Shadow Sweep**

Map ID*	Open Spaces Within Maximum Shadow Sweep Area	Within Maximum Shadow Sweep?	Fully Shaded by Intervening Buildings?	Large Increase in Elevation?
Open Space Resources Included in Analysis				
1a-1e	Proposed Actions open spaces	Yes	No	No
2	West Harlem Waterfront park	Yes	No	No
3	I.S. 195 Playground	Yes	No	No
4	Broadway Malls	Yes	No	No
8	Manhattanville Houses open spaces	Yes	No	No
9	Riverside Park	Yes	No	No
Open Space Resources Screened Out of Analysis				
5	Montefiore Park	No	—	—
6	Jacob H. Schiff Playground	Yes	No	Yes
7	Annunciation Park	Yes	No	Yes
Note: * See Figure 7-1 for the locations of each open space resource.				

Shadow length factors for the remainder of the analysis periods are shorter than they are in December. However, the daylight hours are longer, resulting in longer analysis periods and, therefore, a larger shadow sweep. During the December analysis day, shadows are cast up to 43 degrees east and west, but in June, shadows are cast up to 108 degrees. Open spaces in the southern portion of this shadow sweep in June would not be in the December shadow sweep. After the maximum shadow sweep for each of the buildings in the Proposed Actions was determined, open spaces and sun-sensitive historic resources within the shadow sweep were identified. Although there are multiple open space resources within the shadow sweeps of the proposed buildings, there are no historic resources with sunlight-dependent features.

Resources that would be out of the shadow range of a proposed building (e.g., any resources south of the Project Area), or that would not be affected by project shadows because they are already covered by shadows from existing buildings or are located at a much higher elevation, are eliminated in this analysis. The screening analysis eliminated Montefiore Park at Broadway and West 137th Street, the Jacob H. Schiff Playground north of West 136th Street, and Annunciation Park east of Amsterdam Avenue at West 135th Street from further study.

The screening analysis also eliminated from further study two historic resources with sun-sensitive features. These resources, St. Mary’s Protestant Episcopal Church complex on West 126th Street, which contains stained glass windows and a garden in front of the rectory, and the Old Broadway Synagogue at 15 Old Broadway, with a stained glass window, are located far enough south of the project site to be outside the range of potential new shadows. Figure 7-2 depicts the shadow sweep of the southernmost proposed building on the four analysis days. This proposed building would not cast shadows far enough to the south to reach these two historic



--- Project and Rezoning Area Boundary

0 500 1000 FEET
SCALE

Open Space Resource

- 1a-1e** Proposed Action Open Spaces
- 2** West Harlem Waterfront Park
- 3** IS 195 Playground
- 4** Broadway Malls
- 5** Montefiore Park
- 6** Jacob H. Schiff Playground
- 7** Annunciation Park
- 8** Manhattanville Houses Open Spaces
- 9** Riverside Park



Figure 7-2
Shadow Screening
Sun-sensitive Historic Resources

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resources, and any buildings farther northward would also not cast shadows on these two resources.

POTENTIALLY AFFECTED PUBLIC OPEN SPACES

EXISTING OPEN SPACES

Located north and west of the Project Area, the playground associated with I.S. 195 (No. 3 in Figure 7-1), Roberto Clemente Intermediate School, is on the west side of Broadway between West 133rd and West 135th Streets. This open space is 0.68 acres and contains six paved basketball courts as well as other paved areas for active recreation activities (see Chapter 6, “Open Space”). Other features include curved seating areas, a paved football field, and a jungle gym (see Figure 7-3). This playground is under the jurisdiction of the New York City Department of Education (DOE) and primarily used for the children attending the school; however, the open space is open to the public after school hours.

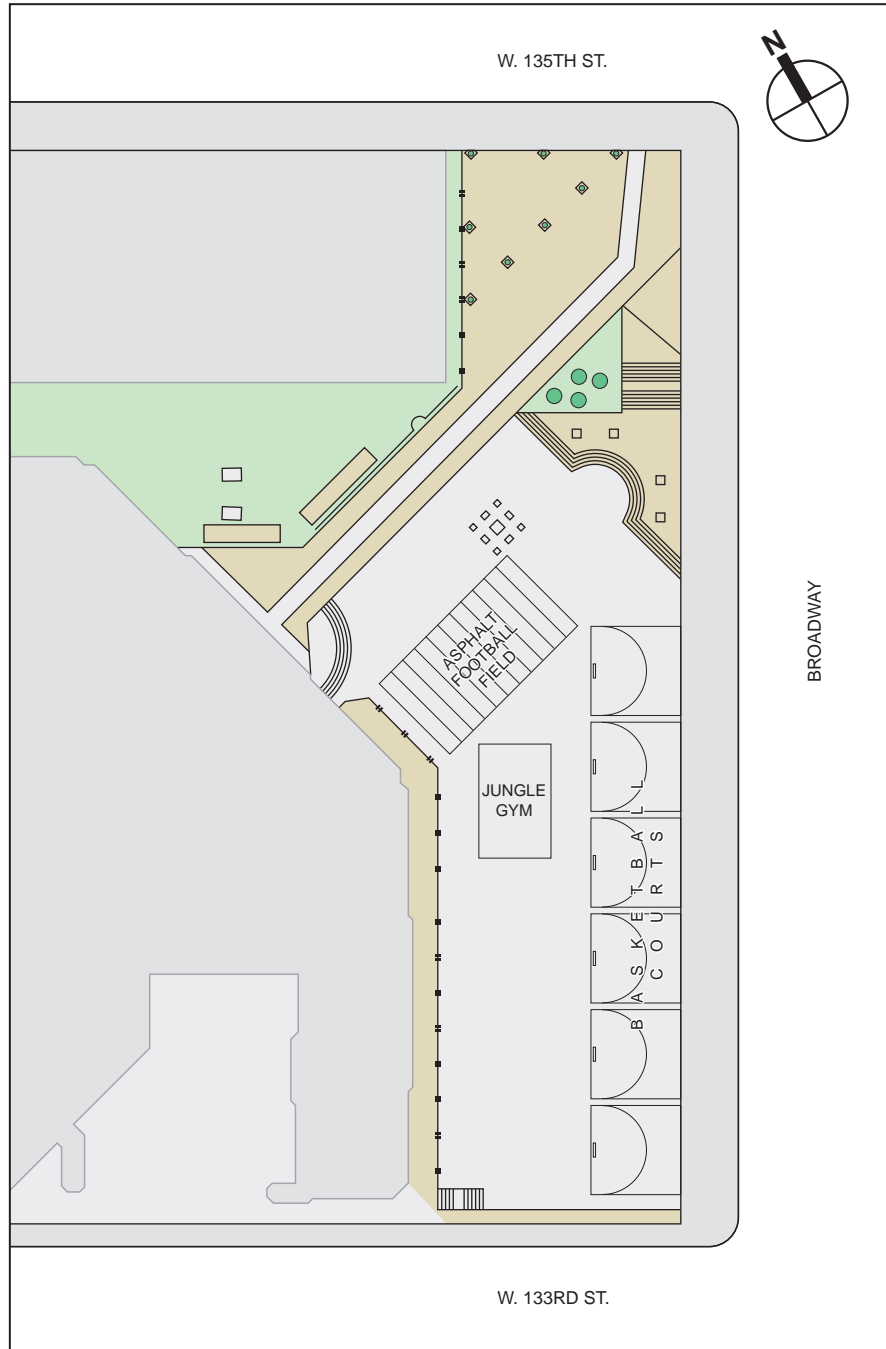
The Broadway Malls (No. 4 in Figure 7-1) are landscaped medians between the north- and southbound roadways. The malls contain shrubs, trees, flowers, benches, and some sculptures. Due to the area’s topography and the location of the Riverside Drive viaduct, the portion of this open space of concern for this analysis is between West 135th and West 137th Streets. The seating in this area is well used in clement weather.

The New York City Housing Authority (NYCHA) owns and operates an approximately 2-acre open space associated with the Manhattanville Houses (No. 8 in Figure 7-1). This development has a tower-in-the-park configuration, which typically consists of a superblock with residential towers surrounded by lawns, trees, walkways, benches, playgrounds, basketball and handball courts, and sometimes parking and community centers. Although the open space associated with this development is primarily meant for Manhattanville Houses’ residents, it is publicly accessible and therefore is included in this analysis. The acreage of the open space for this development was adjusted in this analysis because some of the open areas between the residential buildings are fenced off and not accessible. The open space is equipped with jungle gyms, slides, basketball courts, swings, benches, and paths.

Riverside Park (No. 9 in Figure 7-1) is a large open space totaling 23.5 acres. Approximately 80 percent of the open space is passive recreation, and the remaining 20 percent is active. The open space contains slides, paved walkways, benches, jungle gyms, planters, and Grant’s Tomb.

FUTURE OPEN SPACES

The West Harlem Waterfront park (No. 2 in Figure 7-1) is planned along the waterfront between West 129th and West 133rd Streets. This open space is currently under construction and slated for completion by the 2015 analysis year. This City-owned open space will be developed primarily as passive open space along the upland length of the park (approximately 2.5 acres). The park will include an excursion pier to allow docking for excursion and ferry boats, a recreation pier, an ecological platform, a small multi-purpose building, and several passive recreation areas such as lawns and sitting areas. Since most of the program for the park will consist of a system of passive linear landscape elements and gathering places (approximately 2.26 acres), the entire park is conservatively assessed as passive open space in this analysis.



PROPOSED OPEN SPACES

The Proposed Actions would create new privately owned, publicly accessible open spaces (Nos. 1a–1e in Figure 7-1). The largest would be a large through-block central space of approximately 40,000 sf (the Square), located between West 130th and West 131st Streets (1c). An additional 11,770 sf of open space would be provided in a smaller plaza (the Small Square), on the block to the south (1a); 585 sf at the western tip of the triangular-shaped block formed by the intersection of Broadway, West 125th Street, and West 129th Street (the Grove [1b]); 50-foot-wide north–south pedestrian passageways through the midblocks (midblock open areas [1d]); and in an east–west midblock open area between Broadway and Old Broadway (1e). The open spaces south of West 130th Street would be developed by 2015, and the 40,000-sf Square, the north–south midblock open area north of West 130th Street, and the east–west midblock open area between Broadway and Old Broadway would be completed by 2030 (see Chapter 6 for more details). The design of the open spaces would allow pedestrian access to the Project Area, to major thoroughfares (Broadway, 125th Street, and Twelfth Avenue), and to the West Harlem Waterfront park.

While the design of these open spaces has not yet been developed, the Special Manhattanville Mixed-Use Zoning District text contains urban design requirements for the open spaces. Specifically, no fences or gates would be permitted anywhere in any of the proposed open spaces. The zoning text would limit the open space grade and height of planters to 2½ feet above the grade of the adjacent sidewalk. A minimum of 50 percent of the Square must be landscaped with soft ground cover, including trees, grasses, or shrubs. The Grove and the Small Square must be improved with paved surfaces of a non-skid material and landscaped with trees. Fixed and/or movable seating and bicycle racks must also be provided in the Square. Movable seats would be required in the Small Square, and although not required, movable and fixed seats would be permitted in the Grove. Permanent structures such as kiosks, pavilions, exit stairs, or public restrooms would be permitted only in the Square, provided that they are no more than 20 feet high and do not occupy more than 3 percent of the area of the Square. Temporary or movable amenities would also be permitted only in the Square, including elements such as trellises, movable tables, game tables, play equipment, and performance facilities, provided they not exceed 10 percent of the area of the Square. The new open space would be open to the community and easily accessible from West 130th and West 131st Streets.

POTENTIALLY AFFECTED SUN-SENSITIVE HISTORIC RESOURCES

As described above, no sun-sensitive historic resources or historic landscapes lie inside the shadow sweep of the Proposed Actions' buildings.

D. SHADOW EFFECTS BY SEASON

The sun rises in the east and casts its earliest (and longest) shadows toward the west. Later in the morning, when the sun is higher in the sky, it casts shorter shadows toward the northwest. At noon, the sun is at its highest point in the sky and casts the shortest shadows of the day directly north. (During Daylight Savings Time, this occurs at 1:00 PM rather than at noon.) In the afternoon, the sun continues to move west and begins to descend, casting longer shadows toward the northeast and east.

In its yearly cycle, the height of the sun in the sky and the time and directional location at which it rises and sets varies by season. In the winter, the sun travels in a low arc across the southern

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sky, rising late in the southeast and setting early in the southwest. Because it is so low in the sky, it casts longer shadows. In the spring and fall, the sun arcs through the sky at a somewhat higher angle, rises earlier in the east, and sets later in the west. In these seasons, shadows are of moderate length. In the summer, the sun arcs through the sky at its highest angle, rising almost directly overhead at noon. For this reason, summer shadows are shortest. However, in the summer, the sun rises earliest and sets latest; it also travels farther, from the northeast to the northwest. Thus, the summer sun casts shadows in more directions than in other seasons, and its early sunrise and late sunset create shadows earlier in the morning and later in the evening than in other seasons.

The shadow diagrams and analysis presented below were developed using building envelope and topographical information derived from Sanborn Fire Insurance Maps and U.S. Geological Survey (USGS) data. Shadows were modeled using the solar rendering capabilities of MicroStation V8 software.

The shadow diagrams are presented at the end of this chapter in chronological order by Build year and analysis day, and are outlined in Table 7-2.

**Table 7-2
Figure Number Locator for Shadow Diagrams**

Analysis Day and Time	Figure Nos.	
	2015	2030
March 21—8:36 AM ¹	7-5	7-23
March 21—10:00 AM ¹	7-6	7-24
March 21—11:15 AM ¹	—	7-25
March 21—12:30 PM ¹	—	7-26
March 21—1:45 PM ¹	—	7-27
March 21—2:45 PM ¹	7-7	7-28
March 21—3:45 PM ¹	—	7-29
March 21—5:15 PM ¹	7-8	7-30
May 6—7:27 AM ¹	7-9	7-31
May 6—8:30 AM ¹	7-10	7-32
May 6—10:30 AM ¹	7-11	7-33
May 6—1:00 PM ¹	—	7-34
May 6—2:15 PM ¹	7-12	7-35
May 6—5:45 PM ¹	7-13	7-36
June 21—6:57 AM ¹	7-14	7-37
June 21—8:30 AM ¹	7-15	7-38
June 21—10:00 AM ¹	7-16	7-39
June 21—2:15 PM ¹	7-17	7-40
June 21—5:45 PM ¹	7-18	7-41
December 21—9:45 AM ²	7-19	7-42
December 21—11:00 AM ²	7-20	7-43
December 21—12:00 PM ²	—	7-44
December 21—1:00 PM ²	7-21	7-45
December 21—2:00 PM ²	7-22	7-46
Notes:		
¹ Eastern Daylight Time		
² Eastern Standard Time		

E. ASSESSMENT OF SHADOW IMPACTS—2015

Table 7-3 and Figure 7-4 present the maximum heights allowed by the proposed rezoning for the buildings in the Academic Mixed-Use Area, as well as their mechanical information for both the 2015 and 2030 Build years. The building information in Table 7-3 was used in this analysis.

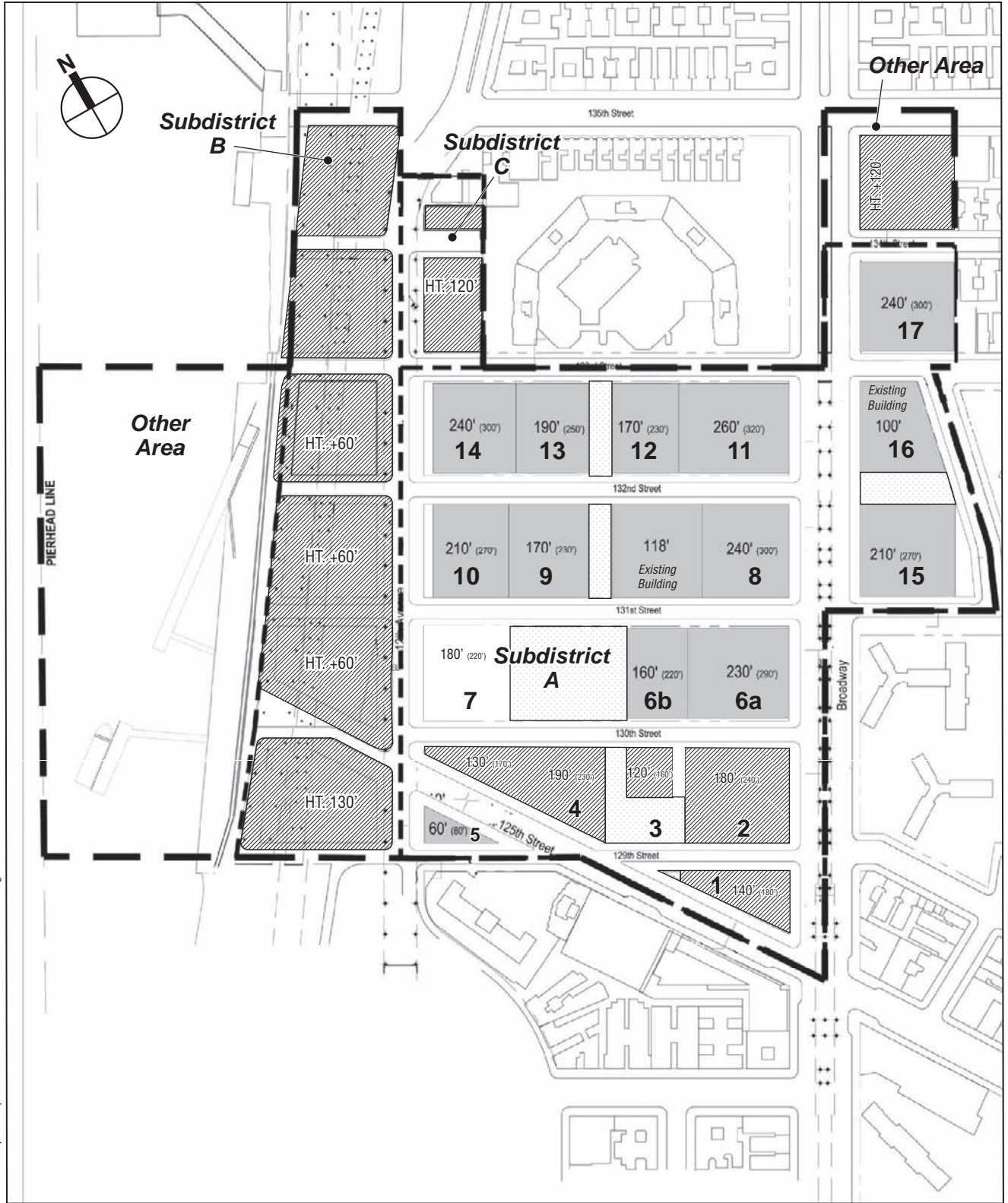
Table 7-3
Maximum Height of Proposed Buildings in the Academic Mixed-Use Area (in Feet)

Building ID	Maximum Height of Streetwall Above Designated Curb Level (in Feet)	Mechanical Height (in Feet)	Maximum Height of Buildings, Including Mechanical Space (in Feet)
1	140.00	40	180.00
2*	180.00	60	240.00
3	120.00	40	160.00
4	190.00	40	230.00
5	60.00	20	80.00
6	230.00	60	290.00
6b	160.00	60	220.00
7	180.00	40	220.00
8	240.00	60	300.00
9	170.00	60	230.00
10	210.00	60	270.00
11	260.00	60	320.00
12	170.00	60	230.00
13	190.00	60	250.00
14*	240.00	60	300.00
15*	210.00	60	270.00
16*	100.00	-	100.00
17*	240.00	60	300.00
The Square	50.00	NA	Open Space

Notes:
Designated curb level is lowest average curb level. See Figure 7-4 for the locations of the sites in Subdistrict A.
* Buildings on sites 2, 14, 15, and 17 are also analyzed with 2 emissions stacks each, side by side, ranging from 3.5 feet to 5 feet in diameter. The stacks on sites 1 and 16 are analyzed with 2 emissions stacks each, side by side, ranging from 1.1 feet to 1.5 feet in diameter. Stacks would range in height from 131 to 397 feet above Manhattan datum.

Under the reasonable worst-case development scenario, the Proposed Actions would result in five new buildings and new privately owned, publicly accessible open spaces in the Academic Mixed-Use Area by 2015 (see Figure 7-4). Four of these buildings (Sites 1–4) would be located in the Project Area south of West 130th Street. The fifth building would be on Site 7 east of Twelfth Avenue between West 130th and West 131st Streets. Open spaces would be located between West 129th and West 130th Streets, and at the western tip of the triangular-shaped block formed by the intersection of Broadway, West 125th Street, and West 129th Street. Also projected for development by 2015 are parcels along Twelfth Avenue in Subdistrict B,¹ and two lots in the Other Area east of Broadway at West 134th Street (see Figure 7-4).

¹ CPC is contemplating certain modifications to Subdistrict B. The proposed modifications would rezone Subdistrict B to a modified M1-2 light manufacturing district to support light manufacturing and retail uses. It is anticipated that this modification would not result in any projected development sites in Subdistrict B. The proposed modifications are more fully described in Chapter 29, “Modifications to the Proposed Actions.” Chapter 29 also analyzes the potential environmental impacts that could result from the proposed modifications.



NOT TO SCALE

- Project and Rezoning Area Boundary
- - -** Subdistrict Boundary
- 120'** Maximum Building Height not including mechanical
- (160')** Maximum Building Height with mechanical
- 1** Development Site

- Open Space
- To be completed by 2015
- To be completed by 2030

Note: See Table 7-2 for breakdown of rooftop and mechanical heights.

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For purposes of this analysis, it was conservatively assumed that the rezoning parcels in Subdistricts B, C, and the Other Areas would be developed by 2015 and to the maximum height permitted under the zoning. Within Subdistrict B, the proposed rezoning would limit building heights to 60 feet, except for the southernmost block between St. Clair Place and West 125th Street, Marginal Street, and Twelfth Avenue, which would have a height limitation of 130 feet.¹ Within the Other Area east of Broadway between West 134th and West 135th Streets, the proposed rezoning would limit building heights to 120 feet. The rest of the parcels in the Academic Mixed-Use Area are scheduled for completion by 2030.

SHADOWS ON OPEN SPACE RESOURCES

This section discusses shadows on each potentially affected open space resource. Durations of shadows that would be cast by the Proposed Actions’ buildings by analysis period in 2015 are presented in Table 7-4. New open space resources created as part of the Proposed Actions would be affected by shadow, but this shadowing is not considered to be significant or adverse, as the open spaces are created as part of the Proposed Actions.

**Table 7-4
Project Shadow Durations—2015**

Open Space	March 21/September 21 8:36 AM–5:29 PM EDT	May 6/August 6 7:27 AM– 6:18 PM EDT	June 21 6:57 AM– 7:01 PM EDT	December 21 8:51 AM– 2:53 PM EST
Proposed Actions’ open space 1a	8:36 AM–2:15 PM 2:30 PM–5:29 PM	7:27 AM–1:30 PM 1:45 PM–6:18 PM	6:57 AM–1:30 PM 1:45 PM–7:01 PM	8:51 AM–1:45 PM 2:00 PM–2:53 PM
Proposed Actions’ open space 1b	8:36 AM–2:15 PM	7:27 AM–1:30 PM	6:57 AM–1:30 PM	8:51 AM–1:45 PM
Proposed Actions’ open space 1c ¹	10:30 AM–2:15 PM 2:30 PM–5:29 PM	1:45 PM–6:18 PM	1:45 PM–7:01 PM	8:51 AM–1:45 PM 2:00 PM–2:53 PM
Proposed Actions’ open space 1d ¹	N/A	N/A	N/A	N/A
Proposed Actions’ open space 1e ¹	N/A	N/A	N/A	N/A
West Harlem Waterfront park	9:45 AM–10:00 AM	8:00 AM–8:15 AM	7:15 AM–7:30 AM	10:45 AM–11:00 AM
I.S. 195 Playground	8:36 AM–9:45 AM	7:27 AM–8:15 AM	6:57 AM–7:45 AM	9:00 AM–10:00 AM
Broadway Malls	–	–	–	9:00 AM–11:15 PM
Manhattanville Houses open spaces	5:00 PM–5:29 PM	4:30 PM–6:18 PM	4:45 PM–7:01 PM	–
Riverside Park	8:36 AM–9:00 AM	7:27 AM–8:30 AM	6:57 AM–8:30 AM	–
Notes:				
EST = Eastern Standard Time.				
EDT = Eastern Daylight Time.				
September 21 is the equivalent of March 21. August 6 is the equivalent of May 6.				
¹ Proposed Actions’ open spaces 1c, 1d and 1e will not be developed by the 2015 analysis year.				

PROPOSED ACTIONS’ OPEN SPACE 1A (THE SMALL SQUARE)

Open space 1a would be surrounded by proposed buildings 1–4. In particular, buildings 1, 2, and 3 would cast shadows on the open space for long periods in the morning on each of the analysis days, while the shadow from building 4 would reach the open space in the later afternoon.

¹ As described earlier, CPC is contemplating certain modifications to Subdistrict B that would not result in any projected development sites in Subdistrict B. The proposed modifications are more fully described in Chapter 29, “Modifications to the Proposed Actions.”

However, from March to September, much of the open space would be in sunlight for between two and three hours during the early afternoon.

On March 21, buildings 2 and 3 would cast shadows on open space 1a starting at the beginning of the analysis period, and continuing until 2:15 PM (see Figures 7-5 and 7-6). At 11:00 AM, the shadow from building 1 would enter the open space, also lasting until 2:15 PM. At 2:30 PM, the shadow from building 4 would move onto the open space and remain there until the end of the analysis day (see Figures 7-7 and 7-8). More than half the open space would be in sunlight from 1:00 PM to nearly 4:00 PM.

On May 6, open space 1a would be partially in shadows from the surrounding Proposed Actions' buildings for the entire analysis period except for a 15-minute period at around 1:30 PM (see Figures 7-9 to 7-13). More than half the open space would be in sunlight from 12:30 PM to nearly 3:00 PM.

On June 21, open space 1a would be partially in shadows from the Proposed Actions' buildings 2, 3, and 4 for the entire analysis period except for a 15-minute period at around 1:30 PM (see Figures 7-14 to 7-18). Similarly to the May analysis day, more than half the open space would be in sunlight from 12:30 PM to nearly 3:00 PM.

During December, the sun is low in the sky and shadows stretch farther than they do at other times of the year. On December 21, unlike on the other analysis days, shadows from existing buildings to the south across 125th Street would reach open space 1a in the middle of the analysis day (see Figures 7-21 and 7-22). Buildings 1, 2, and 3 would cast shadows on this open space from the start of the analysis day until 1:45 PM (see Figures 7-19 to 7-21), and building 4 would cast shadow from just after 2:00 PM to the end of the analysis day. At no time during this day would more than half of the open space be in sunlight.

PROPOSED ACTIONS' OPEN SPACE 1B (THE GROVE)

Open space 1b is the small triangular area at the western tip of the block formed by the intersection of Broadway, West 125th Street, and West 129th Street. It is northwest and adjacent to proposed building 1 and would receive shadow from building 1 in all seasons; it is southwest of proposed building 2 and would receive shadow from building 2 on the spring, summer, and fall analysis days.

On March 21, open space 1b would be partially or completely in shadow from building 1 from the start of the analysis day until 2:15 PM (see Figures 7-5 and 7-6), after which it would be in intermittent shadow from existing buildings to the south across 125th Street (see Figures 7-7 and 7-8).

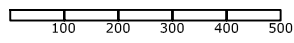
On May 6, building 1 would cast shadow on open space 1b from the beginning of the analysis period, 7:27 AM, until 1:30 PM (see Figures 7-9 to 7-11). Due to the shorter May shadows, the open space would be in full sunlight from 1:30 PM to 5:00 PM, as the shadows from the existing buildings to the south would not reach it until then (see Figures 7-12 and 7-13).

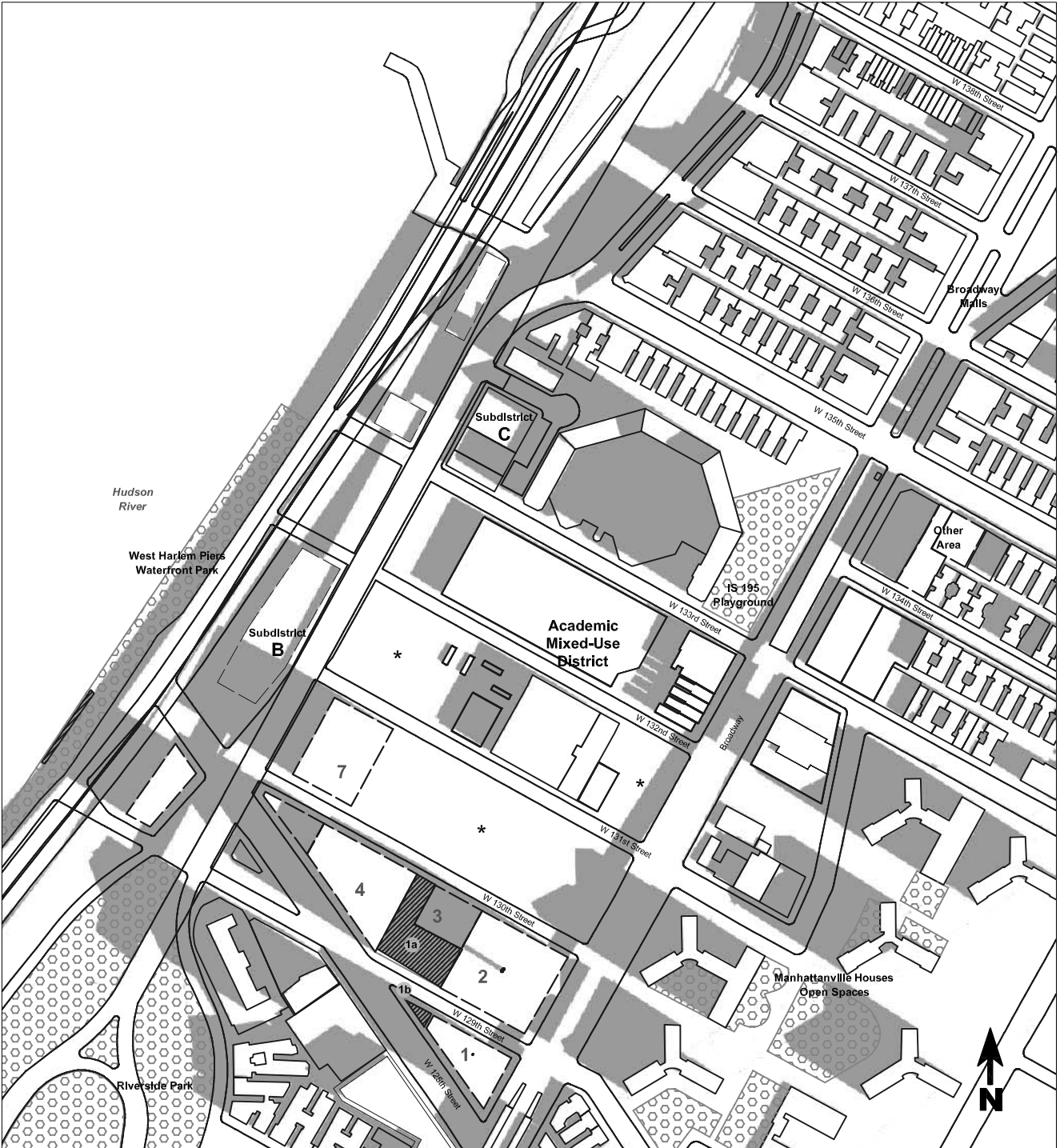
On June 21, building 1 would cast shadow on open space 1b from the beginning of the analysis period, 6:57 AM, until 1:30 PM (see Figures 7-14 to 7-16). The open space would be in full sunlight from 1:30 PM until 4:30 PM, when shadows from existing buildings across 125th Street would reach it (see Figures 7-17 and 7-18).

On December 21, building 1 would cast shadow on open space 1b from the beginning of the analysis period, 8:51 AM, until 1:45 PM, but by this time shadows cast by the existing buildings

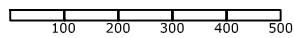


- Shadow
- 2015 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)

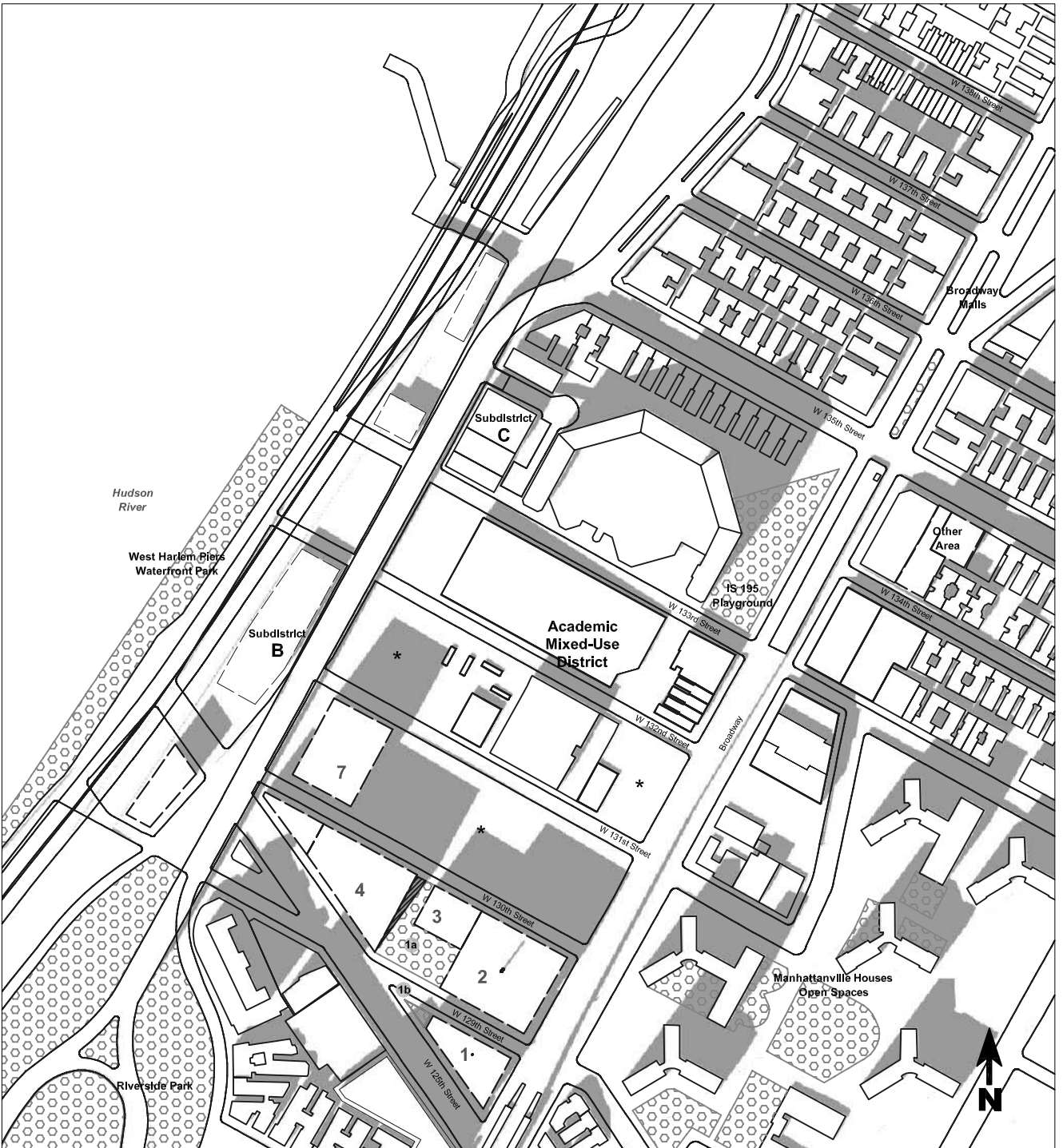








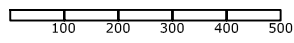
- Shadow
- 2015 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)

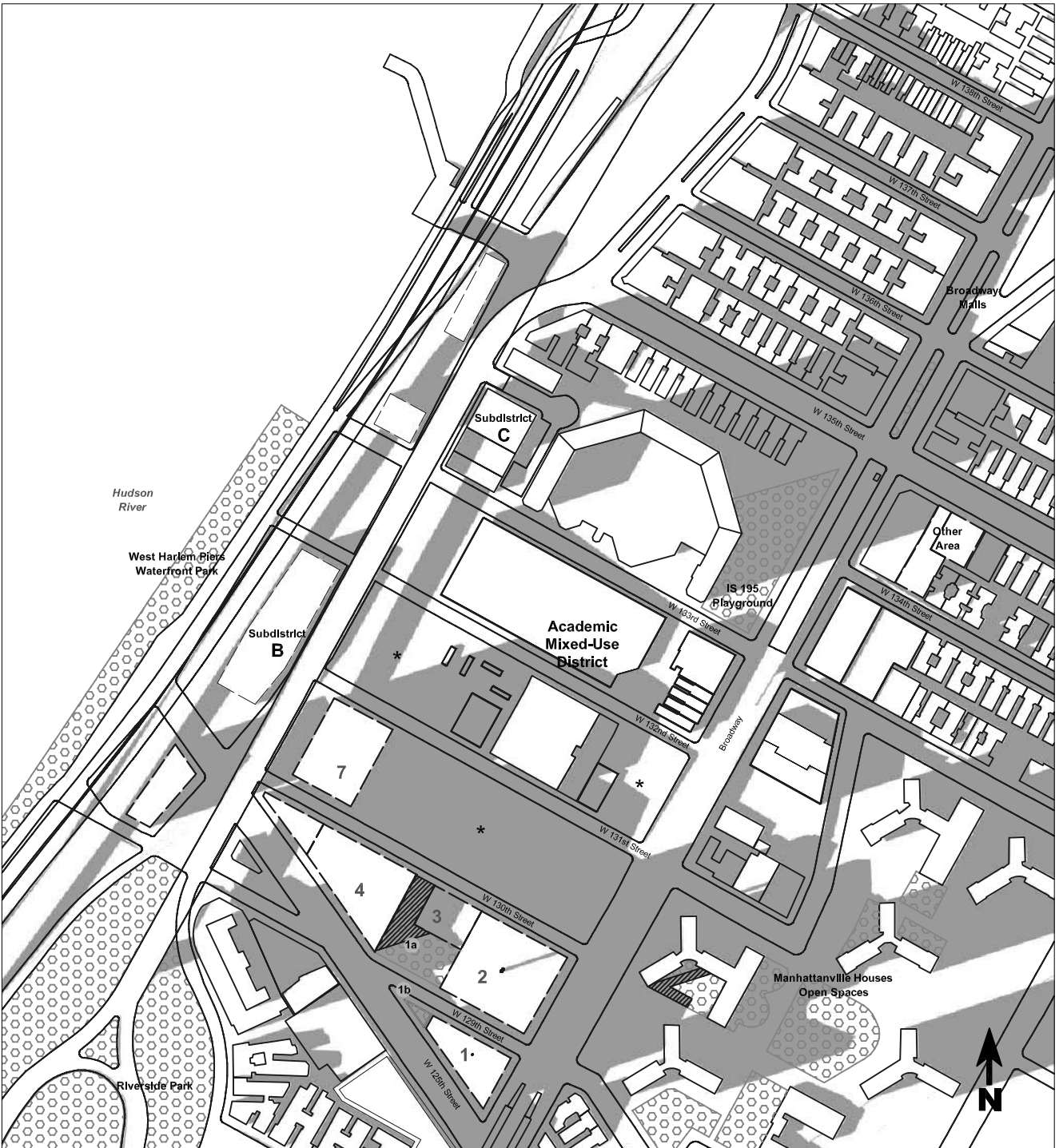


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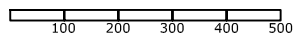


-  Shadow
-  2015 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)



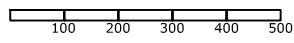


- Shadow
- 2015 Analysis Year Buildings
- ▨ Open Space
- ▩ Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)



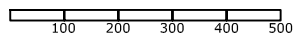


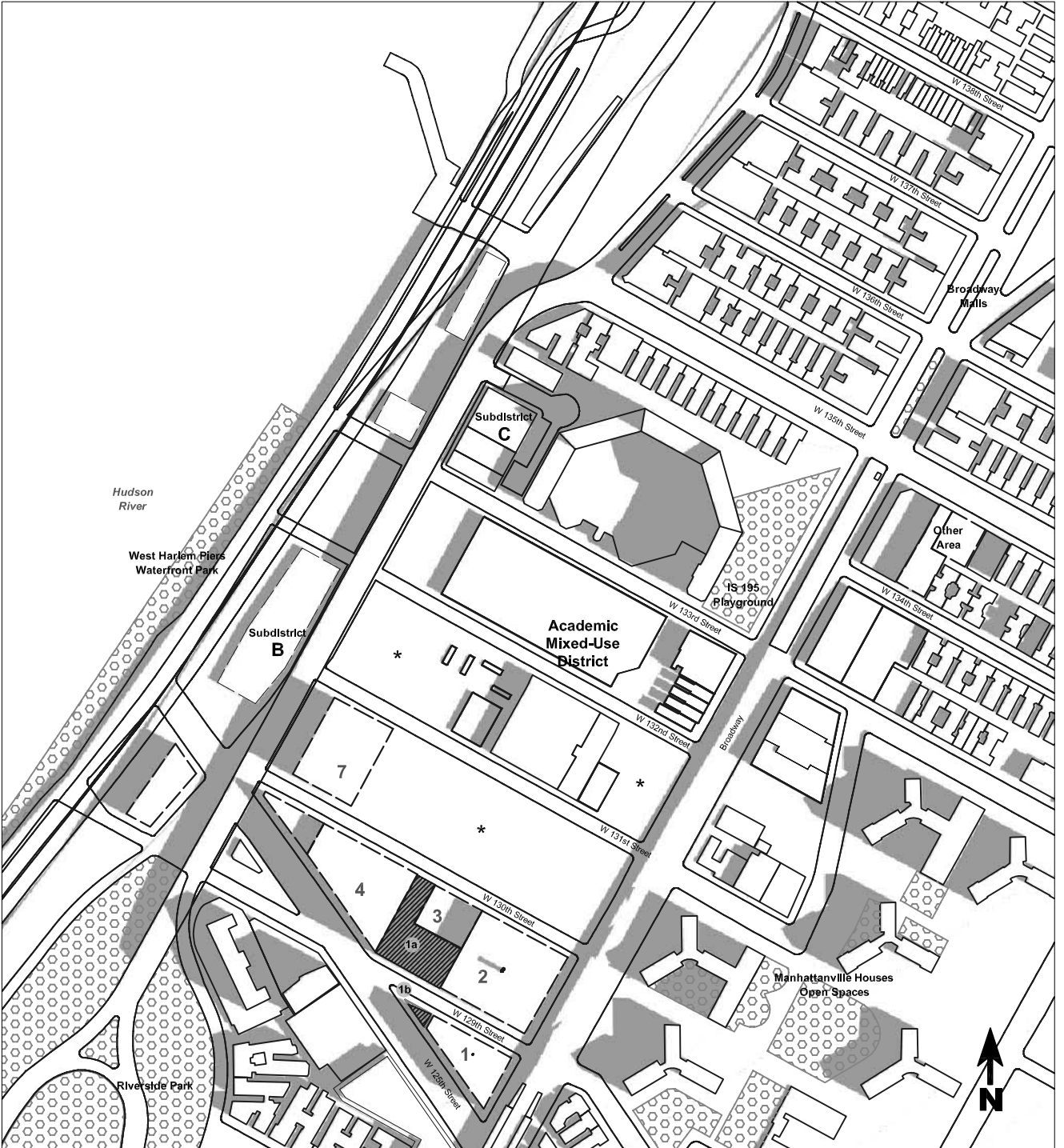
- Shadow
- 2015 Analysis Year Buildings
- ▨ Open Space
- ▩ Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)



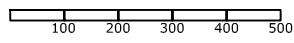


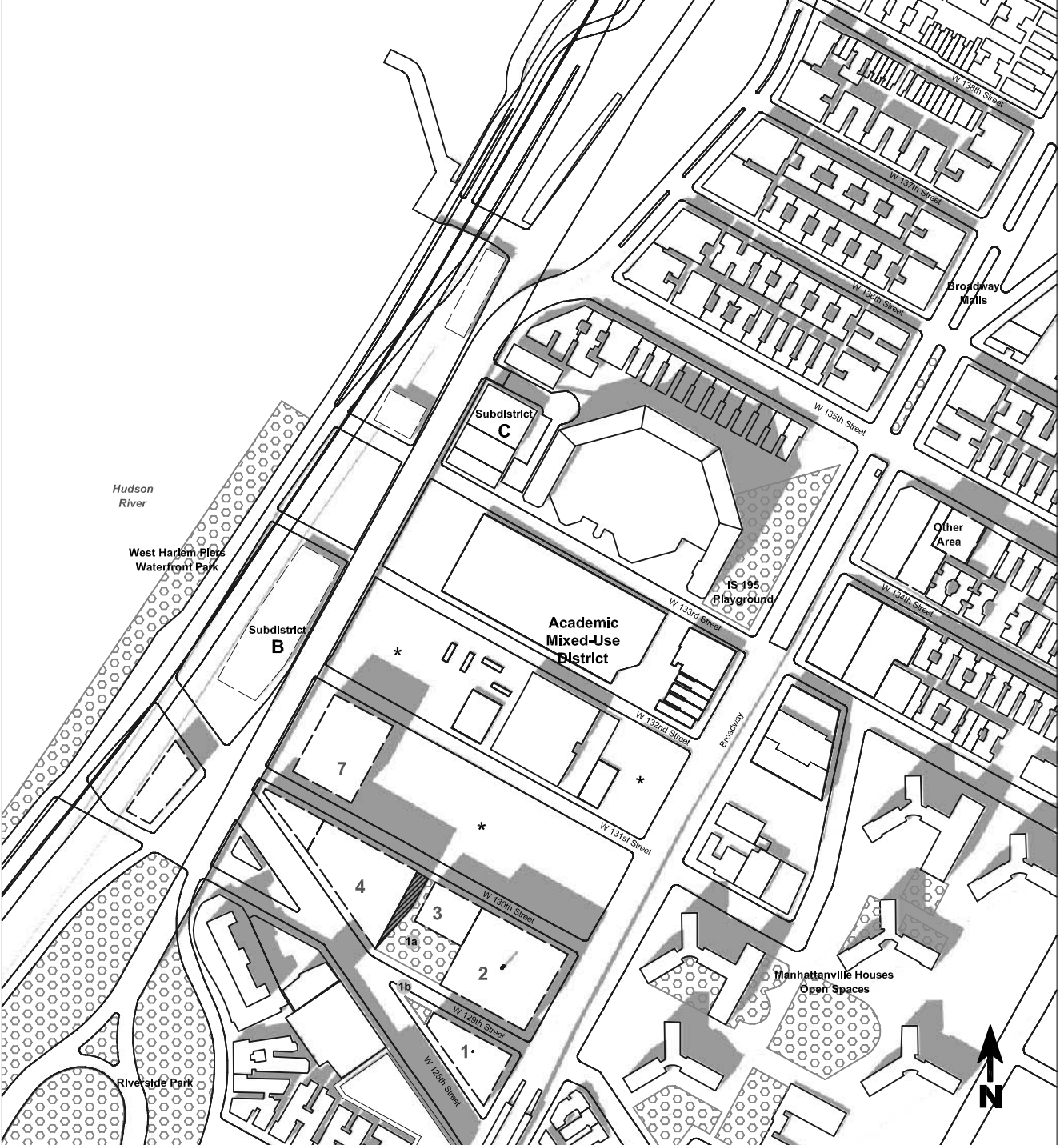
- Shadow
- 2015 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)



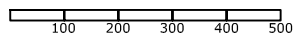


- Shadow
- 2015 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)







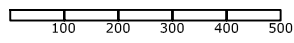


- Shadow
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- Open Space
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




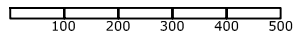


-  Shadow
-  2015 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)



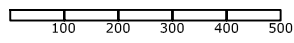


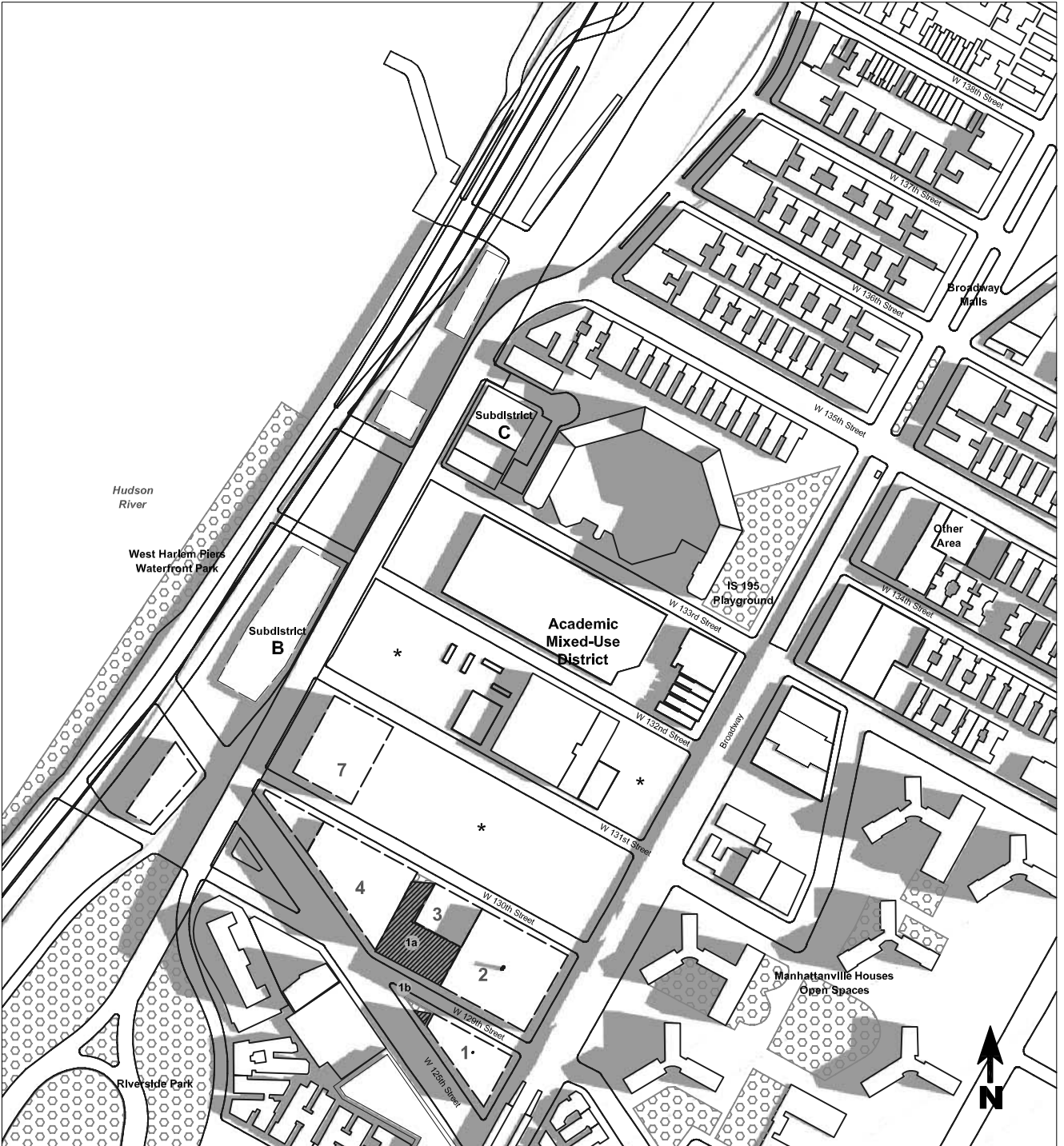
-  Shadow
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-  Open Space
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- * Construction Staging Area (Existing Buildings Demolished by 2015)







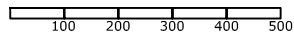


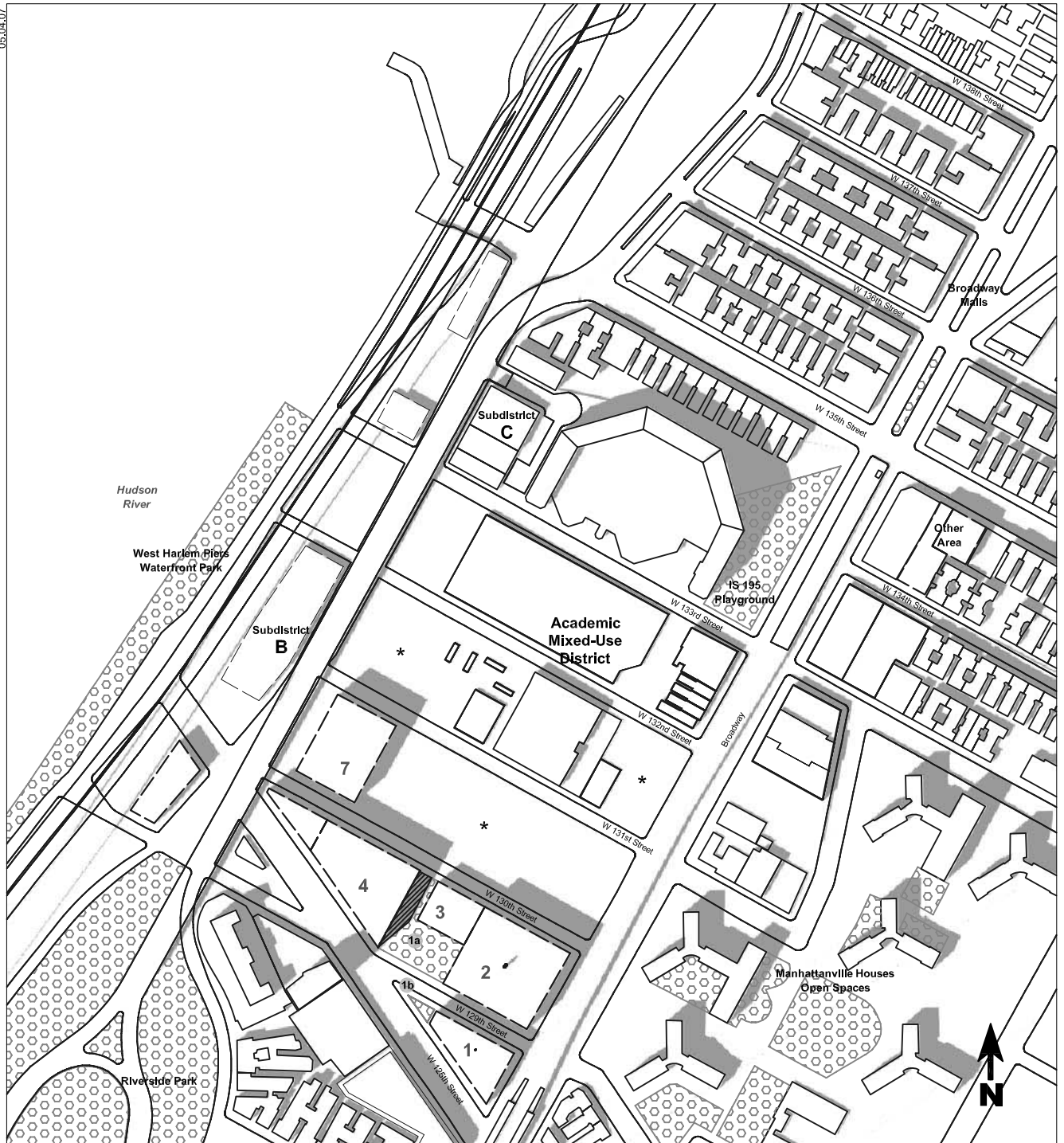
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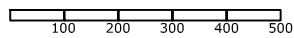


-  Shadow
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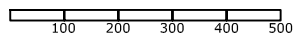


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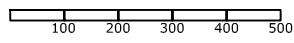


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- * Construction Staging Area (Existing Buildings Demolished by 2015)



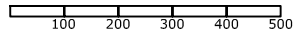


- Shadow
- 2015 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)



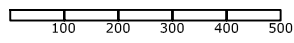


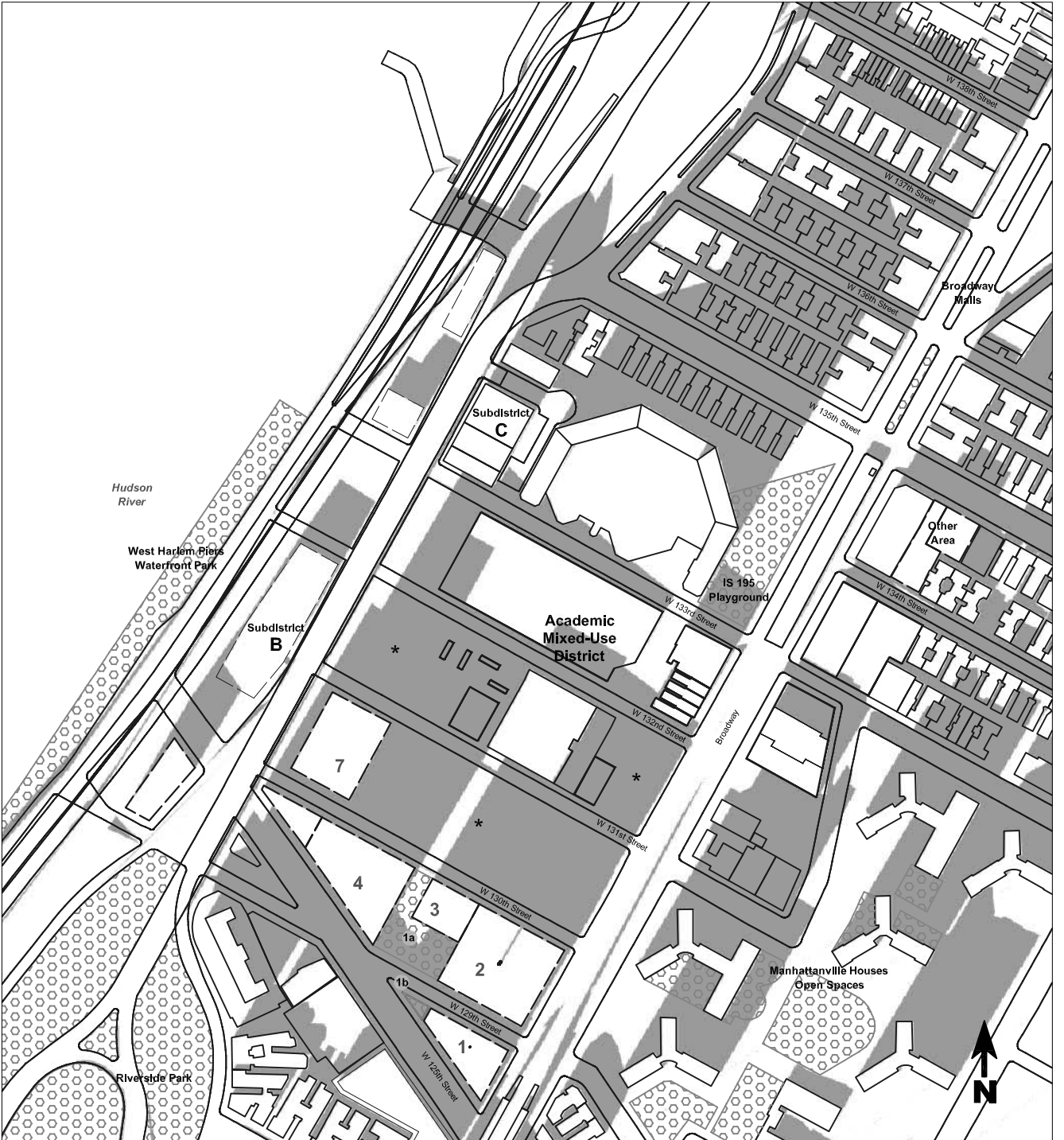
- Shadow
- 2015 Analysis Year Buildings
- Open Space
- ▨ Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)







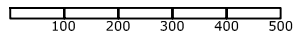


- Shadow
- 2015 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)





-  Shadow
-  2015 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action
- * Construction Staging Area (Existing Buildings Demolished by 2015)



Proposed Manhattanville in West Harlem Rezoning and Academic Mixed-Use Development FEIS

to the south would already completely cover the open space until the end of the analysis day (see Figures 7-19 to 7-22).

WEST HARLEM WATERFRONT PARK

The projected development sites in Subdistrict B would cast incremental shadows on the West Harlem Waterfront park (No. 2 in Figure 7-1) for approximately 15 minutes in the morning on each of the four analysis days. The proposed rezoning would limit building heights to 60 feet, except for the southernmost block between St. Clair Place and West 125th Street, Marginal Street, and Twelfth Avenue, which would have a height limitation of 130 feet.

At the beginning of each analysis day, the park would be covered in shadows cast by the Route 9A and Amtrak viaducts. As these shadows moved east and the western edge of the park along the water began to receive sunlight, the very top of the southernmost projected development site in Subdistrict B (Site 18, analyzed at a maximum height of 130 feet) would cast a small area of shadow on the western edge of the park. This incremental shadow would remain on the park for only about 15 minutes on all four days, moving quickly eastward off the park. On March 21, the incremental shadow would last from 9:45 AM to 10:00 AM (see Figure 7-6); on May 6, from 8:00 AM to 8:15 AM; on June 21, from 7:15 AM to 7:30 AM; and on December 21, from 10:45 AM to 11:00 AM (see Figure 7-20).

Due to the small areas and short durations of the incremental shadows, there would be no significant adverse impacts on the West Harlem Waterfront park with the Proposed Actions.

I.S. 195 PLAYGROUND

The projected development sites in the Other Area east of Broadway between West 134th and 135th Streets would cast incremental shadows on the I.S. 195 Playground (No. 3 in Figure 7-1) in the morning throughout the year. The proposed rezoning would allow for maximum building heights of 120 feet at this location. The existing building at 3333 Broadway, adjacent to the playground to the west, casts shadow on it during the afternoon throughout the year, and other nearby existing buildings cast shadows on it during parts of the year.

On March 21, projected development in the Other Area east of Broadway would cast incremental shadows on the northern part of the playground from 8:36 AM to 9:45 AM (see Figure 7-5); then the playground would experience full sunlight until the afternoon, when shadow from the existing 3333 Broadway would begin to move onto the open space.

On May 6, there would be incremental shadow on the playground from the beginning of the analysis period at 7:27 AM until 8:15 AM (see Figure 7-9). The playground would then experience full sunlight until the afternoon, when shadow from the existing 3333 Broadway would begin to move onto the open space.

On June 21, projected development in the Other Area east of Broadway would cast incremental shadows on the playground from the beginning of the analysis period at 6:57 AM until 7:45 AM (see Figure 7-14). The playground would experience full sunlight from 7:45 AM until the afternoon, when shadow from the existing 3333 Broadway would begin to move onto the open space.

On December 21, very small incremental shadows would be cast from projected development in the Other Area east of Broadway onto the northeast corner of the playground from 9:00 AM to 10:00 AM (see Figure 7-19).

Overall, the shadow durations would be limited to the morning hours and would be relatively short in duration. Therefore, there would be no significant adverse impacts to the I.S. 195 Playground from the Proposed Actions.

BROADWAY MALLS

The projected development sites in the Other Area east of Broadway between West 134th and 135th Streets would cast incremental shadows on a small portion of the Broadway Malls (No. 4 in Figure 7-1) on the December 21 analysis day. The incremental shadows from projected development in the Other Area east of Broadway would fall on the southern half of the mall between West 135th and 136th Streets from 9:00 AM to 11:00 AM (see Figures 7-19 and 7-20).

There would be no significant adverse impacts on the Broadway Malls with the Proposed Actions. While the malls would experience two hours of incremental shadows during the December analysis day, the coverage of these shadows would be limited to half a block of the mall at its greatest extent. At other times of the year, no incremental shadows would occur, and the overall usability and enjoyment of the malls would not be affected.

MANHATTANVILLE HOUSES OPEN SPACES

The Proposed Actions would result in the development of buildings on the west side of Broadway and on the south side of West 130th Street that would cast shadows on the Manhattanville Houses open spaces (No. 8 in Figure 7-1) in the late afternoon hours from March through September. These shadows would last from 29 minutes to just over 2½ hours, depending on the analysis day.

On March 21, incremental shadow from proposed building 2 would reach the westernmost open space between West 130th and West 131st Streets from 5:00 PM to 5:29 PM (see Figure 7-8). A portion of this open space would remain in sunlight during this time.

On May 6, incremental shadow from building 2 would be cast on the westernmost open space for a longer period, from 4:15 PM until the end of the analysis period, at 6:18 PM (see Figure 7-13). From 5:30 PM until 6:18 PM, the incremental shadow would remove all the sunlight from the open space. Proposed building 1 would also cast incremental shadow on the southernmost open space from 6:00 PM to 6:18 PM.

On June 21, the Proposed Actions' incremental shadows would last from 4:30 PM to 7:01 PM. Incremental shadow from building 2 would move onto the westernmost open space at 4:30 PM and remove all remaining sunlight from 5:45 PM until 7:01 PM (see Figure 7-18). Small areas of incremental shadow from buildings 1 and 2 would also reach the southernmost and central open spaces for less than an hour at the end of the analysis period.

On December 21, incremental shadows from the Proposed Actions would not reach the open spaces of the Manhattanville Houses.

Due to the short durations and small sizes of the incremental shadows, there would be no significant adverse impacts on the Manhattanville Houses open spaces. While incremental shadows would remove the last of the sunlight from the westernmost open space on two analysis days for periods of about an hour, the other open spaces would remain largely or wholly unaffected throughout the year; therefore, the overall usability of the open spaces would not be significantly reduced.

RIVERSIDE PARK

The Proposed Actions' building 4 (located south of West 130th Street) would cast very small areas of incremental shadow on Riverside Park (No. 9 in Figure 7-1) in the early morning from March through September. On March 21, the incremental shadow would fall on the park from 8:36 AM until 9:00 AM (see Figure 7-5). On May 6, the incremental shadow would fall on Riverside Park from the beginning of the analysis period, 7:27 AM, until 8:30 AM (see Figures 7-9 and 7-10). On June 21, building 4 would cast incremental shadow on the park from the beginning of the analysis period, 6:57 AM, until 8:30 AM (see Figures 7-14 and 7-15). On all three days, the incremental shadow would combine with other shadows from existing buildings between building 4 and the park.

Incremental shadows from the Proposed Actions would not reach Riverside Park on December 21. No significant adverse impacts on Riverside Park are anticipated, as the shadow durations would be short, and the size of the incremental shadows would be exceedingly small relative to the size of the park.

F. ASSESSMENT OF SHADOW IMPACTS—2030

As 2030 is the analysis year when full development is assumed, the discussions below indicate the greatest potential impacts of shadows from the Proposed Actions. In addition to the elements of the Proposed Actions to be completed in 2015, full development would include new open spaces—including the Square, the north–south midblock open areas and widened sidewalks north of West 130th Street, and the east–west midblock open area between Broadway and Old Broadway—and 12 additional buildings. The bulk of the new buildings would be located north of West 130th Street, east of Twelfth Avenue, and on both sides of Broadway above West 131st Street (see Figure 7-4). The 2030 full build-out would add more areas of incremental shadows and longer incremental shadow durations to most of the Proposed Actions' open spaces, the West Harlem Waterfront park, the I.S. 195 Playground, and the Broadway Malls. The Manhattanville Houses open spaces would receive more areas of incremental shadow, but the durations would be the same throughout the year. Riverside Park would be unaffected by the 2030 full build-out.

The shadow increments discussed in this section represent the full build-out of the Proposed Actions, taking into account all rezoning parcels and all buildings to be completed by 2030, including those already analyzed in the 2015 discussion.

SHADOWS ON OPEN SPACE RESOURCES

This section discusses shadows on each potentially affected open space resource. Durations of shadows that would be cast by the Proposed Actions' buildings by analysis period in 2030 are presented in Table 7-5. New open space resources created as part of the Proposed Actions would be affected by shadows, but this is not considered to be significant or adverse, as the open spaces are created as part of the Proposed Actions.

PROPOSED ACTIONS' OPEN SPACES 1A AND 1B

Very little would change for open space 1a with the addition of the 2030 buildings to the north. Only proposed building 6 would cast additional shadow on the open space, beyond those described for the 2015 Build year. These shadows would cover a very small area of the open space for two hours or less at the start of the March, May, and June analysis days. (See

“Assessment of Shadow Impacts—2015,” above, for a description of the effect of shadows from the Proposed Actions’ buildings on open space 1a.)

**Table 7-5
Project Shadow Durations—2030**

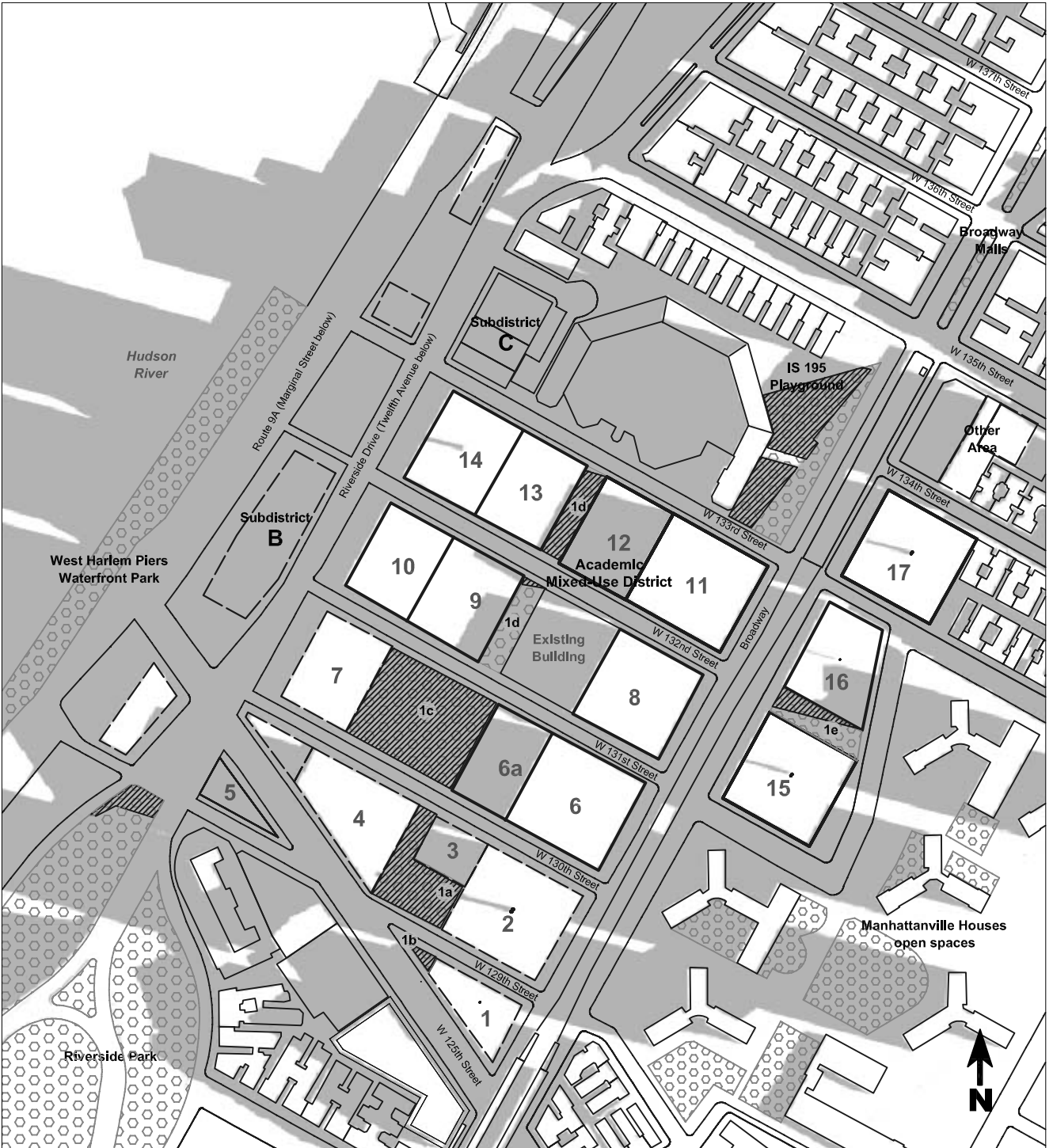
Open Space	March 21/ September 21 8:36 AM– 5:29 PM EDT	May 6/August 6 7:27 AM– 6:18 PM EDT	June 21 6:57 AM– 7:01 PM EDT	December 21 8:51 AM– 2:53 PM EST
Proposed Actions’ open space 1a	8:36 AM–2:15 PM 2:30 PM–5:29 PM	7:27 AM–1:30 PM 1:45 PM–6:18 PM	6:57 AM–1:30 PM 1:45 PM–7:01 PM	8:51 AM–1:45 PM 2:00 PM–2:53 PM
Proposed Actions’ open space 1b	8:36 AM–2:15 PM	7:27 AM–1:30 PM	6:57 AM–1:30 PM	8:51 AM–1:45 PM
Proposed Actions’ open space 1c	8:36 AM–5:29 PM	7:27 AM–6:18 PM	6:57 AM–7:01 PM	8:51 AM–2:53 PM
Proposed Actions’ open space 1d	8:36 AM–2:15 PM 2:30 PM–5:29 PM	7:27 AM–1:30 PM 1:45 PM–6:18 PM	6:57 AM–1:30 PM 1:45 PM–7:01 PM	8:51 AM–2:53 PM
Proposed Actions’ open space 1e	8:36 AM–9:45 AM 10:00 AM–5:29 PM	7:27 AM–10:30 AM 10:45 AM–6:18 PM	6:57 AM–11:15 AM 11:30 PM–7:01 PM	8:51 AM–2:53 PM
West Harlem Waterfront park	9:30 AM–10:30 AM	8:00 AM–9:00 AM	7:15 AM–8:30 AM	10:30 AM–11:00 AM
I.S. 195 Playground	8:36 AM–5:29 PM	7:27 AM–6:18 PM	6:57 AM–11:15 AM 12:30 PM–7:01 PM	8:51 AM–2:53 PM 9:00 AM–1:30 PM 2:15 PM–2:53 PM
Broadway Malls	–	–	–	–
Manhattanville Houses open spaces	5:00 PM–5:29 PM	4:30 PM–6:18 PM	4:45 PM–7:01 PM	–
Riverside Park	8:36 AM–9:00 AM	7:27 AM–8:30 AM	6:57 AM–8:30 AM	–
Notes:				
EST= Eastern Standard Time. EDT= Eastern Daylight Time. September 21 is the equivalent of March 21. August 6 is the equivalent of May 6.				

No additional shadows would be cast on open space 1b with the completion of the 2030 buildings, as the newer buildings would be located too far to the north for their shadows to reach the open space. (See “Assessment of Shadow Impacts—2015,” above, for a description of the effect of shadows from the Proposed Actions’ buildings on open space 1b.)

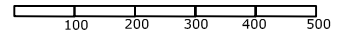
PROPOSED ACTIONS’ OPEN SPACE 1C (THE SQUARE)

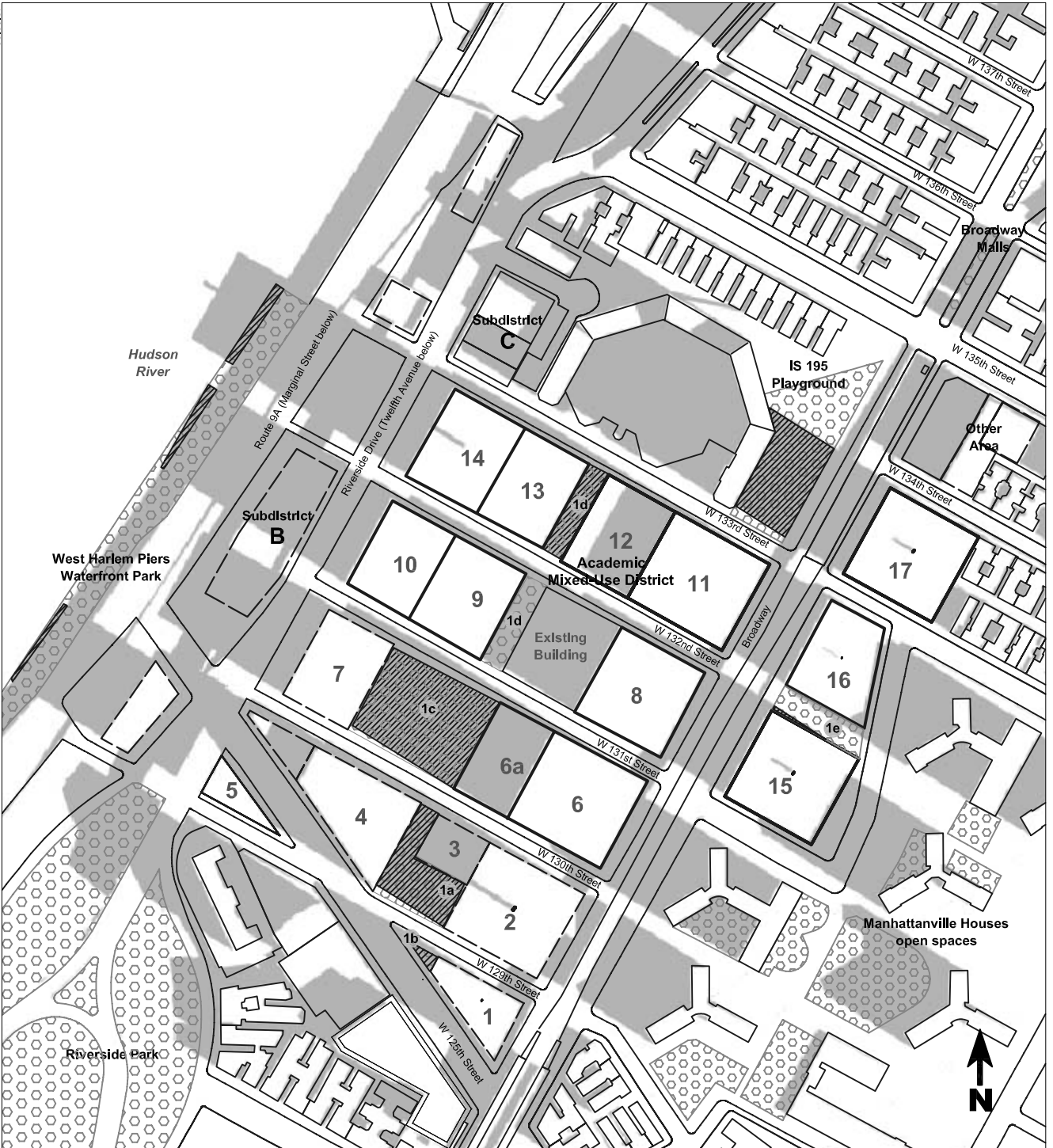
Open space 1c (the Square) would be completed in 2030, designed as the largest and most central open space in the development.

At the beginning of the March 21 analysis day, open space 1c would be completely in shadows from the Proposed Actions’ buildings to the east and northeast (see Figure 7-23). At 10:00 AM, the shadow from proposed building 6A (next to the open space to the east) would begin to move off the open space (see figure 7-24). At 11:00 AM, shadow from building 4 to the south would enter the open space, while the shadow from building 6A would still cover more than half the space. The two shadows would move eastward across the space through the midday hours, covering a little more than half the open space during this period (see Figures 7-25 to 7-27). The shadow from building 6A would exit at 2:15 PM, but by that time the shadow from building 4 would have moved to cover more than half the space. At 3:15 PM, shadow from building 4 would cover the entire space, which would remain in complete shadows from buildings 4 and 7 until the end of the analysis day (see Figures 7-29 and 7-30).

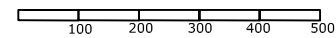


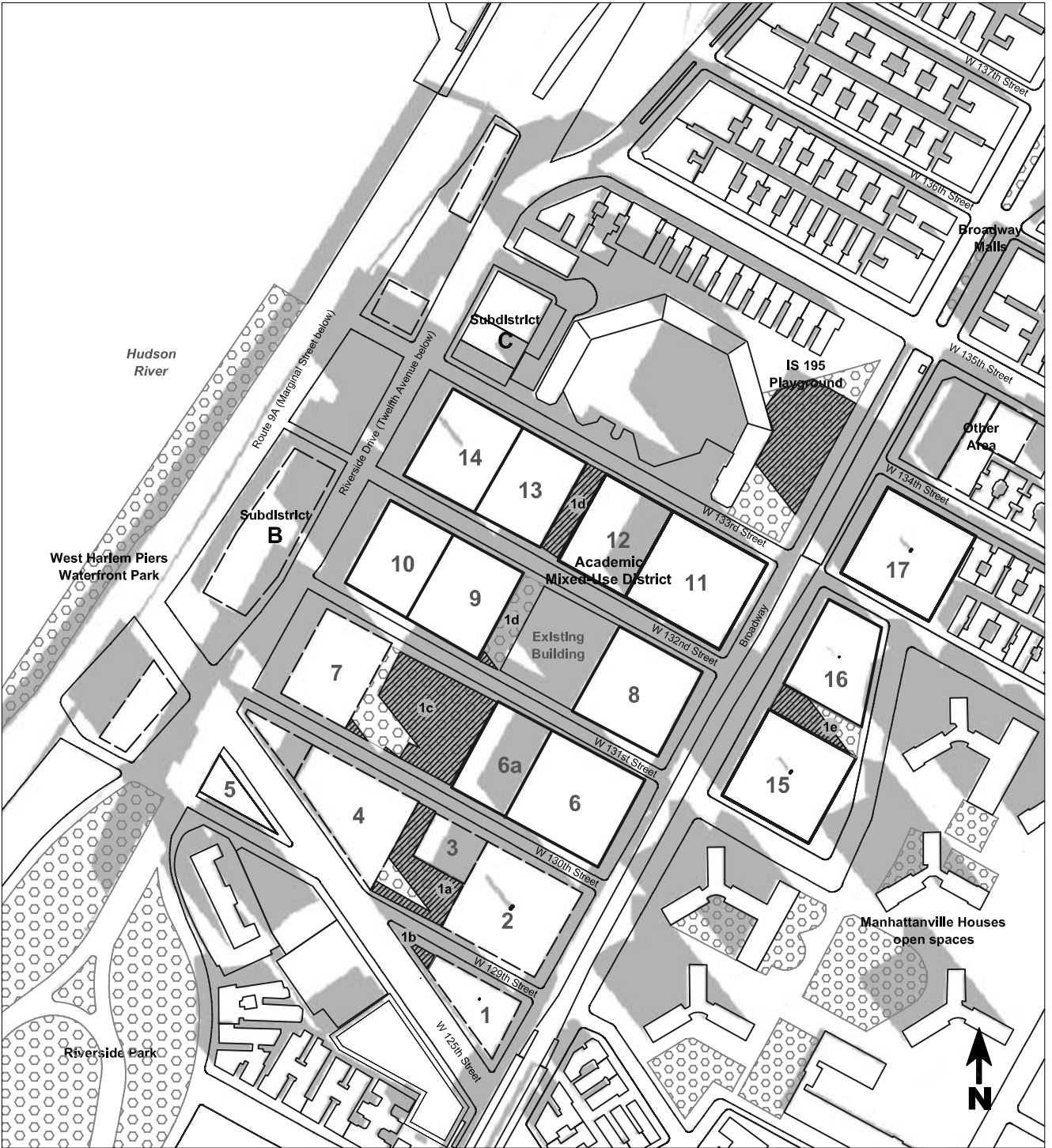
- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action



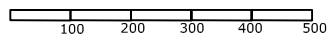


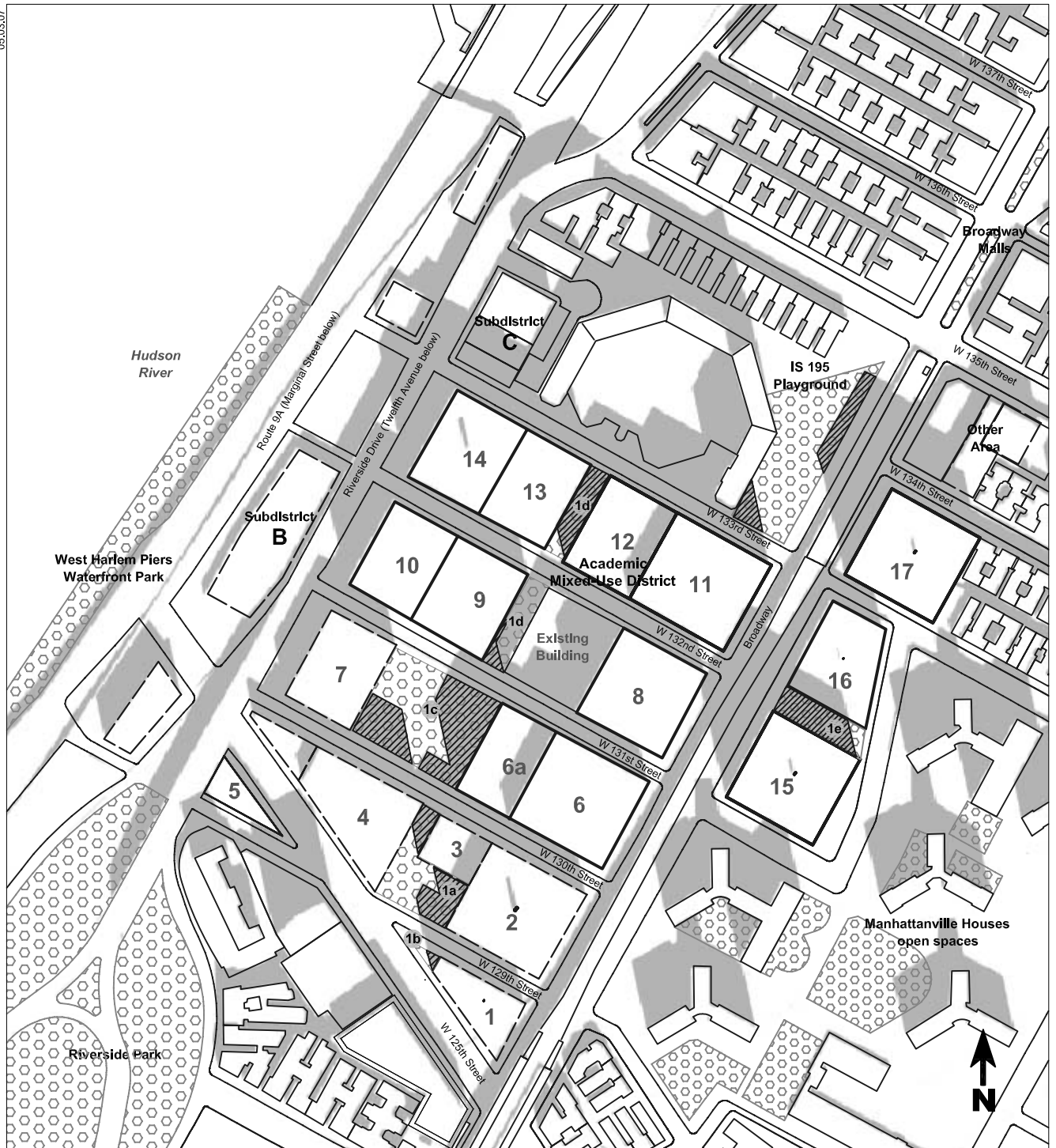
- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action





- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action

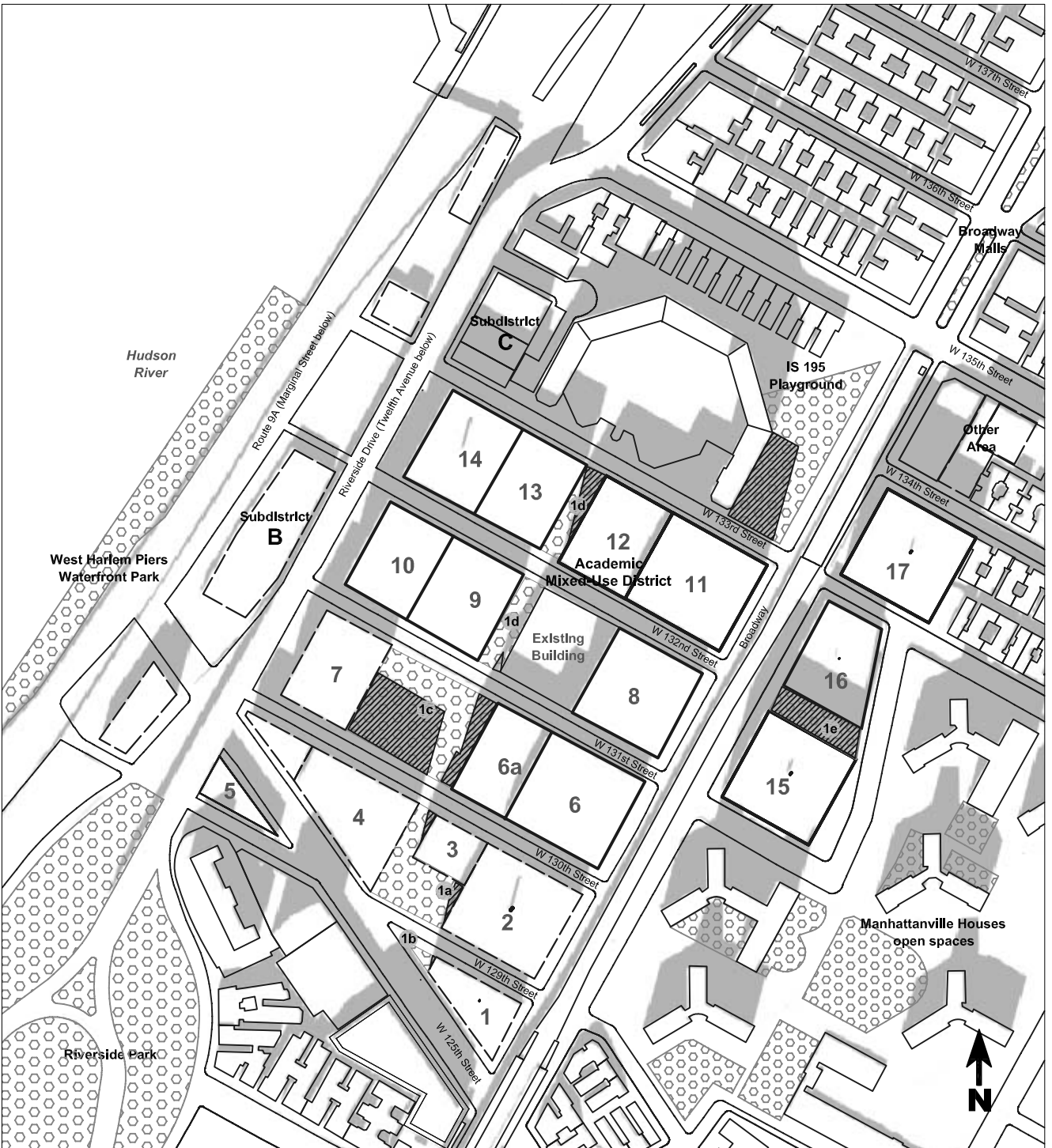




- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action

Shadow Diagram - 2030 Analysis Year
 March 21 - 12:30 PM DST
 Figure 7 - 26

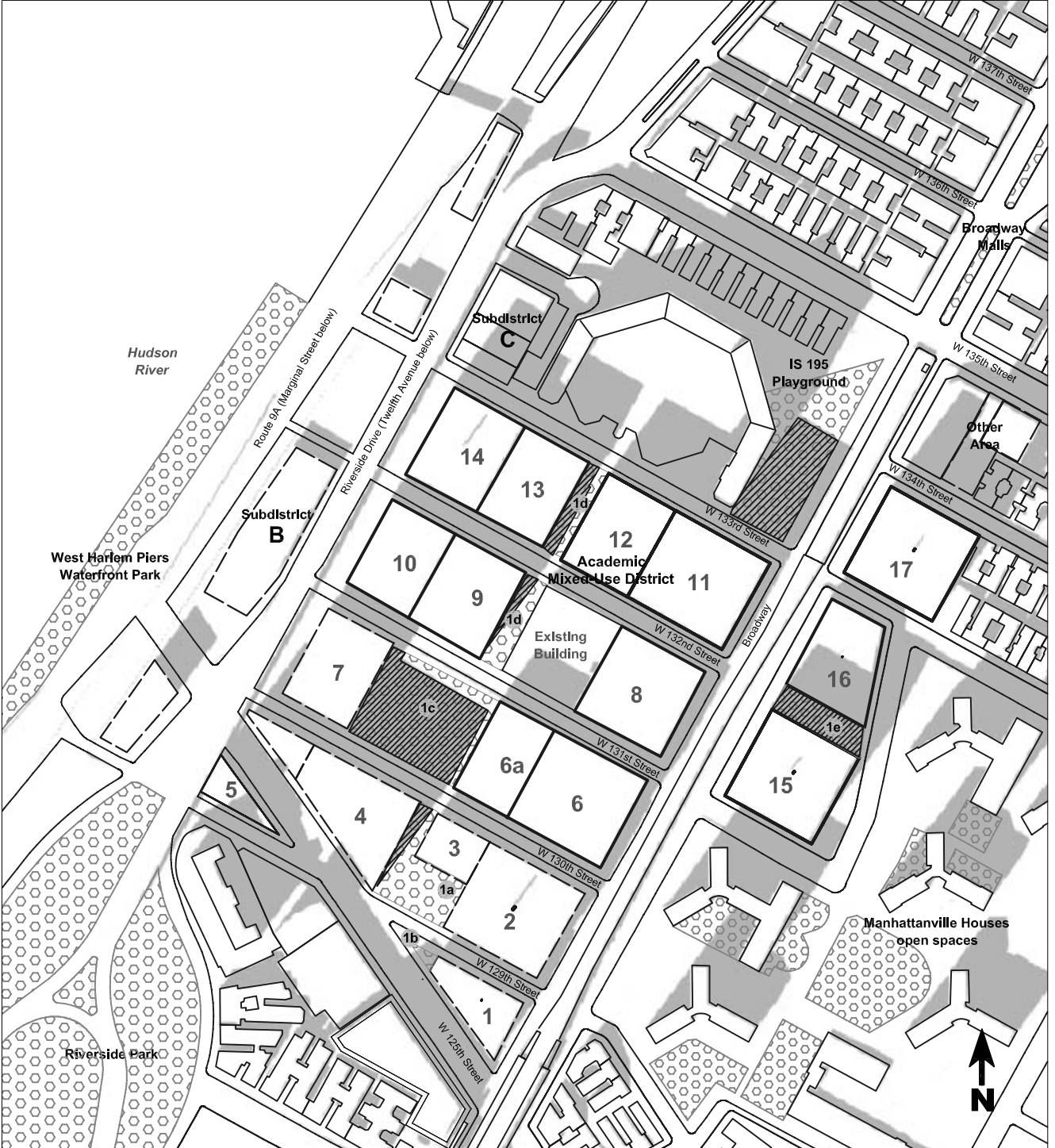
**MANHATTANVILLE REZONING IN WEST HARLEM
 AND ACADEMIC MIXED-USE DISTRICT**








- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action

Shadow Diagram - 2030 Analysis Year
 March 21 - 1:45 PM DST
 Figure 7 - 27

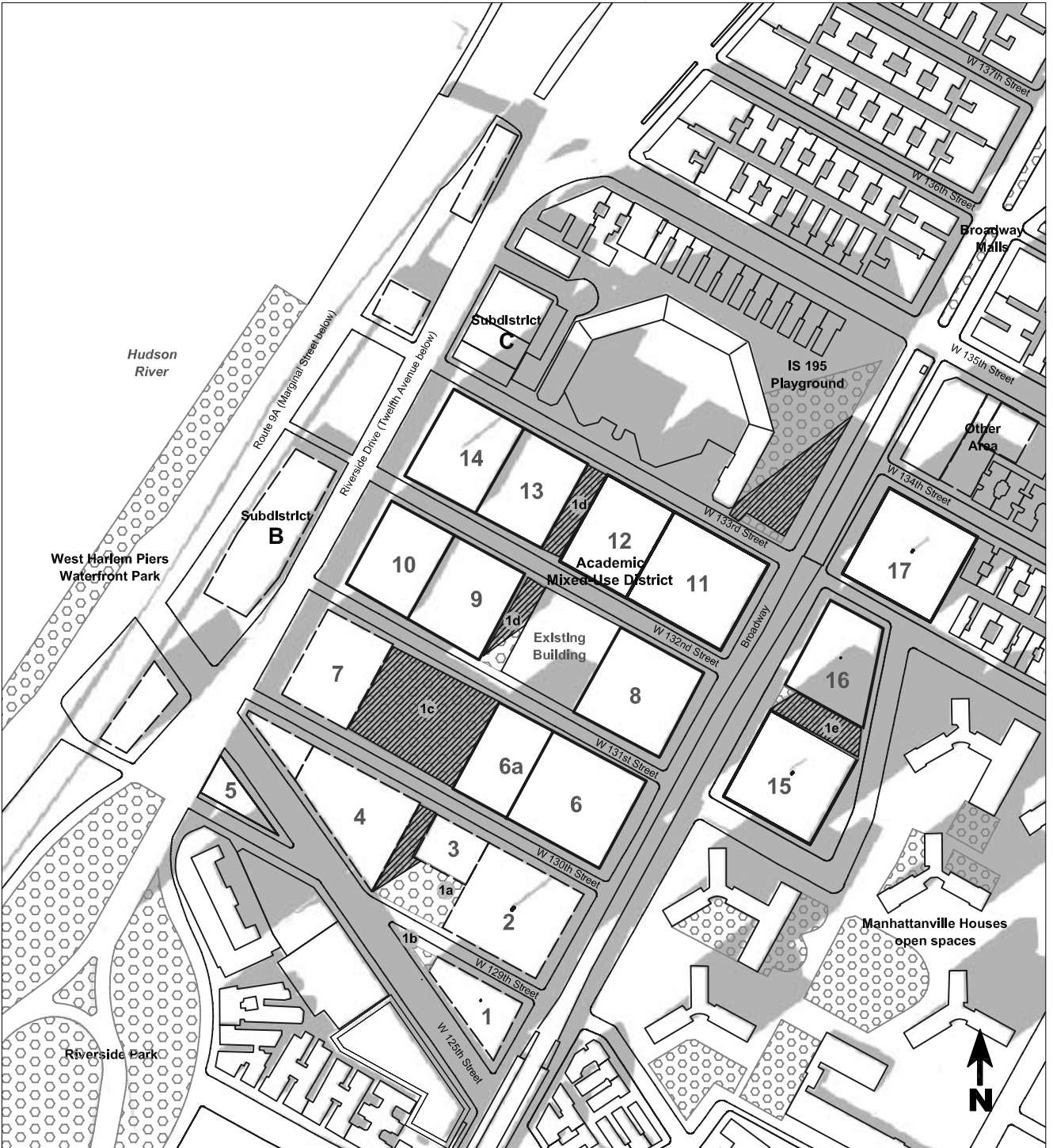
**MANHATTANVILLE REZONING IN WEST HARLEM
 AND ACADEMIC MIXED-USE DISTRICT**








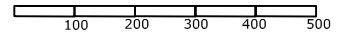
-  Shadow
-  2015 Analysis Year Buildings
-  2030 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action

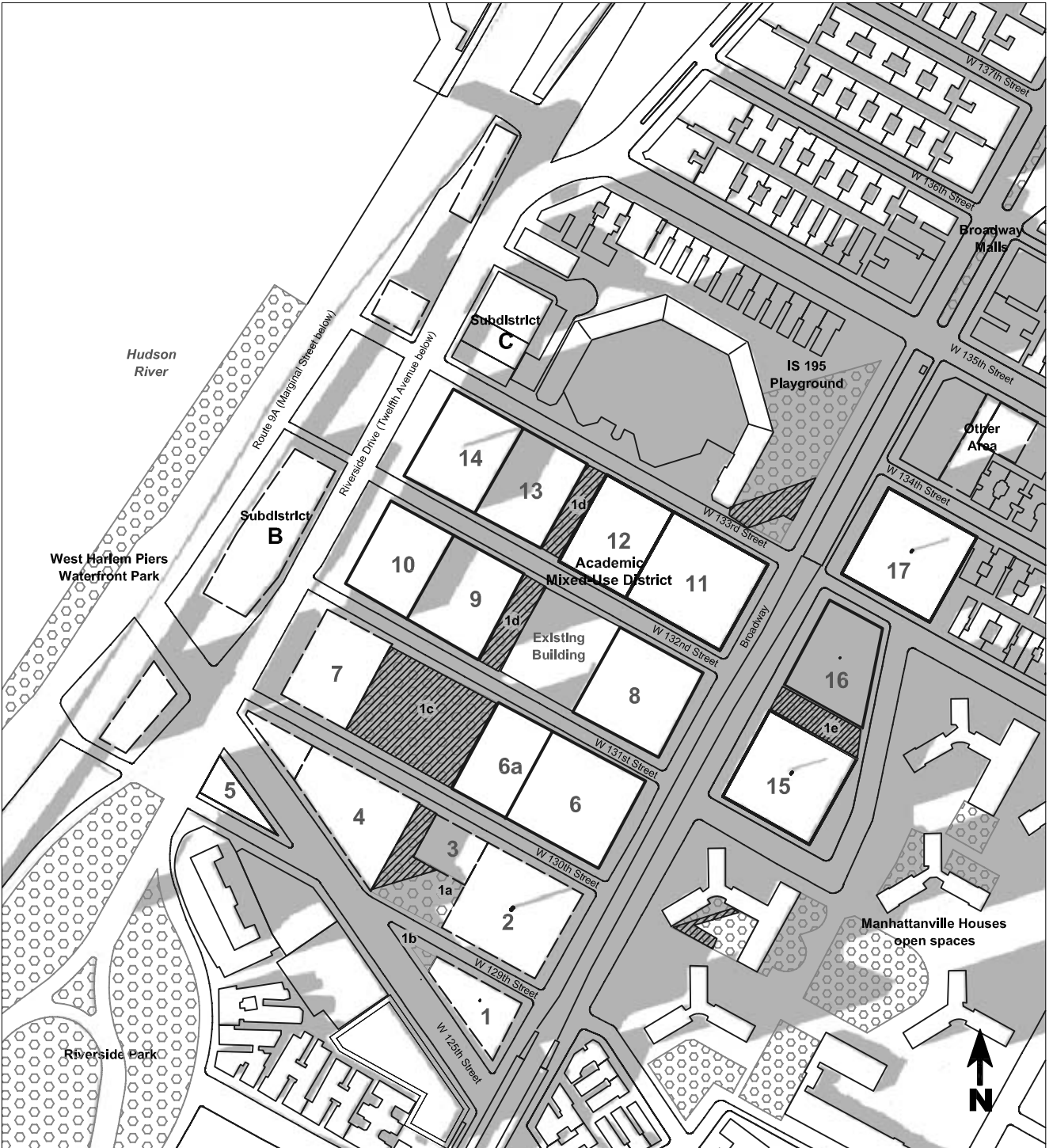
Shadow Diagram - 2030 Analysis Year
 March 21 - 2:45 PM DST
 Figure 7 - 28

**MANHATTANVILLE REZONING IN WEST HARLEM
 AND ACADEMIC MIXED-USE DISTRICT**

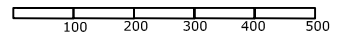


-  Shadow
-  2015 Analysis Year Buildings
-  2030 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action





- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action



Proposed Manhattanville in West Harlem Rezoning and Academic Mixed-Use Development FEIS

At the beginning of the May 6 analysis day, open space 1c would be in complete shadows from the Proposed Actions' buildings to the east and northeast (see Figures 7-31 and 7-32). At 9:15 AM, a portion of the open space would begin to receive sunlight; this area would increase in size (see figure 7-33) until 11:30 AM, when more than half the open space would be in sunlight. At 12:00 PM, shadow from building 4 to the south would enter the space, while at 1:30 PM the last shadow from the east (building 6A) would exit the space. More than half the open space would remain in sunlight until around 2:15 PM (see Figures 7-34 and 7-35). After this, shadows from proposed buildings to the west and south would grow larger across the open space (see Figure 7-36). From 6:00 PM until the end of the analysis day, the open space would be completely covered in shadows from the Proposed Actions' buildings.

At the beginning of the June 21 analysis day, open space 1c would be in complete shadows from the Proposed Actions' buildings to the east and northeast (see Figures 7-37 and 7-38). At 8:45 AM, a small area of the open space would begin to receive sunlight; this area would increase in size (see Figure 7-39) until 11:15 AM, when more than half the open space would be in sunlight, shaded only by building 6A to the immediate east. At 12:45 PM, just before shadow from building 4 to the south would enter the space, nearly the entire open space would be in sunlight. The open space would remain mostly in sunlight (see Figure 7-40) until around 3:30 PM, when shadows from buildings 4 and 7 would grow larger across half the open space. Most of the open space would be in shadows until the end of the analysis day (see Figure 7-41), but at no time in the afternoon would the entire open space be in shadows.

In December, the sun is low in the sky, and shadows stretch farther than they do in other seasons. On the December 21 analysis period, open space 1c would be mostly or completely in shadows from the Proposed Actions' buildings throughout the day (see Figures 7-42 to 7-46).

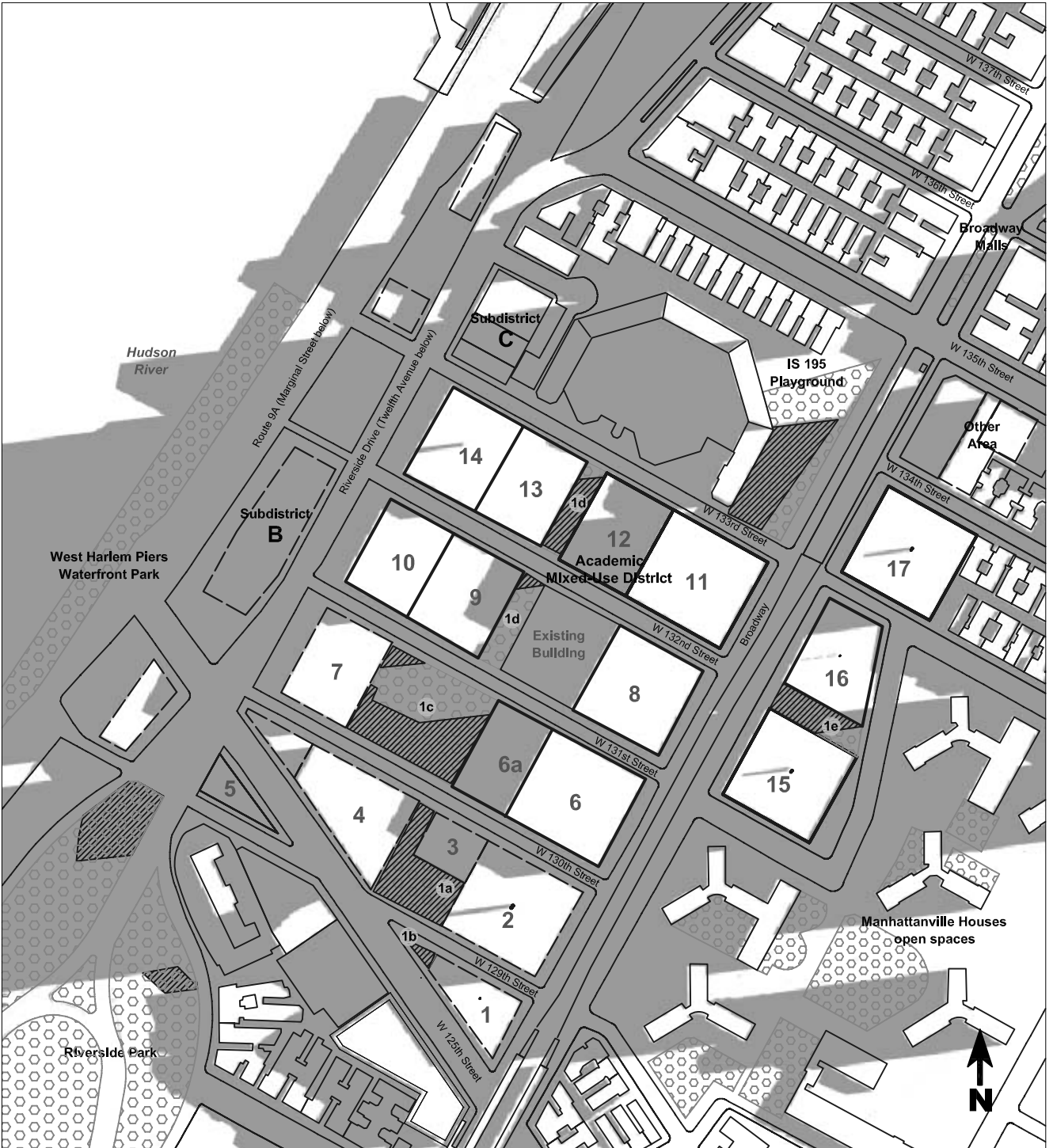
PROPOSED ACTIONS' OPEN SPACE 1D

On all four analysis days, open space 1d would be mostly or completely covered by shadow from early morning to midday, and then again from mid-afternoon to sundown.

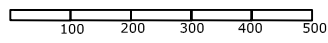
On March 21, open space 1d would be in complete shadow until 12:00 PM (see Figures 7-23 to 7-25), when shadows from proposed buildings to the south and southeast would begin to move off the open space. At about 2:15 PM, the open space would experience approximately 15 minutes of full sunlight; then shadows from proposed buildings to the west and southwest would enter the open space. By 5:00 PM, the open space would be in complete shadow until the end of the analysis day (see Figure 7-30).

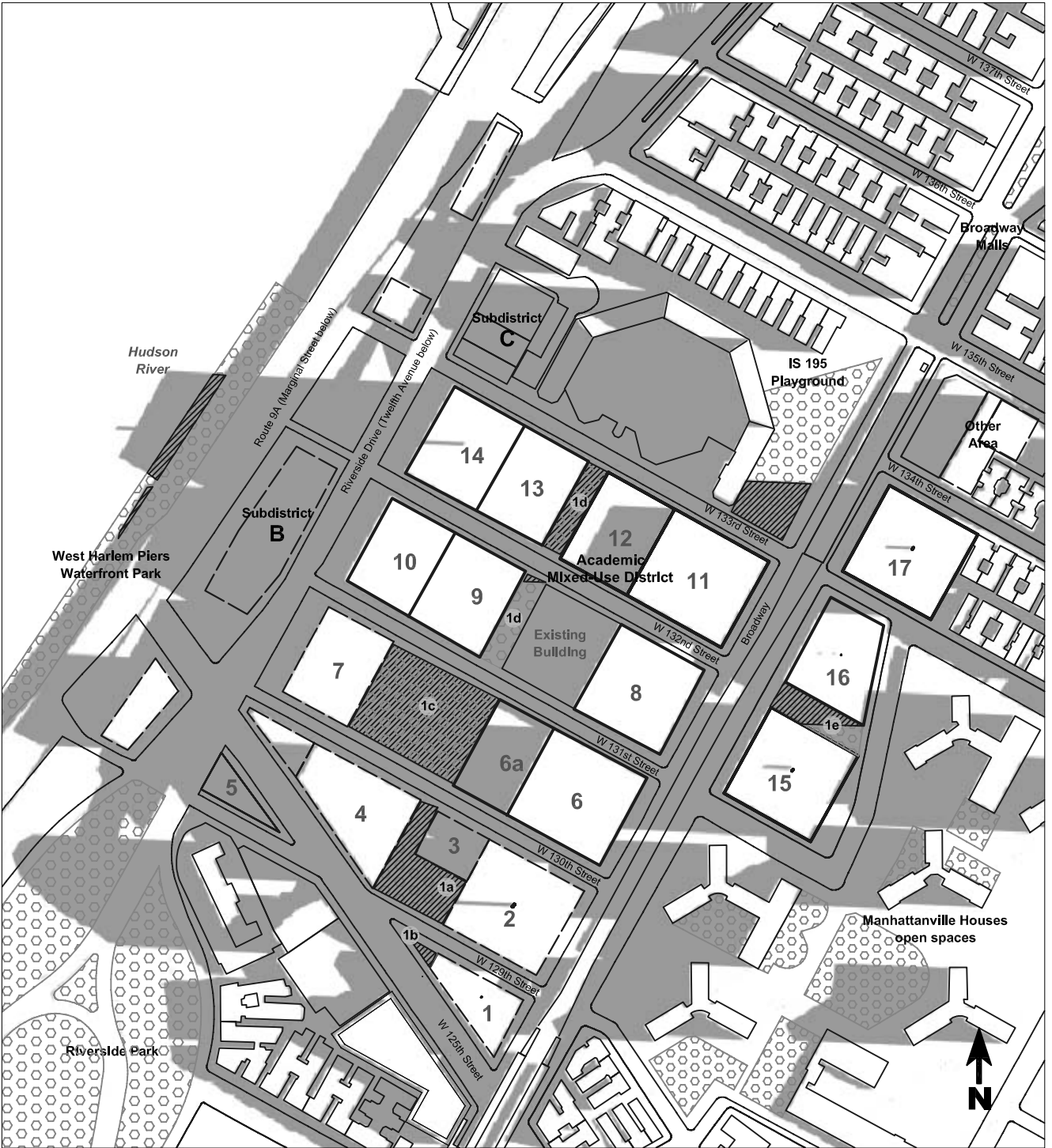
On May 6, open space 1d would be in complete shadow until 10:45 AM (see Figures 7-31 to 7-33), when shadows from proposed buildings to the south and southeast would begin to move off the open space. At about 1:30 PM, the open space would experience approximately 15 minutes of full sunlight; then shadows from proposed buildings to the west and southwest would enter the open space. By 4:45 PM, the two midblock open areas would be in complete shadow until the end of the analysis day (see Figure 7-36).






On June 21, open space 1d would be in complete shadow until 11:15 AM (see Figures 7-37 to 7-39), when shadows from proposed buildings to the south and southeast would begin to move off the open space. At about 1:30 PM, the open space would experience approximately 15 minutes of full sunlight; then shadows from proposed buildings to the west and southwest would enter the open space. By 5:00 PM the open space would be in complete shadow until the end of the analysis day (see Figure 7-41).

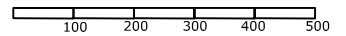


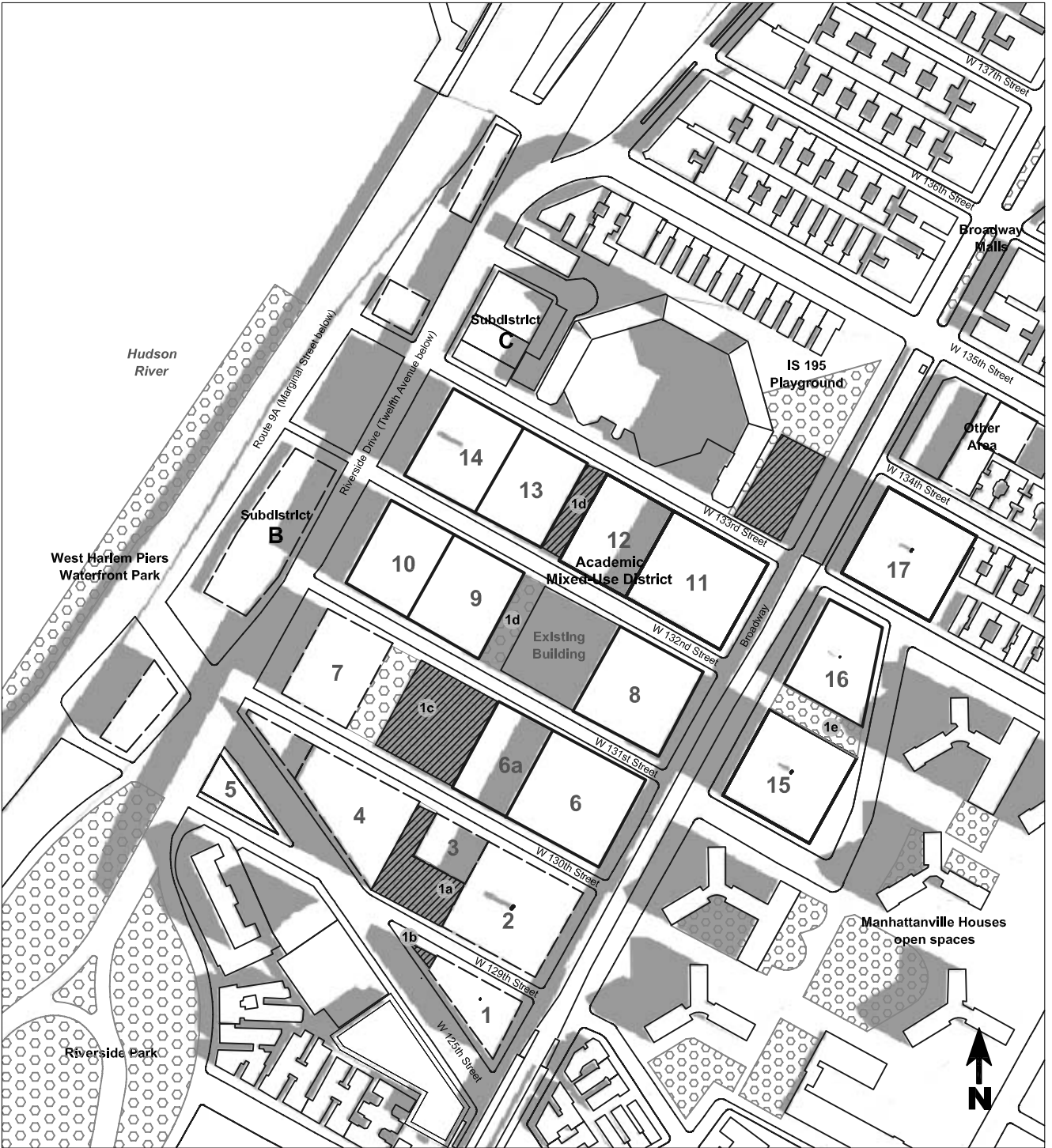
- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action



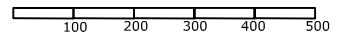


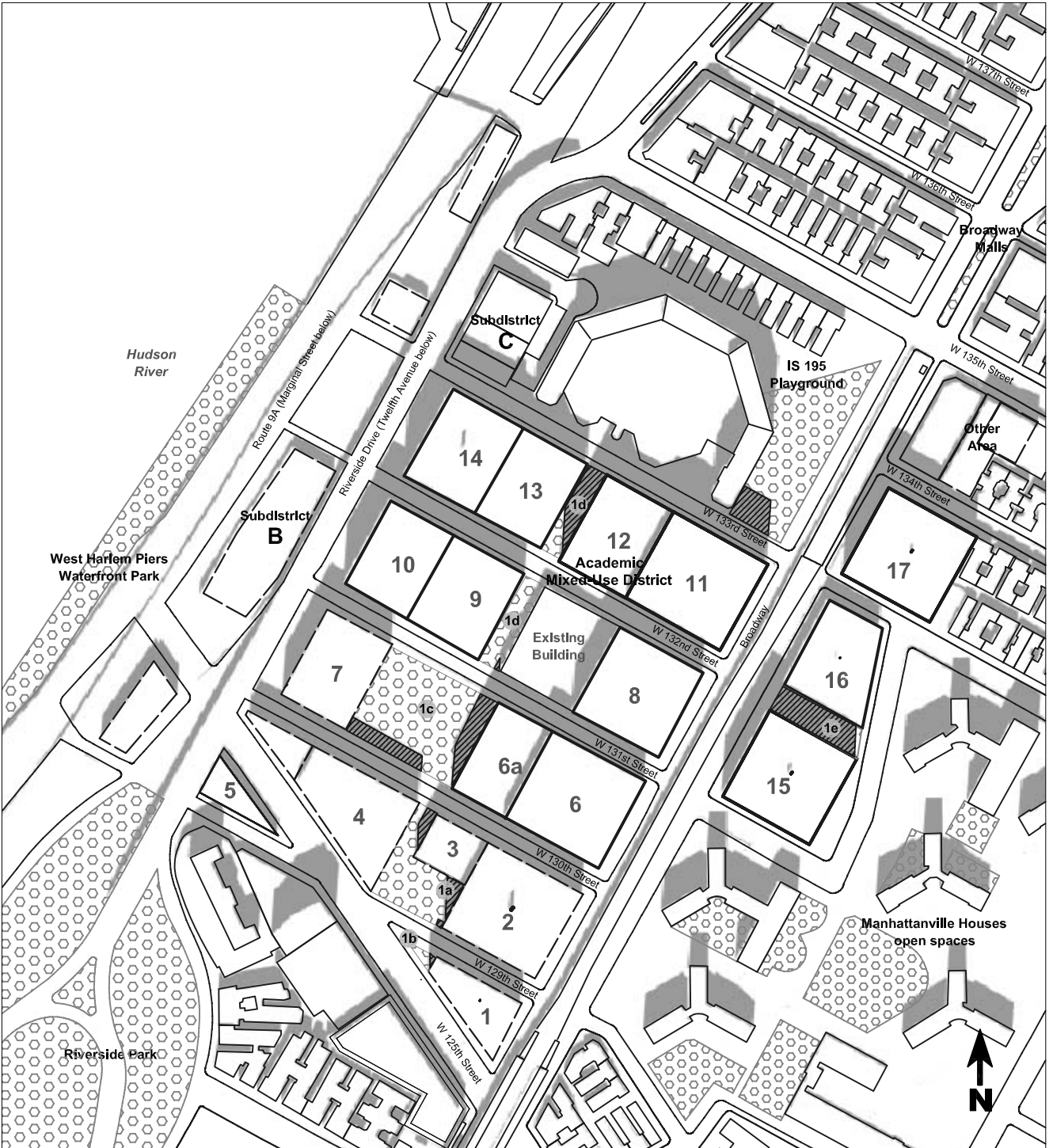
-  Shadow
-  2015 Analysis Year Buildings
-  2030 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action





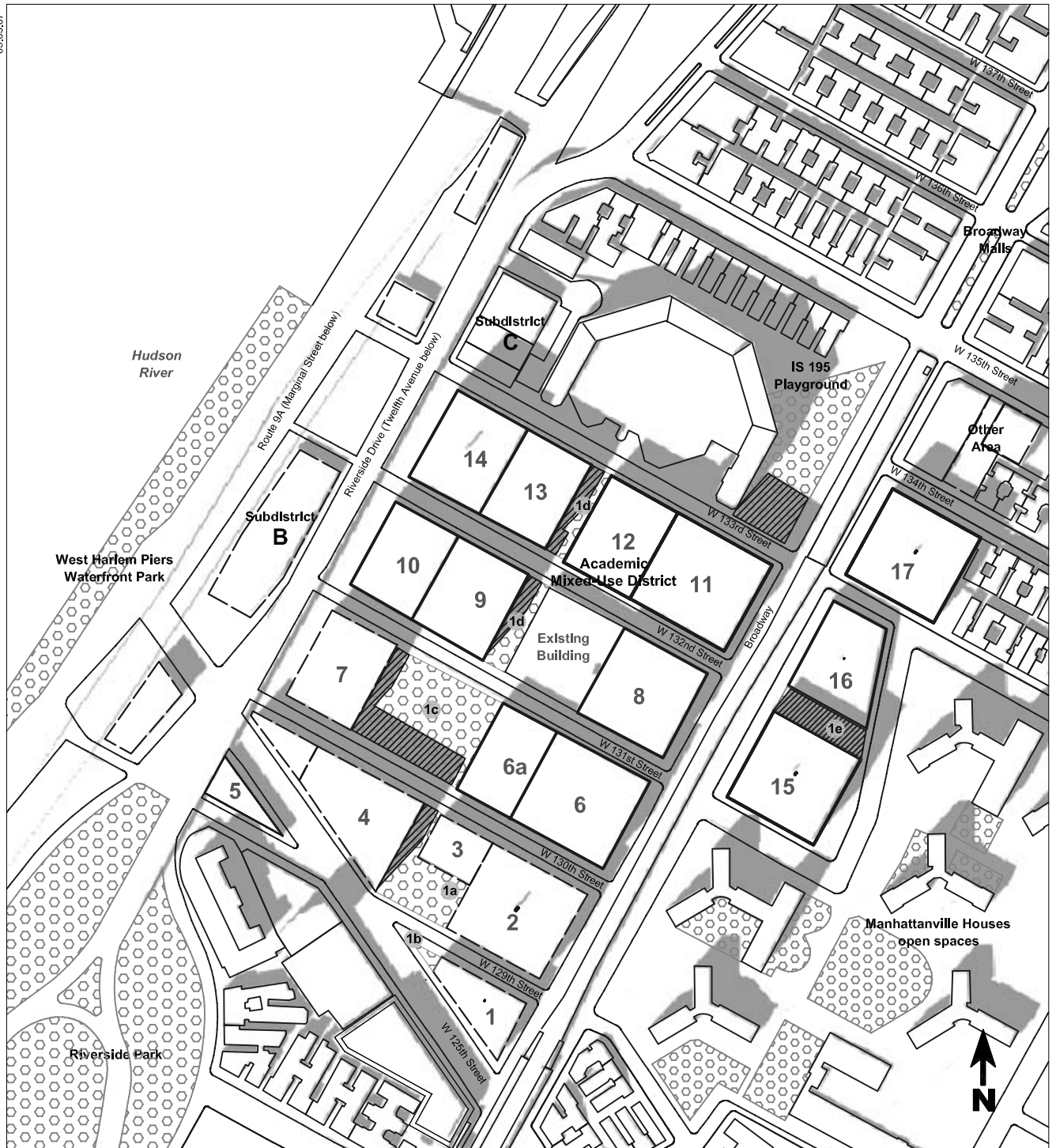
- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action





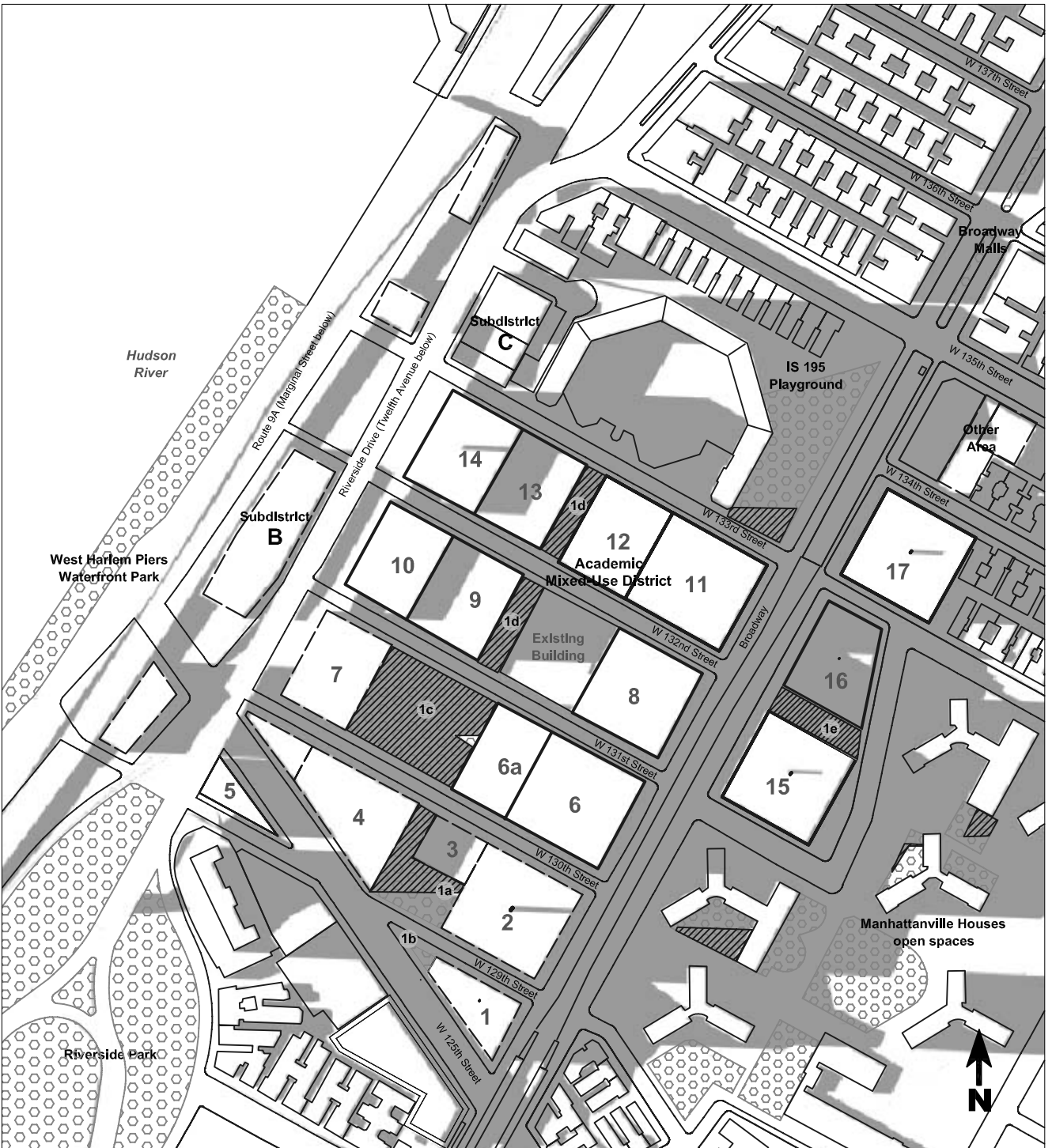
- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action

Shadow Diagram - 2030 Analysis Year
 May 6 - 1:00 PM DST
 Figure 7 - 34

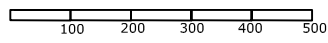


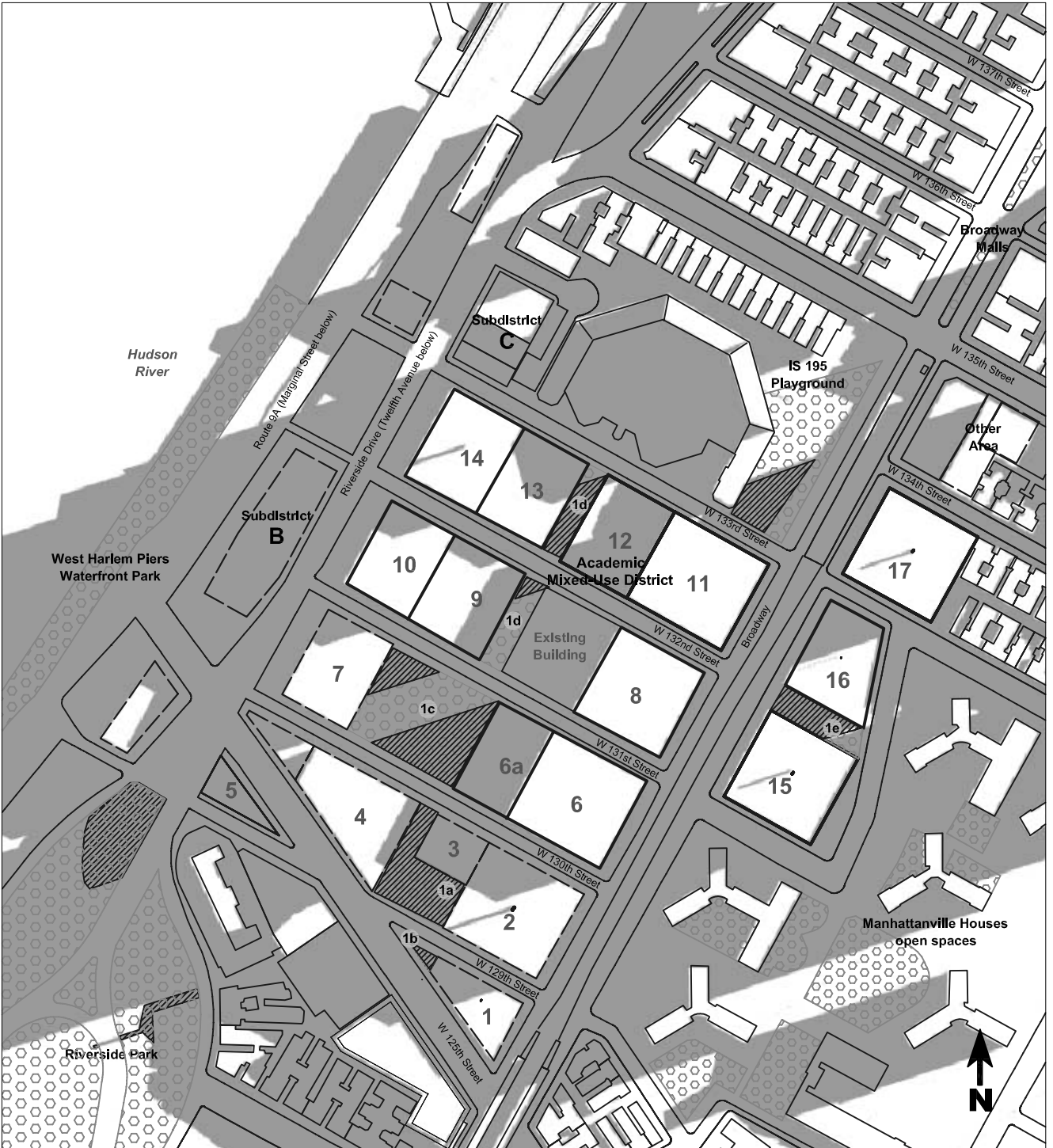
- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action

Shadow Diagram - 2030 Analysis Year
 May 6 - 2:15 PM DST
 Figure 7 - 35



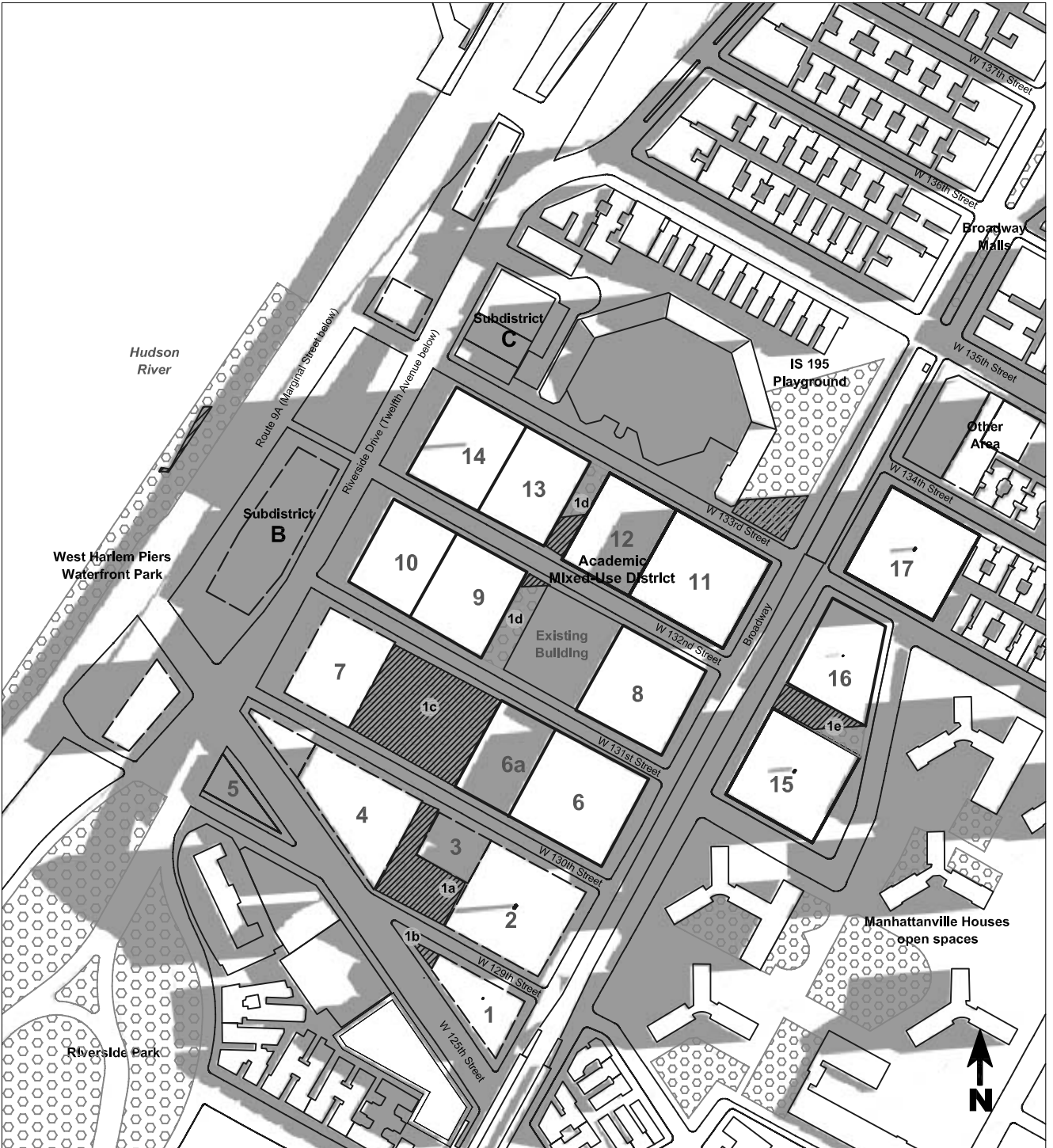
- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action










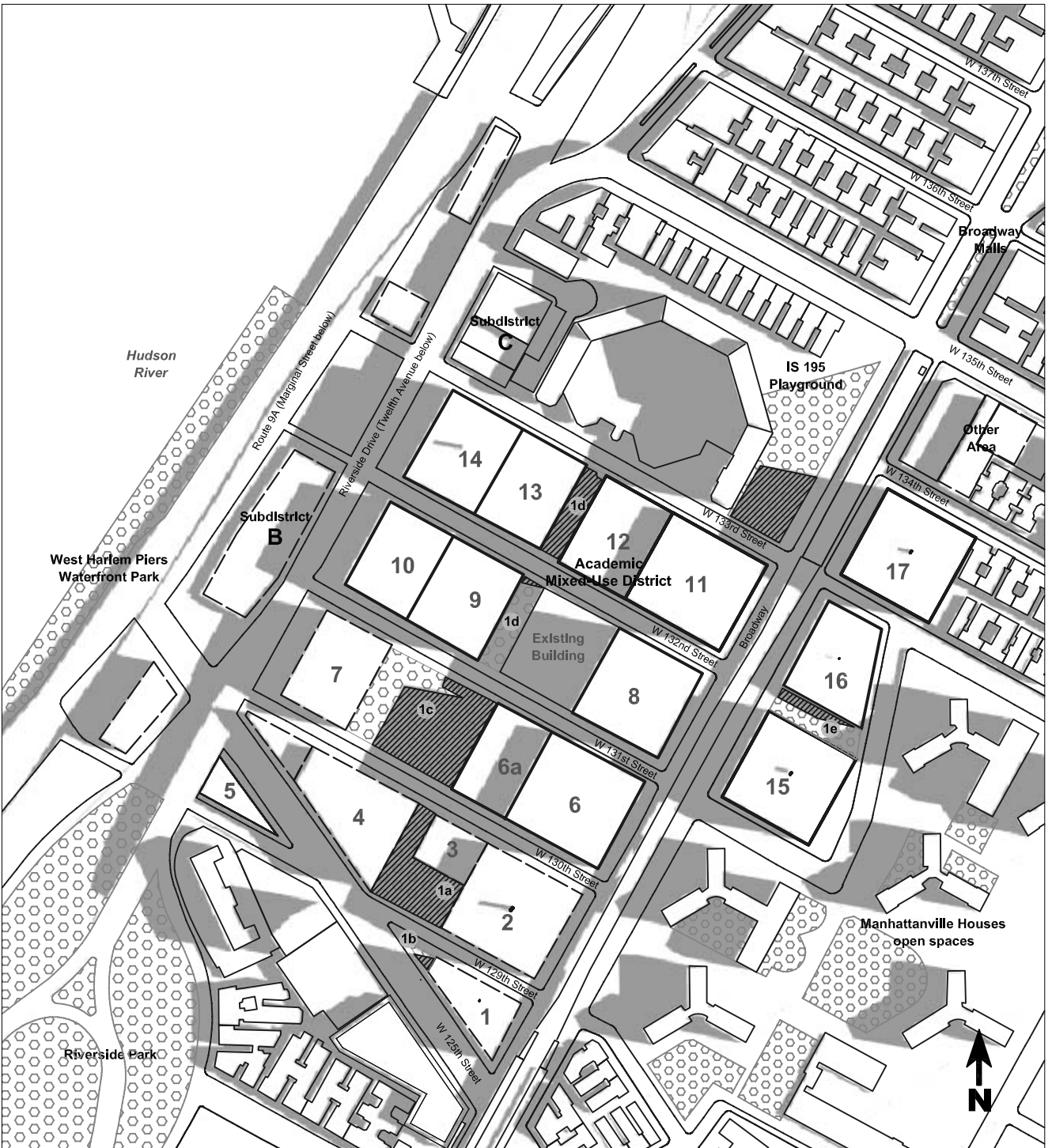
- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action






Shadow Diagram - 2030 Analysis Year
 June 21 - 6:57 AM DST
 Figure 7 - 37

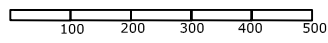


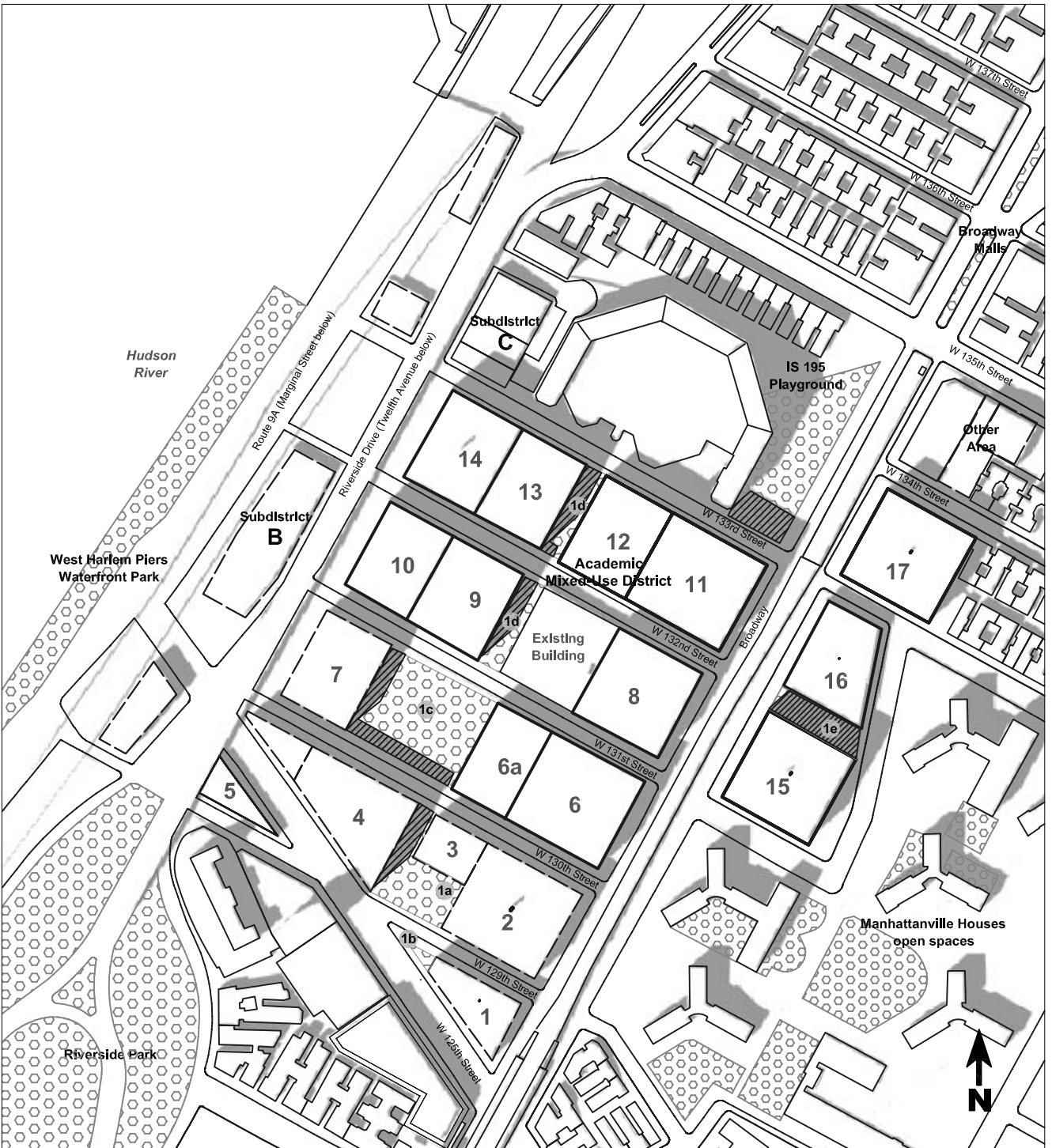
-  Shadow
-  2015 Analysis Year Buildings
-  2030 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action






Shadow Diagram - 2030 Analysis Year
 June 21 - 8:30 AM DST
 Figure 7 - 38

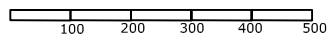


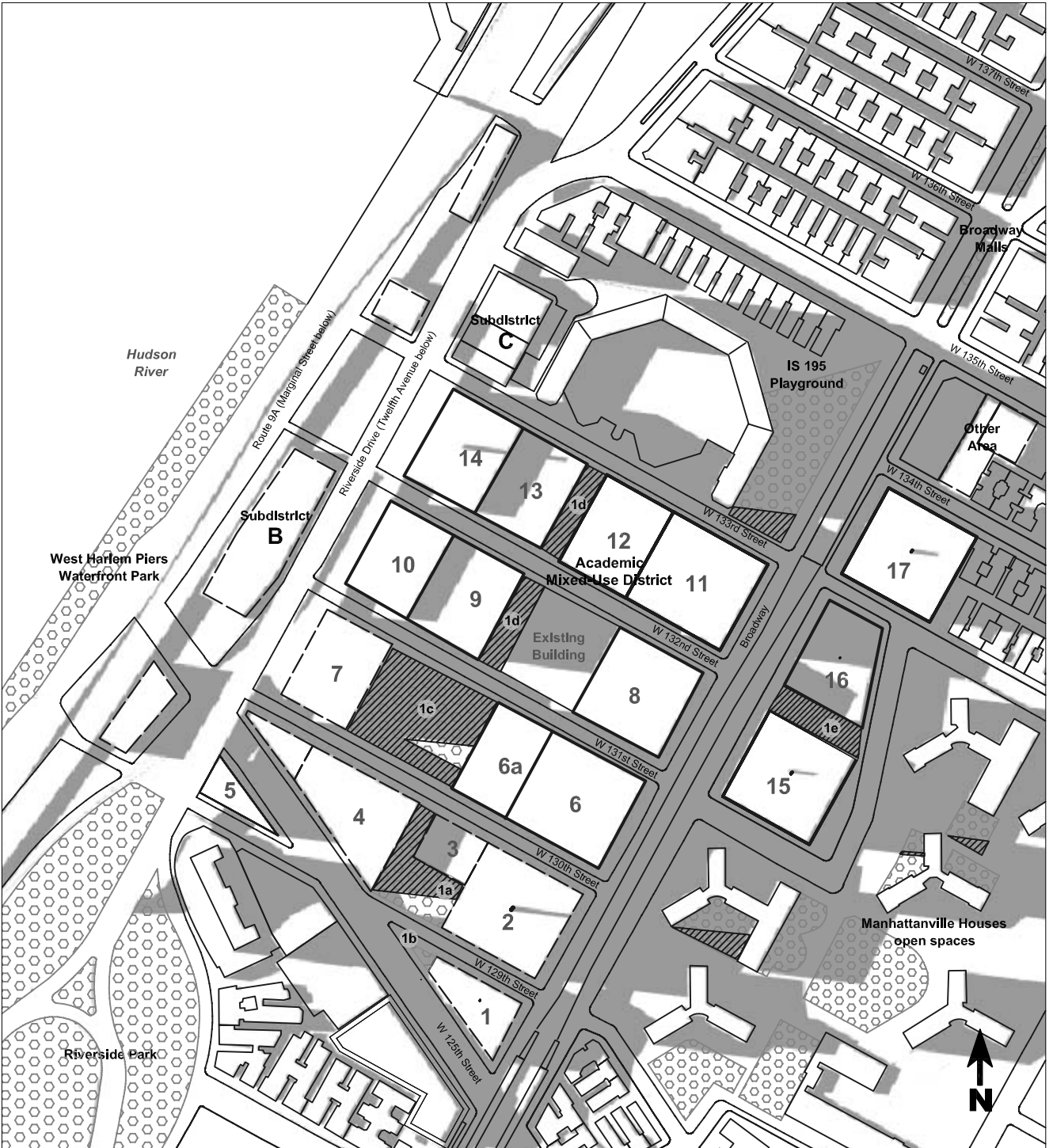
-  Shadow
-  2015 Analysis Year Buildings
-  2030 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action



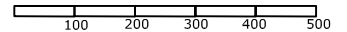


-  Shadow
-  2015 Analysis Year Buildings
-  2030 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action





- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action



On December 21, open space 1d would be in complete shadow until 12:45 PM (see Figures 7-42 to 7-44). Portions of the open space would receive sunlight until 2:30 PM (see Figures 7-45 and 7-46); then it would be in complete shadow until the end of the analysis day.

PROPOSED ACTIONS' OPEN SPACE 1E

Open space 1e is a linear open space running east–west along the north side of proposed building 15. Building 15 would cast shadows on this open space for nearly the entire analysis period on all four analysis days.

At the beginning of the March 21 analysis day, open space 1e would be in complete shadows from proposed building 16 and existing buildings to the east (see Figure 7-23). At 9:30 AM, a portion of the open space would begin to receive sunlight, and between 9:45 AM and 10:45 AM, more than half the open space would be in sunlight (see Figure 7-24). After 11:00 AM, most or all of the open space would be in shadows from the Proposed Actions' buildings to the south and southwest (see figures 7-25 to 7-30).

At the beginning of the May 6 analysis day, open space 1e would be in complete shadows from proposed building 16 and existing buildings to the east (see figures 7-31 and 7-32). At 9:00 AM, a portion of the open space would begin to receive sunlight, and between 9:45 AM and 11:15 AM, more than half the open space would be in sunlight (see Figure 7-33). After 11:30 AM, most or all of open space 1e would be in shadows from the Proposed Actions' buildings to the south and southwest (see Figures 7-34 to 7-36).

At the beginning of the June 21 analysis day, open space 1g would be in complete shadows from proposed building 16 and existing buildings to the east (see Figures 7-37 and 7-38). At 8:45 AM, a portion of the open space would begin to receive sunlight, and between 10:00 AM and 11:45 AM, more than half the open space would be in sunlight (see Figure 7-39). After 12:00 PM, most or all of open space 1e would be in shadows from the Proposed Actions' buildings to the south and southwest (see Figures 7-40 and 7-41).






Most or all of open space 1e would be in shadows from the Proposed Actions' buildings throughout the December analysis day (see Figures 7-42 to 7-46).

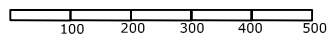
WEST HARLEM WATERFRONT PARK

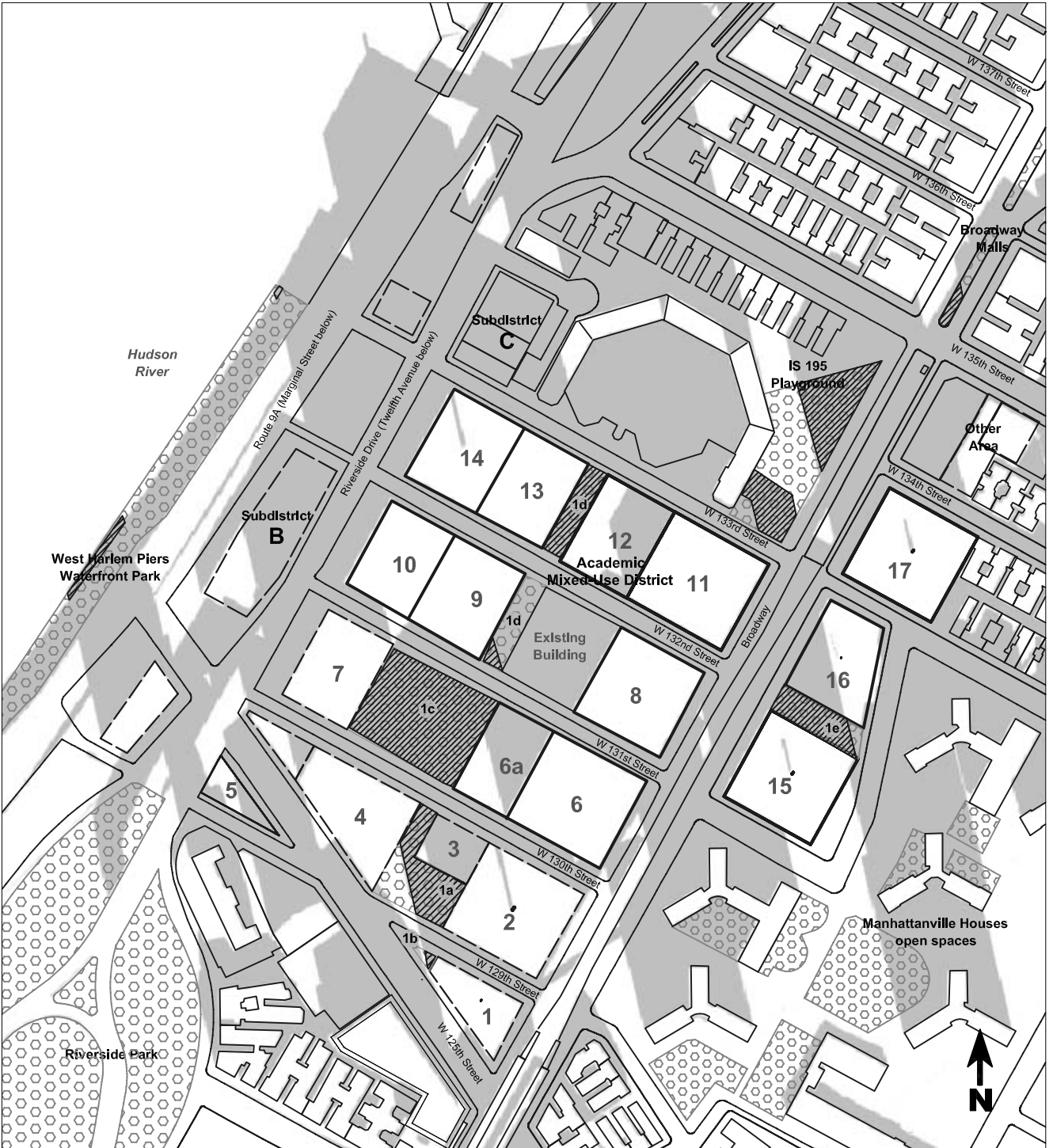
In 2030, the Proposed Actions' buildings 10 and 14 would cast very small areas of new shadow on the park in the mornings on all four analysis days. This new shadow would be in addition to shadows from the projected development sites in Subdistrict B, as described above in "Assessment of Shadow Impacts—2015." The new shadow would increase the total duration of Proposed Actions-generated shadows by between 15 minutes and 1 hour, depending on the analysis day.






At the beginning of each analysis day, the park would be covered in shadows cast by the Route 9A and Amtrak viaducts. As this shadow moved east and the western edge of the park along the water began to receive sunlight, the tops of the southernmost projected development sites in Subdistrict B and proposed buildings 10 and 14 would cast small areas of shadow on the western edge of the park. These incremental shadows would remain on the park for a short time on all four analysis days, moving quickly eastward off the park. On March 21, the incremental shadows would last from 9:30 AM to 10:30 AM (see Figure 7-24); on May 6, from 8:00 AM to 9:00 AM (see Figure 7-32); on June 21, from 7:15 AM to 8:30 AM (see Figure 7-38); and on December 21, from 10:30 AM to 11:00 AM (see Figure 7-43).

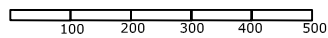


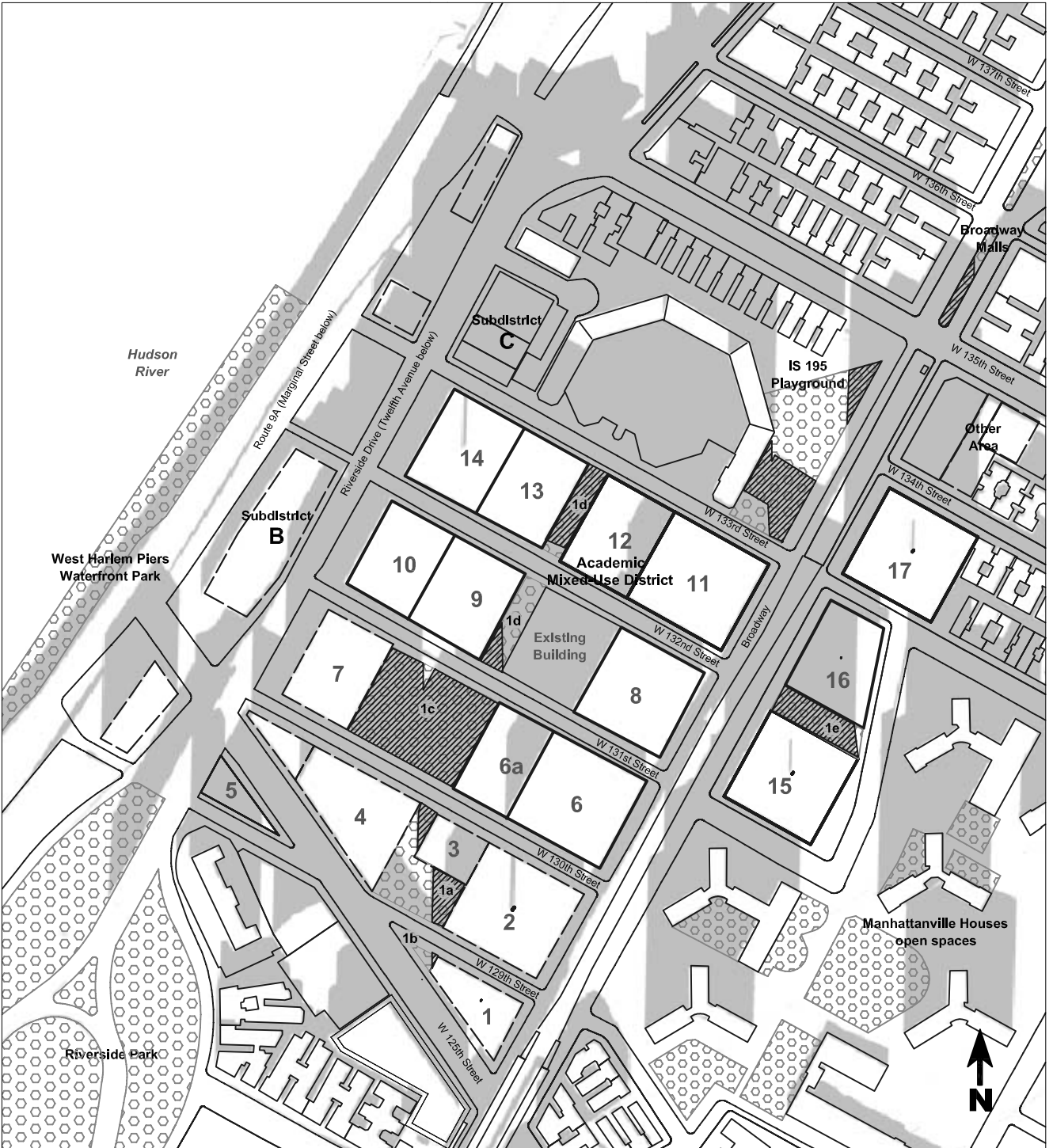
-  Shadow
-  2015 Analysis Year Buildings
-  2030 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action



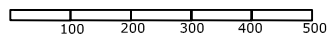


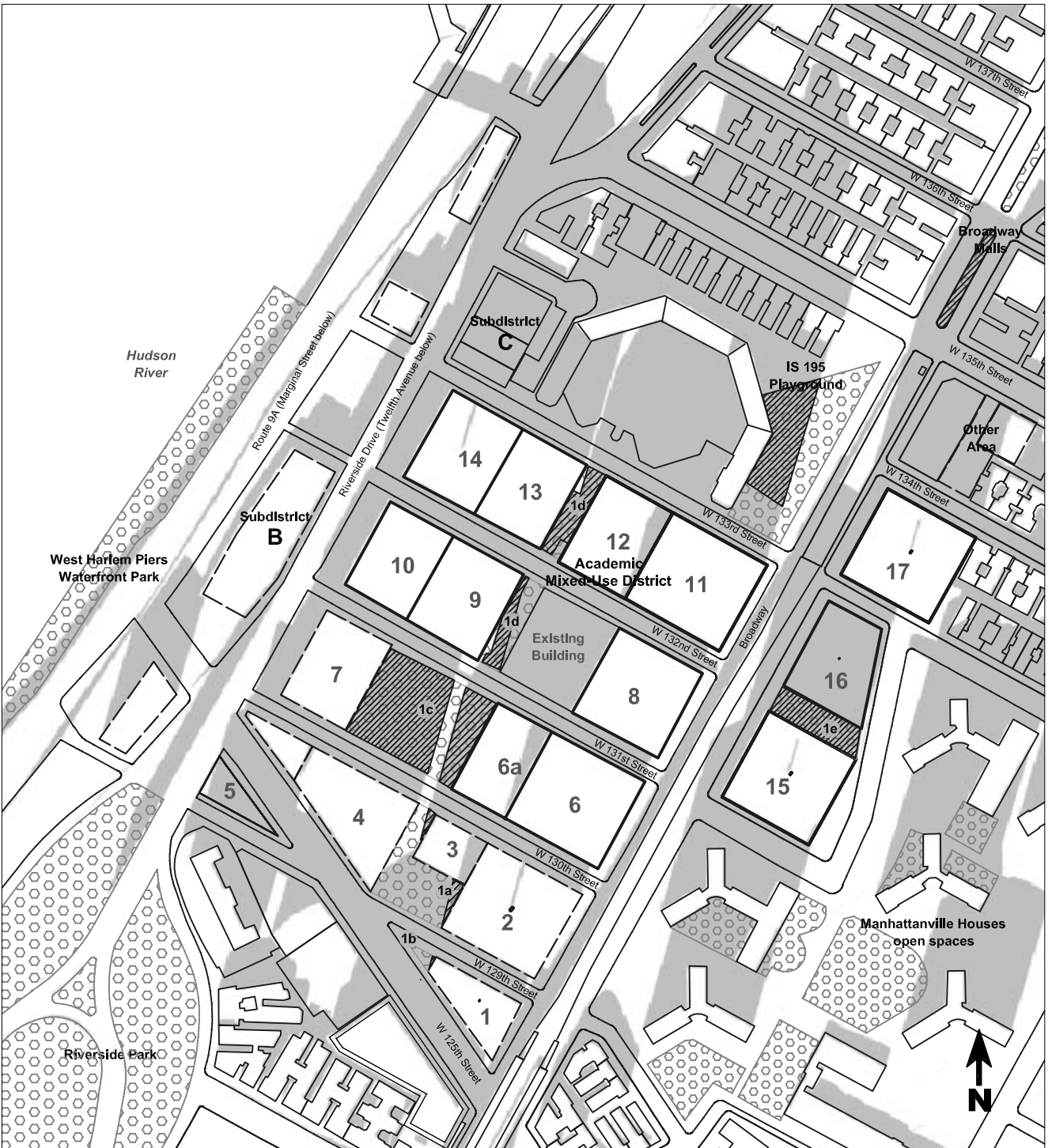
-  Shadow
-  2015 Analysis Year Buildings
-  2030 Analysis Year Buildings
-  Open Space
-  Incremental Shadow from Proposed Action



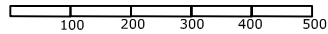


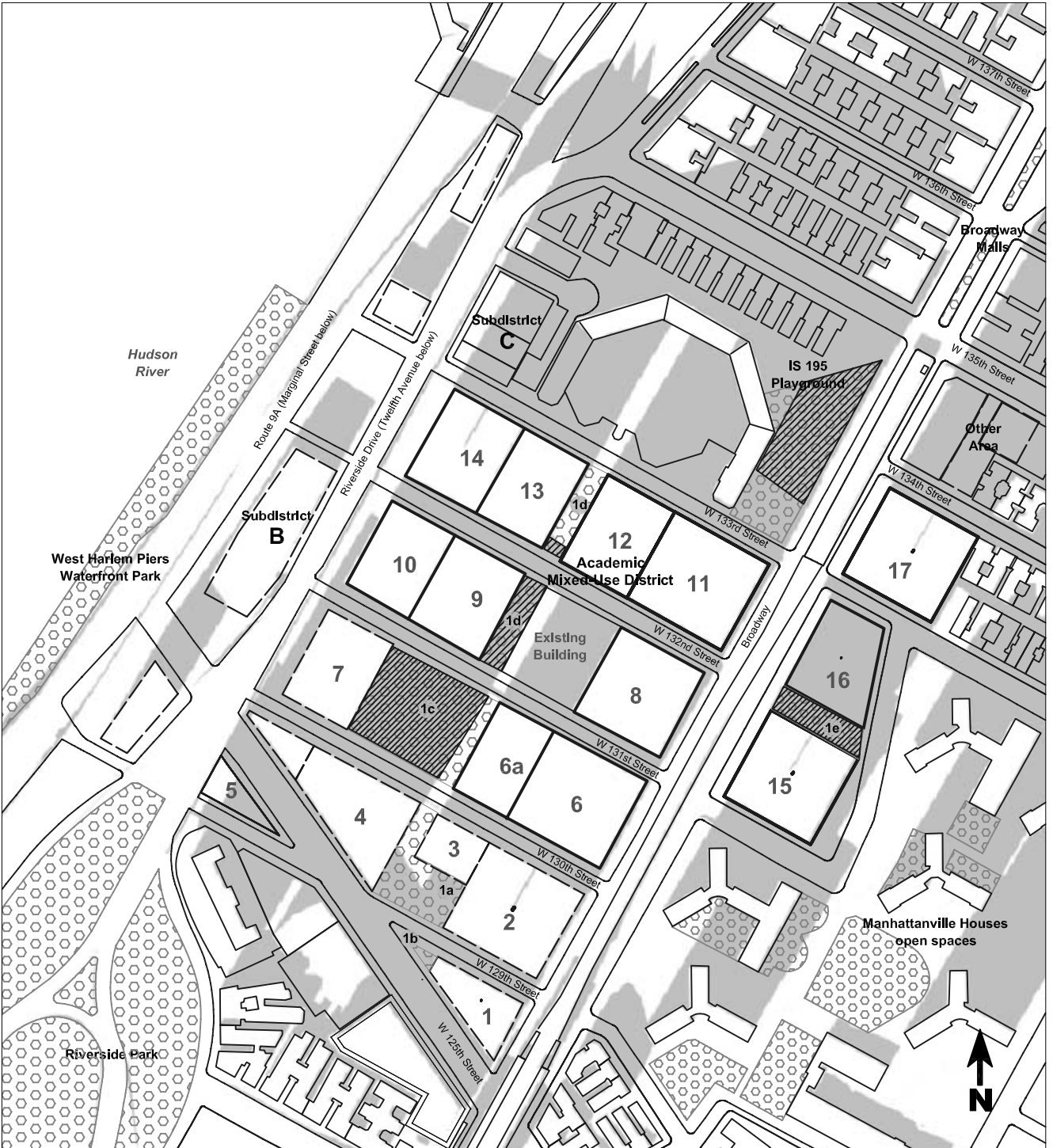
- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action



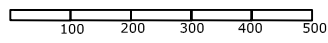


- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action





- Shadow
- 2015 Analysis Year Buildings
- 2030 Analysis Year Buildings
- Open Space
- Incremental Shadow from Proposed Action



Proposed Manhattanville in West Harlem Rezoning and Academic Mixed-Use Development FEIS

Due to the small areas and short durations of the incremental shadows, there would be no significant adverse impact on the West Harlem Waterfront park with the Proposed Actions.

I.S. 195 PLAYGROUND

In the 2015 analysis year, the projected development sites in the Other Area east of Broadway between West 134th and West 135th Streets would cast incremental shadow for short periods in the morning on all four analysis days. In 2030, proposed buildings 11 and 17 would cast additional incremental shadows on the I.S. 195 Playground (No. 3 in Figure 7-1) on all four analysis days, building 12 would cast incremental shadow very briefly at the end of the May and June analysis days, and buildings 15 and 16 would cast incremental shadows on the December analysis day.

On March 21, the Proposed Actions' buildings would cast incremental shadows for the entire analysis day. Beginning at 8:36 AM, incremental shadows from building 17 and the projected development sites in the Other Area east of Broadway would cover most of the playground (see Figure 7-23). The shadows from the projected development sites in the Other Area east of Broadway would exit the playground at about 9:45 AM, but the shadow from building 17 would be covering more than half the playground at this time (see Figure 7-24). This shadow would move across the playground and exit at 12:45 PM, at which time an incremental shadow from building 11 would have entered the southern portion of the playground at 11:45 AM, and by 2:15 PM it would cover much of the playground (see Figures 7-25 to 7-28). Around this time, shadow from the existing building at 3333 Broadway would also begin to move across the playground. From 3:45 PM until the end of the analysis day, the playground would be in complete shadows from a combination of existing shadows and incremental shadows from buildings 11 and 12 (see Figures 7-29 and 7-30).

On May 6, incremental shadows from the projected development sites in the Other Area east of Broadway would cover most of the playground at the beginning of the analysis period, 7:27 AM (see Figure 7-31). This shadow would move off the playground in less than an hour, but incremental shadow from building 17, also present at the start of the analysis day, would increase in size to cover approximately half the playground until 10:45 AM (see Figures 7-32 and 7-33). This shadow would then decrease in size and exit the eastern edge of the playground at 11:45 AM, just when incremental shadow from building 11 would enter along the southern edge. More than half the playground would receive sunlight between 10:45 AM and 2:00 PM (see Figure 7-34). At 2:15 PM, the incremental shadow from building 11 and shadow from the existing 3333 Broadway would combine to cover more than half the space (see Figure 7-35). From 3:45 PM until the end of the analysis day, the playground would be in complete shadows from the combination of incremental and existing shadows (see Figure 7-36).

During the June 21 analysis period, shadows are shortest, and while the movement of incremental shadows would follow the same general pattern as on May 6, they would cover less area of the playground throughout the day. Incremental shadows from the Proposed Actions' buildings to the east would fall on the playground from the start of the analysis day until late morning, and then exit, but more than half the playground would remain in sunlight throughout this period (see Figures 7-37 to 7-39). The playground would be in full sunlight from 11:30 AM to 12:15 PM. Incremental shadow from building 11 to the south would enter the space at 12:30 PM and move across the southern portion of the playground. Existing shadow from 3333 Broadway would increasingly cover the northern portion of the playground during the afternoon (see Figure 7-40), and the incremental shadow from the south would remove the remaining sunlight from the playground from 4:00 PM to the end of the analysis day (see Figure 7-41).

On December 21, incremental shadows from the Proposed Actions' buildings would fall on the playground for the entire analysis day, though portions of the open space would be in sunlight for most of the morning and early afternoon. Incremental shadows from the projected development sites in the Other Area east of Broadway, building 17, and building 16 would fall on the playground at the start of the analysis period. As these shadows moved northeast, the shadows from the projected development sites in the Other Area east of Broadway would move off the playground at 9:45 AM (see Figure 7-42), and at around 10:00 AM, incremental shadows from buildings 15 and 11 would enter the playground in the southwest. Incremental shadow from building 16 would exit the playground at 10:45 AM. The shadows from buildings 17 and 11 would move across the northeastern and southern portions of the playground, respectively, leaving the central portion in sunlight (see Figures 7-43 and 7-44) until 12:15 PM, when the shadow from building 17 would exit the space. At 12:45, the shadow from building 15 would exit the space; at this time, half the playground would be in sunlight, and most of the other half would be covered by incremental shadow from building 11 (see Figure 7-45). From 2:00 PM until the end of the analysis day, incremental shadow from building 11 would remove the remaining sunlight from the playground (see Figure 7-46).

Incremental shadows from the Proposed Actions' buildings would fall on the playground for the entire analysis period in March, May, and December, and almost the entire analysis period in June. On all four analysis days, incremental shadows would remove the last remaining sunlight in the mid-afternoon and late afternoon hours. On the May and June analysis days, large portions of the playground would receive sunlight for much of the morning and afternoon hours. Therefore, a significant adverse impact is not expected on these analysis days. However, during the March and December analysis days, incremental shadows would cover significantly more area during the late morning and early afternoon hours, when the playground is in use. Additionally, the increased incremental shadows would occur during the fall, winter, and early spring months, when cooler temperatures make sunlight more valuable. Given these factors, it is expected that the incremental shadows created by the Proposed Actions in the 2030 Build year would result in significant adverse impacts on the March/September and December analysis days.

BROADWAY MALLS

In the 2015 analysis year, incremental shadows from the projected development sites in the Other Area east of Broadway would fall on a small portion of the Broadway Malls for 2¼ hours on the December analysis day. In the 2030 analysis year, proposed buildings 17 and 11 would cast additional incremental shadows on the Broadway Malls on the December analysis day. Incremental shadows from the projected development sites in the Other Area east of Broadway would fall on the southern half of the mall between West 135th and West 136th Streets from 9:00 AM to 11:00 AM (see Figures 7-42 and 7-43). Incremental shadow cast by building 17 would move onto the southern end of the mall between West 135th and West 136th Streets at 11:15 AM. It would move across the mall, covering half of the mall by 12:00 PM and the entire mall between 12:45 PM and 1:15 PM (see Figures 7-44 and 7-45). It would then exit the mall completely at 1:30 PM. For about 15 minutes at around 1:15 PM, the incremental shadow would reach the southern tip of the next portion of the mall to the north between West 136th and West 137th Streets. Building 11 would cast incremental shadow from 2:15 PM until 2:53 PM, the end of the analysis day.

While incremental shadows would be cast on portions of the Broadway Malls between West 135th and West 136th Streets for most of the analysis day, the adjacent mall to the north between West 136th and West 137th Streets and between West 137th and West 138th Streets would be mostly or completely in sunlight during the same periods. These adjacent malls are visible and

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accessible to any users of the malls between West 135th and West 136th Streets that would be affected by the incremental shadows. The incremental shadows would not reduce the overall usability of the Broadway Malls due to their limited effects over the course of the year; therefore, there would be no significant adverse impacts on the Broadway Malls.

MANHATTANVILLE HOUSES OPEN SPACES

In 2015, the Proposed Actions' buildings 1 and 2 would cast shadows on part of the Manhattanville Houses open spaces (No. 8 in Figure 7-1) in the late afternoon hours from March through September. In the 2030 analysis year, additional incremental shadows from building 6 and building 15 would fall on the northernmost open space on the May and June analysis days. The overall times and durations would not change on these days, however. The March and December analysis days would be unaffected by the 2030 proposed buildings.

On the March 21 analysis day, incremental shadow from proposed building 2 would reach the westernmost open space between West 130th and West 131st Streets from 5:00 PM to 5:29 PM (see Figure 7-30). A portion of this open space would remain in sunlight during this time.

On the May 6 analysis day, incremental shadow from building 2 would be cast on the westernmost open space for a longer period, from 4:30 PM until the end of the analysis period, at 6:18 PM. Additionally, incremental shadow from building 15 would enter the northernmost open space at 4:30 PM. From 5:15 PM until 6:18 PM, incremental shadow would remove all the sunlight from the northernmost space, and from 5:30 PM until 6:18 PM, incremental shadow would remove all the sunlight from the westernmost space (see Figure 7-36). Building 1 would cast incremental shadow on the southernmost open space from 6:00 PM to 6:18 PM, and building 6 would cast incremental shadow on the northwestern open space from 6:00 PM to 6:18 PM.

On the June 21 analysis day, the Proposed Actions' incremental shadows would last from 4:45 PM to 7:01 PM. Incremental shadow from building 2 would move onto the westernmost open space at 4:45 PM and remove all remaining sunlight from the open space from 5:45 PM until 7:01 PM (see Figure 7-41). Incremental shadow from building 15 would move onto the northernmost and northwestern open spaces at 4:45 PM as well. The incremental shadow would remove all sunlight from the northernmost space by 5:30 PM and from the northwestern space at 6:30 PM. Small areas of incremental shadows from buildings 1 and 2 would also reach the southernmost and central open spaces for less than an hour at the end of the analysis period.

Incremental shadows from the Proposed Actions would not reach the open spaces of the Manhattanville Houses during the December 21 analysis period. Due to the short durations and small sizes of the incremental shadows, there would be no significant adverse impacts on the Manhattanville Houses open spaces. While incremental shadows would remove the last sunlight from the northernmost and westernmost open spaces on two analysis days for periods of about an hour, the other open spaces would remain largely or wholly unaffected throughout the year; therefore, the overall usability of the open spaces would not be significantly reduced.

RIVERSIDE PARK

No additional incremental shadows would be cast on Riverside Park with the completion of the 2030 full build-out, as the newer buildings would be located too far to the north for their shadows to reach the park. (See "Assessment of Shadow Impacts—2015," above, for a description of the effect of incremental shadows from the Proposed Actions' buildings on Riverside Park.)

No significant adverse impacts on Riverside Park are anticipated, as the incremental shadow durations would be short, and the size of the incremental shadows would be exceedingly small relative to the size of the park. *