Chapter 6: Shadows

A. INTRODUCTION

This chapter examines the reasonable worst-case development scenario (RWCDS) as described in Chapter 1, "Project Description," on a site-specific basis (both projected and potential developments), for potential shadow effects on sunlight-sensitive historic resources and open spaces, and examines the range of incremental shadow coverage that would occur under the proposed actions, with respect to those resources and the potential for adverse impacts. This chapter has been updated since the Draft Environmental Impact Statement to reflect changes to the Reasonable Worst-Case Development Scenario as described in Chapter 1, "Project Description."

The study area covers approximately 368 blocks in Downtown Jamaica and the nearby residential communities. According to the *CEQR Technical Manual*, the longest shadow a structure will cast is 4.3 times the building's height. Projected and potential developments under the RWCDS range in height up to 250 feet in the Downtown area and would therefore cast maximum shadows of up to 1,075 feet. The guidelines of the *CEQR Technical Manual* require the preparation of a shadow assessment if a proposed action includes new structures tall enough (generally 50 feet high or taller) to cast new shadows on a publicly accessible open space or historic resource with sunlight-sensitive features. A preliminary assessment of the projected and potential development sites and the shadows they could cast found that several of the projected and potential developments could cast shadows over open spaces and historic architectural resources. Therefore, a detailed shadow modeling was undertaken for these sites to determine whether the proposed actions have the potential to result in significant shadow impacts.

B. METHODOLOGY

Computer-generated simulations of the incremental shadows resulting from the proposed development program were prepared for representative times on four analysis days: March 21/September 21 (the equinoxes); May 6/August 6 (the midpoints between the equinoxes and the summer solstice); June 21 (the summer solstice); and December 21 (the winter solstice). Since the CEQR methodology does not consider shadows and incremental increases in shadows within 1½ hours of sunrise or sunset, the analysis period on each analysis day begins 1½ hours after sunrise and ends 1½ hours before sunset. In general, shadows on city streets and sidewalks or on other buildings are not considered under *CEQR Technical Manual* guidelines.

The uses and vegetation in an open space determine its sensitivity to shadows. Uses that rely on sunlight include passive uses, such as sitting or sunbathing, and such activities as gardening or wading in fountains or pools. Vegetation requiring sunlight includes the tree canopy and flowering plants. In open spaces where lawns are actively used, the grass also requires extensive sunlight. Four to six hours a day of sunlight is generally a minimum requirement, particularly in the growing season. Sun-sensitive features of historic resources may include large windows admitting light into interior spaces, stained glass windows in churches, deeply sculpted façade ornamentation, and historic landscapes.

Following the guidelines of the *CEQR Technical Manual*, the analysis focuses on the incremental or additional shadows cast by the proposed development program beyond the shadows from structures which could be built under the no development scenario. The analysis examines the potential impact of these incremental shadows and takes into account uses and users of open space, landscaping and vegetation of open space, as well as the characteristics of any significant natural features or historic resources with qualities or details that are sunlight-dependent and make such resources significant. The *CEQR Technical Manual* identifies the following conditions when a proposed development program 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 plant survival);
- Reduction in sunlight available to a sensitive use from more to less than the minimum time necessary for plant survival;
- Substantial reduction in sunlight to a sun-sensitive use or feature; and
- Substantial reduction in the usability of the open space.

There may be situations where a very small loss of sunlight is important (for example, in areas where people sit or in a historic church with stained glass windows) or where a comparatively large loss is not significant (for example, where vegetative species are shade-tolerant). Although these situations represent a general guideline for determining significant adverse impacts, each case is reviewed on its own merits. Potential impacts were considered based on the coverage and duration of shadows on each sensitive receptor, as well as the presence or lack of sun-sensitive uses, the amount of use in general, and the availability of alternative space within each sensitive receptor.

The shadow diagrams and analysis presented in this chapter were developed using building envelope and topographical information supplied by the New York City Department of City Planning. Shadows were modeled using the solar rendering capabilities of MicroStation V8 software.

C. RESOURCES OF CONCERN

As discussed in Chapter 10, "Natural Resources," there are no significant natural features in the study area. As discussed in Chapter 5, "Open Space," and Chapter 7, "Historic Resources," there are publicly accessible open spaces and architectural resources to the north, south, east, and west of the projected and potential development sites. These resources were assessed for their potential to be sunlight sensitive. Only the sunlight sensitive resources within the shadow radius (discussed above) of a projected or potential development were included in the analysis. These resources are described below.

HISTORIC RESOURCES

GRACE EPISCOPAL CHURCH

Grace Episcopal Church, located at 155-03 Jamaica Avenue, was constructed in 1861. The Grace Episcopal Church of Jamaica is S/NR-listed and is a designated NYCL. The most prominent feature of the small church is a corner tower with a tall steeple. Other Gothic-style features include a rose window, an entrance porch, buttresses, and pointed-arch stained glass windows. The church features stained glass windows on the eastern and western façades, which are the sunlight-sensitive elements of this resource. Based on field surveys and signage, the Grace

Episcopal Church and surrounding cemetery are open to the public from 11:00 AM until 1:00 PM. In addition, services are held Sunday morning at 8:00 AM and 10:00 AM.

OPEN SPACE RESOURCES

According to the *CEQR Technical Manual*, open spaces can contain facilities that are both sensitive and not sensitive to sunlight. Features that are not sensitive include recreational areas (such as handball or basketball courts) where there are no sitting areas, no sunlight-dependant vegetation, no historic plantings, or plantings that are shade tolerant. Facilities such as children's playgrounds and sprinklers, swimming pools, sitting or sunning areas, ball fields, and other play areas that are covered with turf do require direct sunlight for some part of the day, or at certain times of the year. These features are therefore sunlight sensitive.

Most open space resources within the study area are small and accommodate paved sitting areas, basketball courts, and/or playgrounds which contain scattered planters and/or trees that are shade tolerant. As described in Table 5-3 in Chapter 5, "Open Space," most of the open spaces in the study area are paved and contain shade tolerant planters and/or trees. Based on field surveys, the following open space resources were identified as falling within the shadow radius of the projected or potential development site, and also as containing sunlight sensitive features that therefore require detailed shadow modeling to identify any incremental shadows created by the RWCDS. These resources are briefly described below.

RUFUS KING PARK

Rufus King Park, an 11.5-acre park, is bounded by Jamaica Avenue, 153rd Street, 89th Avenue and 150th Street, and is the largest open space in the area. This open space has both passive and active recreation areas, featuring handball courts, paved walkways, a dog run, a field house, baseball/softball fields, landscaping, a small decorative garden, and benches. It also includes a historic resource, the Rufus King House, which is accessible to the public for tours but does not contain any sun-sensitive features. Sunlight sensitive features in Rufus King Park include the seating areas along the walkways and the small decorative garden. Sensitive features in Rufus King Park include the seating areas, the benches along the walkways, and the decorative garden.

P.S. 50 PLAYGROUND

The playground at P.S. 50 is a paved playground with a handball court along the southeastern edge. It is mainly used by the students of P.S. 50. There is also a temporary class-room unit located on the playground. There are no sunlight-dependent passive open space features such as benches or other facilities in the playground.

NORELLI-HARGREAVES TRIANGLE

Norelli-Hargreaves Triangle is a small open space located on the block to the east of the P.S. 50 Playground. It has a small triangular-shaped area with low plantings in the middle of the Triangle, but is primarily lawn and some trees. There are no sunlight-sensitive passive facilities such as seats, benches or other areas for passive recreation.

MAJOR MARK PARK

Major Mark Park is a 0.90-acre park located on the corner of 173rd Street and Warwick Crescent. This well-maintained open space provides trees, benches, and paved walkways. This park is mainly dedicated to passive uses with benches placed along the walkways and open lawn areas, with the majority of the park being therefore sunlight sensitive.

HARVARD PLAYGROUND

Located on 179th Place north of Jamaica Avenue, Harvard Playground is mostly composed of active recreation areas. This 0.581-acre park is equipped with swings, slides, handball courts, benches, jungle gyms, paved walkways, trees, and a running track. It is mainly dedicated to active uses and has few sunlight-sensitive passive areas.

LATIMER PLAYGROUND

Latimer Playground, has swings, slides, basketball courts, handball courts, and jungle gyms, and is well-maintained. Though this playground also includes benches, trees, lighting, and paved walkways, it is mostly dedicated to active uses and therefore has few sunlight-sensitive features.

BRINKERHOFF MALL

Brinkerhoff Mall, a 0.4-acre open space, is located at the intersection of Brinkerhoff Avenue, Merrick Boulevard, and 110th Road. It is covered with grass and mature trees; it does not feature any play equipment, play fields, or seating areas. The mall is mainly grass and mature trees and there are no major sunlight-sensitive features (i.e., benches, picnic areas, and other seating areas).

LIBERTY PARK

Liberty Park, eight acres in size, is located on Liberty Avenue between 172nd and 173rd Streets. This open space features basketball, handball, and tennis courts in the northern section and race track and swimming pool in the southern section. The northern section of the park is mainly dedicated to active uses; in the southern section there are some benches, picnic tables and other areas for passive recreation. The southern section is more sunlight-sensitive, as it contains the seating and rest areas. The northern section is less sunlight-sensitive, as it contains active recreational areas.

D. THE FUTURE WITHOUT THE PROPOSED ACTION

As defined in the RWCDS, it is expected that the buildings on the projected and potential development sites will be developed under the current zoning which allows buildings up to 120 feet in height.

In the future without the proposed actions, absent the proposed actions, it is expected that approximately 0.55 acres of publicly accessible open space will be constructed as part of the Jamaica Transportation Center Intermodal Enhancements project (see Chapter 5, “Open Space”). As part of this project’s extension of Atlantic Avenue, an approximately 0.39-acre park is to be created by the extension of Atlantic Avenue through the block bounded by 94th Avenue, 138th Place, 95th Avenue, and the Van Wyck Expressway. The open space, which is not yet programmed, would be bisected by the extension of Atlantic Avenue, and composed of an eastern section and a western section. In addition, as currently envisioned, the north side would have active uses, while the south side would include sitting areas, plantings, and other elements.

E. PROBABLE IMPACTS OF THE PROPOSED ACTION

PROJECTED AND POTENTIAL DEVELOPMENTS AND METHODOLOGY

Table 6-1 compares the heights of the buildings on the proposed and potential development sites under the future with and without the proposed actions. Table 6-1 compares the No Action development heights with the proposed actions heights; these are the heights used for the shadow analysis presented below.

Table 6-1
No Action and Proposed Actions Development Heights

Resource of Concern	Projected and Potential Site Source	No Action Development Maximum Height (in feet)	Proposed Actions Development Maximum Height (in feet)	Net Increase in Height Under the Proposed Actions (in feet)
Rufus King Park	103-110, 36, 51-54	70	80	10
	122, 294,295	30	250	220
	297	30	250	220
	300	30	250	220
	301	30	250	220
PS 50 Playground	368,369	35	70	35
Norelli-Hargreaves Memorial Triangle	370-372	35	70	35
	351	40	125	90
Major Mark Playground	215-217	70	125	55
	235	40	125	85
Harvard Playground	580,581	30	60	30
Latimer Playground	506	30	70	40
	507	35	70	35
Brinkerhoff Mall	511-513	35	70	35
Liberty Park	537	35	70	35
Atlantic Avenue Extension Park	286	30	125	95
Grace Episcopal Church	118	70	125	55
	119	70	250	180

Source: NYCDCP, June, 2006.

In accordance with the *CEQR Technical Manual*, this shadow analysis provides data on the time of day when the projected and potential developments would create an incremental shadow on open spaces or historic resources. As the sun travels across the sky, shadows move in a curve opposite the sun. When the sun rises, shadows fall to the west. As the sun travels across the southern part of the sky throughout the day, shadows move clockwise until they stretch east, as the sun sets in the west. Midday shadows are always shorter than those at other times of the day because that is when the sun is highest in the sky. In addition, because of the tilt of the earth's axis, the angle at which the sun's rays strike the earth varies throughout the year. For example, winter shadows, although the longest, move more quickly along their paths (because of the earth's tilt) and do not affect the growing season of outdoor trees and plants.

As directed by the *CEQR Technical Manual*, shadow analyses were performed for four days of the year: June 21, May 6, March 21, and December 21. Table 6-2 provides the start and end time of the incremental shadows cast by the projected and potential developments on the resources of concern and shows the estimated duration of those new incremental shadows. For this analysis, the maximum building heights of the proposed actions developments was compared to the maximum heights of the RWCDS. The "entering" times shown in the table are the times that the shadows first hit any part of the resource being evaluated, and the "exit" time represents the time that the incremental shadow leave the resource. As shown in Table 6-2, a resource can be affected by more than one site, yielding multiple entries and exits. Figures 6-1 through 6-54 show the incremental shadows cast on the resources of concern for each of the shadow analyses which are described in greater detail below. Incremental shadows are the additional shadow coverage created by the developments under the proposed the proposed actions beyond the shadows that would occur in the future without the proposed actions. The incremental shadows from projected and potential developments on the resources of concern are represented by hatch marks.

Table 6-2
Durations of Incremental Shadows on Resources of Concern

Resource of Concern	Source of Shadow (Development Sites and Heights in feet)	March 21/ September 21 7:36 AM-4:29 PM EST	May 6/ August 21 7:27 AM-6:18 PM DST	June 21 6:57 AM-7:01 PM DST	December 21 8:51 AM-2:53 PM EST
Rufus King Park	Sites 36, 51-54, 103—80 feet, Sites 122, 294, 295, 297, 300, 301—250 feet	Enter: 7:36 AM Exit: 8:55 AM Duration: 1h 19m Enter: 2:25 PM Exit: 4:29 PM Duration: 2h 4m **Total for analysis day: 3h 23m**	Enter: 7:27 AM Exit: 9:29 AM Duration: 2h 2m Enter: 4:07 PM Exit: 6:18 PM Duration: 2h 11m **Total for analysis day: 4h 13m**	Enter: 6:57 AM Exit: 9:27 AM Duration: 2h 30m Enter: 4:40 PM Exit: 7:01 PM Duration: 2h 21m **Total for analysis day: 4h 51m**	Enter: 8:51 AM Exit: 9:15 AM Duration: 24m Enter: 11:25 AM Exit: 2:53 PM Duration: 3h 28m **Total for analysis day: 3h 52m**
PS 50 Playground	Sites 368,369—70 feet	Enter: 7:36 AM Exit: 9:06 AM Duration: 1h 30m **Total for analysis day: 1h 30m**	Enter: 7:27 AM Exit: 8:25 AM Duration: 58m **Total for analysis day: 58m**	Enter: 6:57 AM Exit: 7:35 AM Duration: 38m **Total for analysis day: 38m**	Enter: 8:51 AM Exit: 11:35 AM Duration: 2h 44m **Total for analysis day: 2h 44m**
Norelli-Hargreaves Memorial Triangle	Sites 370-372—70 feet Site 351—125 feet	Enter: 7:36 AM Exit: 9:35 AM Duration: 1h 59m **Total for analysis day: 1h 59m**	Enter: 7:27 AM Exit: 8:49 AM Duration: 1h 20m **Total for analysis day: 1h 20m**	Enter: 6:57 AM Exit: 7:55 AM Duration: 58m Enter: 5:05 PM Exit: 7:01 PM Duration: 2h 6m **Total for analysis day: 3h 4m**	Enter: 9:00 AM Exit: 12:03 PM Duration: 3h 3m **Total for analysis day: 3h 3m**
Major Mark Park	Site 215-217—125 feet, Site 235—125 feet	Enter: 7:36 AM Exit: 9:25 AM Duration: 1h 49m Enter: 12:43 PM Exit: 4:29 PM Duration: 3h 36m **Total for analysis day: 5h 25m**	Enter: 7:27 AM Exit: 10:07 AM Duration: 3h 40m Enter: 2:25 PM Exit: 6:18 PM Duration: 3h 53m **Total for analysis day: 7h 33m**	Enter: 7:30 AM Exit: 10:07 AM Duration: 2h 37m Enter: 2:55 PM Exit: 7:01 PM Duration: 4h 6m **Total for analysis day: 6h 43m**	N/A
Brinkerhoff Mall	Sites 511-513—70 feet	Enter: 2:55 PM Exit: 4:29 PM Duration: 1h 34m **Total for analysis day: 1h 34m**	Enter: 5:05 PM Exit: 6:18 PM Duration: 1h 13m **Total for analysis day: 1h 13m**	Enter: 5:55 PM Exit: 7:01 PM Duration: 1h 7m **Total for analysis day: 1h 7m**	Enter: 12:40 PM Exit: 2:53 PM Duration: 3h 13m **Total for analysis day: 3h 13m**
Liberty Park	Site 537—70 feet	Enter: 2:00 PM Exit: 4:29 PM Duration: 2h29m **Total for analysis day: 2h29m**	Enter: 2:50 PM Exit: 6:18 PM Duration: 3h 28m **Total for analysis day: 3h 28m**	Enter: 4:15 PM Exit: 7:01 PM Duration: 2h 46m **Total for analysis day: 2h 46m**	Enter: 12:20 PM Exit: 2:53 PM Duration: 2h 33m **Total for analysis day: 2h 33m**
Atlantic Avenue Extension Park	Site 286—125 feet	Enter: 7:36 AM Exit: 8:40 AM Duration: 1h 16m **Total for analysis day: 1h 16m**	Enter: 7:27 AM Exit: 9:08 AM Duration: 1h 41m **Total for analysis day: 1h 41m**	Enter: 6:57 AM Exit: 9:00 AM Duration: 2h 3m **Total for analysis day: 2h 3m**	N/A
Grace Episcopal Church	Site 118—125 feet Site 119—250 feet Site 122—250 feet	Enter: 1:02 PM Exit: 4:29 PM Duration: 3h 27m **Total for analysis day: 3h 27m**	Enter: 7:27 AM Exit: 9:20 AM Duration: 1h 53m Enter: 2:03 PM Exit: 6:18 PM Duration: 4h 15m **Total for analysis day: 6h 8m**	Enter: 6:57 AM Exit: 9:40 AM Duration: 2h 43m Enter: 1:25 PM Exit: 6:05 PM Duration: 4h 40 m **Total for analysis day: 7h 23m**	Enter: 1:19 PM Exit: 2:53 PM Duration: 1h 34m **Total for analysis day: 1h 34m**

Notes:
September 21 is the equivalent of March 21, but one hour later.
August 6 is the equivalent of May 6.
Source: AKRF, Inc. December, 2006.

As detailed in the discussion below, the proposed actions would create incremental shadows on six of the open spaces in the Downtown Jamaica area. Based on the modeling analyses, the First Reformed Church, the Harvard Playground, and Latimer Park, which have been identified as sunlight-sensitive resources, would not experience any incremental shadows with the proposed actions. The discussion below focuses on the duration, location, and size of the shadows from the proposed actions, with respect to the sunlight-sensitive resources that would experience incremental shadows due to the proposed actions.

OPEN SPACE RESOURCES

Rufus King Park

In the future without the proposed actions, Rufus King Park would experience shadows along the eastern edge of the park in the morning hours and along the western edge of the park in the evening hours on all four analysis days. Additionally, on the December analysis day the park would experience shadows along the southern edge. Generally, the existing shadows would exit the park by the late morning hours and would not enter again until the evening hours, allowing the park to experience full sun for the majority of the day. The incremental shadows with the proposed actions are due to potential development site numbers, 36, 52, 53, 104-110, 119, and sites 294–297.

During the morning hours of the March analysis day projected and potential development sites 104-110 and 119 would cast incremental shadows from 7:36 AM until 8:55 AM. These shadows would be confined to the eastern edge of the park and are largest at 7:36 AM, the beginning of the analysis period (see Figure 6-1).[1] The proposed actions would only add limited shadows near the decorative garden area.

On the May analysis day, incremental shadows would enter the park at the beginning of the analysis period (see Figure 6-2). At this time, 7:27 AM, development site 119 would cast new shadows along the eastern edge of the park up to the Rufus King House and would cover the area near the plantings. The incremental shadows would quickly decrease in size, and an hour later at 8:30 AM they would only cover a small section of the park near the southeast corner (see Figure 6-3).

During the June analysis period the incremental shadows would reach the furthest across the southern section of the park. At 6:57 AM, the beginning of the analysis period, the incremental shadows from potential development site 119 would cover most of the area south of the Rufus King House where the walkway is (see Figure 6-4). The proposed actions at sites 104-110 would only create a small amount of incremental shadows (see Figure 6-4). Approximately 1 hour and a half later, at 8:30 AM, the incremental shadows would be greatly reduced in size and only cover the small section of the southeast corner of the park and by 9:27 AM they would exit the park completely (see Figure 6-5).

During the morning hours of the December analysis day the incremental shadows would be present at the beginning of the analysis period (8:51 AM) and would exit the park less than 30 minutes later.

Incremental shadows along the western and southern edges of Rufus King Park would be due primarily to development sites 36, 52, 53, and 294-297.

[1] All shadows figures can be found at the end of this chapter.

During the evening hours of the March analysis period, a small amount of incremental shadows would enter the western edge of the park at 2:25 PM. The incremental shadows would be their greatest in size at 4:29 PM, the end of the analysis period, when the proposed actions developments would only add a small amount of additional shadow (see Figure 6-6).

In the evening hours of the May analysis day, incremental shadows would enter the park at 4:07 PM and would remain until the end of the analysis period. They would be greatest at the end of the analysis period and would add a small amount of new shadow (see Figure 6-7).

During the evening hours of the June analysis period incremental shadows would enter the park at 4:40 PM and would remain until the end of the analysis period. Similar to May the proposed development as compared to the no action developments would only add a small amount of new shadows (see Figure 6-8).

Incremental shadows from site 297 would enter Rufus King Park at 11:25 PM on the December analysis day. They grow in size and at the end of December analysis day, 2:53 PM, they would be greatest in size. Development sites 296 and 297 would cast new shadow on the southwest corner of the park near the Rufus King House where walking paths and mature trees are present (see Figure 6-9).

Overall, while the proposed actions would add incremental shadows to Rufus King Park, this incremental shadow would reduce the amount of sunlight on the park, though the park would remain in full sun for the majority of the day on each of the four analysis days. The maximum duration of additional shadow on the park would be 4 hours and 51 minutes on June 21st. This incremental shadow is due to a number of development sites on the east and west sides of the park. The park would not be affected by incremental shadow the balance of the analysis day (which is about 12 hours). In addition, these shadows would occur largely at the sides of the park; the center of this large park, where the active and passive areas are, would remain in sunlight for much of the day (see Figure 6-5 for the morning incremental shadow and Figure 6-8 for the evening incremental shadow on June 21st). Therefore, there would not be a substantial reduction in the amount of sunlight on the park. While the incremental shadows would reach the decorative garden and plantings, they would not rest on them for a long amount of time or greatly cover them in shadows, and there would not be a great reduction in the amount of sunlight to the plantings. Since most of the park would remain in sunlight for the majority of each analysis day, and the sun-sensitive plantings would continue to receive adequate sunlight during the growing seasons, and as the overall usability of the park would not be diminished, significant adverse shadow impacts to Rufus King Park are not anticipated with the proposed actions.

P.S. 50 Playground

In the future without the proposed actions, with the exception of the December analysis day, the P.S. 50 Playground would be in sun for the morning and afternoon hours. In the late afternoon and evening hours the P.S. 50 building would cast shadow on the northwest corner of the park. In addition, the temporary classroom unit, located on the playground, would also cast shadows on the playground; however, it would be only one-story in height and therefore would not add much shadow to the playground.

Incremental shadows on the playground would be limited to the morning hours and the southern section of the playground (see Figures 6-10 through 6-19). Incremental shadows on the playground would be cast from the proposed buildings on potential development sites 368, 369, and 370. On the March analysis day the shadow would be greatest in size at the beginning of the

March analysis period, 7:36 AM (see Figure 6-10), when they would cover the area south of the school and a portion of the handball courts. An hour later at 8:30 AM they would decrease in size and only cover a small portion of the playground (see Figure 6-11) and at 9:06 AM they would completely exit the playground.

At the beginning of the May analysis day, 7:27 AM, incremental shadows from proposed development sites 368 and 369 would cover the area south of the school, while incremental shadows from development sites 370 would cover the southeastern corner of the playground (see Figure 6-12). A portion of the handball courts would be covered by the incremental shadows at the beginning of the analysis period (see Figure 6-12). However, they would move quickly; by 8:15 AM they would barely reach the playground and by 8:25 AM would completely exit the playground (see Figure 6-13).

At 6:57 AM, the beginning of the June analysis period, development sites 368 and 369 would cast an incremental shadow on the area south of school while development site 370 would cast a small incremental shadow along the southeastern edge of the playground, including the handball court (see Figure 6-14). Approximately 30 minutes later, at 7:35 AM incremental shadows from these projected and potential development sites would completely exit the playground.

The incremental shadow duration would be longest on the December analysis day; incremental shadows from projected development sites 368 and 369 would cover the upper half of the playground east of the school (see Figure 6-15). At 9:30 AM they would cover almost all of the playground east of the school (see Figure 6-16). An hour later at 10:30 AM they would only cover the southeast corner, where the handball court is located, and they would completely exit the playground by 11:35 AM (see Figure 6-17). There would be no incremental shadows from development sites 370-371 on the December analysis day.

With the proposed actions, the P.S. 50 Playground would receive additional shadows during the morning hours of each of the analysis days. As shown in Table 6-2, the analysis period with the greatest duration of impact is December 21st, with about 2 hours and 44 minutes of additional shadow over the analysis period (which is just under 6 hours long). The incremental shadow would occur in the morning along the southern section of the playground. The playground would continue to receive full sun (except shadows cast by the temporary classroom unit located on the playground) during the afternoon and evening hours. Since the proposed actions would result in shadows limited to the morning hours only, and the playground would remain in full sun for the majority of the analysis day, the usability of the playground would not be greatly reduced. In addition, there are no sun-sensitive plantings or uses. Therefore, there would be no significant adverse shadow impacts to the P.S. 50 Playground with the proposed actions.

Norelli-Hargreaves Triangle

In the future without the proposed actions, the Norelli-Hargreaves Triangle would be partially covered in shadows during the morning and evening hours of the June and December analysis days. On the May analysis day the triangle would be in full sun until the last half hour of the analysis period; while on the March analysis day the triangle would experience a small amount of shadow for the first half hour of the analysis period and then would be in sun for the rest of the day.

At the beginning of the March analysis day, 7:36 AM, incremental shadows from development sites 370-372 would cover all of the Norelli-Hargreaves Triangle. However the southern potion of the triangle would already be in shadow from development sites 370 and 371 (see Figure 6-10). The incremental shadow would decrease in size, and by 8:30 AM it would cover

approximately half of the triangle (see Figure 6-11). By 9:35 AM on the March analysis day the incremental shadow would completely exit the triangle.

At the beginning of the May analysis period, 7:27 AM, the incremental shadow from development sites 370-372 would cover almost all of the triangle (see Figure 6-12). However, the shadow would move quickly and by 8:15 AM would only cover a small portion of the paved part of the triangle (see Figure 6-13).

At the beginning of the June analysis day, 6:57 AM, the incremental shadows would cover approximately three-quarters of the triangle, though they would exit the triangle approximately and hour later at 7:55 AM (see Figure 6-14).

On December analysis days the Norelli-Hargreaves Triangle would experience new shadows during the morning hours; however, at this time it would experience the same amount of shadow from the no action conditions as the proposed actions. Incremental shadows from the proposed actions buildings on sites 370-372 would enter the triangle at 9:00 AM, and at 9:30 AM would cast a small amount of incremental shadows along the northern edge of the triangle (see Figure 6-16). At 10:30 AM the proposed actions buildings at sites 370-372 would cover the eastern edge of the triangle including a small portion of the plantings and would completely exit the triangle by 12:30 PM (see Figure 6-17).

At 5:15 PM, on the May analysis day incremental shadows from potential development site 351 would enter the northeast corner of the triangle. The incremental shadow would increase in size and by 6:18 PM, the end of the analysis period, they would cover approximately one-third of the Triangle (see Figure 6-18). Development site 351 would also cast incremental shadows on the triangle starting at 5:05 PM on the June analysis day; they would remain on the triangle until the end of the analysis period, and would cover approximately two-thirds of the triangle (see Figure 6-19).

With the proposed actions the triangle would experience incremental shadows in the morning and afternoon. These shadows would be of greatest duration in the June 21 and December 21 analysis periods. The June shadows are longest in the afternoon and the December shadows occur in the morning. The sunlight-sensitive features of the Norelli-Hargreaves Triangle are plantings; however, these plantings include low shrubs, grass, and trees. Therefore, the winter shadows (December) would not impact this resource. Net incremental shadow coverage on June 21 occurs for an hour in the morning and two hours in the evening. Net incremental shadow coverage on March 21 and May 21, two growing season months, would be about 2 hours and 1.5 hours, respectively. The park would not be covered in shadows from other surrounding structures for large parts of the day (see Figures 6-13 through 6-19), and substantial reduction in sunlight to the park, especially the plantings, would not occur. Further, there are no active or passive areas (benches or play areas), and so the overall usability of the open space would not be reduced. It is therefore concluded that the proposed actions would not result in significant adverse impacts on this open space resource, which is primarily lawn and trees.

Major Mark Park

In the future without the proposed actions, Major Mark Park would experience shadows along the southern portion of the park during the morning hours and along the northern section of the park in the evening hours on the March, May, and June analysis days; the shadows would be greatest at the beginning and end of the analysis periods. The park would be in full sun during the afternoon hours. On the December analysis day the park would experience shadows similar to the other analysis days, however as December shadows are longer in length, it would experience greater shadows throughout this day.

Incremental shadows fall on Major Mark Park in both the morning and evening hours; incremental shadows are for shorter durations in the morning hours and are a result of the buildings on proposed development site 217. The incremental shadows in the evening hours are from potential development sites 215 and 216 and development site 235 (see Figures 20-29).

For the March analysis period, incremental shadows cover approximately one-third of the playground at the beginning of the analysis period and would exit the Playground by 9:25 AM (see Figure 6-20). In May incremental shadows would be present at the beginning of the analysis period, 7:27 AM; the proposed development would only add a small amount of incremental shadows as compared to the no action developments (see Figure 6-21). They would continue to cover the southern edge of the park, though would only be a small amount (see Figure 6-22) and would exit by 10:07 AM.

On the June analysis day incremental shadows would enter the park at 7:30 AM, however, during the morning hours they would only add a small amount of additional shadow (see Figure 6-23). At 9:15 AM the proposed development at site 217 would only add a small amount of new shadows (see Figure 6-24) which would completely exit the eastern edge of park by 10:07 AM.

On the March analysis days, incremental shadows would enter the northern section of the park at 12:43 PM; by the end of the March analysis day they would be greatest in size and would cover the midsection of the park (see Figure 6-25). Incremental shadows would also enter the western edge of the park on the May analysis day; starting at 2:25 PM and remaining on the park until the 6:18 PM, the end of the analysis period. During the afternoon hours they would only cover a small section of the park (see Figure 6-26), however by the end of the analysis period they would be greatest in size and cover both the northern edge and part of the southwestern edge (see Figure 6-27).

Incremental shadows from development sites 215 and 216 enter the southwestern edge of the park at 2:55 PM on the June analysis day and would last until the end of the analysis period, 7:01 PM. In the early evening hours the incremental shadows would cover only a small amount of the western edge (see Figure 6-28). At the end of the analysis period the incremental shadows from the proposed developments at sites 215, 216 and 235 would cover only approximately one-third more of the park (see Figure 6-29).

The proposed actions would not add any incremental shadow to the park on the December analysis day.

With the proposed actions the park would experience an increase in the amount of shadow coverage on the March, May and June analysis days. No incremental shadow coverage would occur in the December analysis period. The total duration of additional shadow is about 5 hours on March 21/September 21 (with about 2.5 hours in the morning and 3.5 hours in the evening) and almost 7 hours on May 6/August 21 and June 21, with about 3.5 hours in the morning and about 3.5 hours in the evening. The incremental shadows would be greatest in size at the beginning and the end of analysis periods allowing the park to experience nearly full sun during the afternoon hours, and would move across the park to allow for parts of the passive recreational areas (walkways and open lawn) to remain in sun on each of the analysis days (see Figures 6-20 to 6-29). Since the shadows are greatest in size at the beginning and end of the analysis periods, and since part of the park will remain in sun at all times, the overall usability of the park would not be diminished. In addition, there are no sun-sensitive plantings which could be affected by incremental shadows. Therefore, there would be no significant adverse shadow impacts.

Brinkerhoff Mall

In the future without the proposed actions, on the March, May, and June analysis days the Brinkerhoff Mall would receive a small amount of shadow from potential development site 512 and projected development site 513 during the early morning and late evening hours, allowing the mall to be in full sun for the majority of these analysis days. Almost half of the mall would be in shadow at the beginning of the December analysis period; it would also receive shadow in the late afternoon hours.

Incremental shadows would reach the Brinkerhoff Mall on all four analysis days. On the March analysis day they would enter the mall at 2:55 PM and remain on the mall until 4:29 PM, the end of the analysis day. At this time the incremental shadows would be greatest in size for this analysis day and would cover approximately half of the mall (see Figure 6-30). On the May analysis day, incremental shadows would enter the mall at 5:05 PM and would remain on the mall until the end of the analysis period, 6:18 PM. At this time they would cover two sections along the western edge of the park (see Figure 6-31). On the June analysis day, incremental shadows would enter the mall at 5:55 PM and would remain on the mall until the end of the analysis period, 7:01 PM. At the end of the analysis period the incremental shadows would cover approximately half of the mall (see Figure 6-32). On the December analysis day incremental shadows would enter the mall at 12:40 and would remain on the mall until 2:53 PM, the end of the analysis period. At this time they would cover most of the northern half of the mall (see Figure 6-33).

With the proposed actions the Brinkerhoff Mall would experience additional shadow in the afternoon and evening hours on the March, May, and June analysis days. The incremental shadow would be greatest in March when it would be 1½ hours in duration. However, most of the mall would remain in sun for the majority of the March, May, and June analysis days. Therefore, there would not be a substantial reduction in the amount of sunlight to the park. On the December analysis day, the proposed actions would cast incremental shadows on the mall during the afternoon hours (total duration about 2 hours). However, these shadows would not add a considerable amount of new shadows to the mall and about half of the mall would still be in sun for all of the analysis period. During the growing seasons (March 21, May 6, June 21), the incremental shadows of the proposed action would only last about 1 hour and would not greatly reduce the amount of sunlight to the plantings during this time. In addition, large portions of the mall would remain open to the sunlight (see Figures 6-30 through 6-32). Given the relatively short duration of the incremental shadow, that the mall would largely remain open to the sun, and that the overall usability of the mall would not be reduced, it is concluded that the incremental shadows would not have significant adverse shadow impacts on the Brinkerhoff Mall.

Liberty Park

In the future without the proposed actions, Liberty Park experiences a small amount of incremental shadow from projected development site 537 on the northwest corner of the park on each of the four analysis days. As this 8-acre park is primarily surrounded by small houses and other low-scale buildings, it would be in sun for most of the day for each of the four analysis days.

Incremental shadows would reach Liberty Park on all four analysis days, yet they would only reach a small section of the northwestern section of the park where the basketball courts are. On the March analysis day they would enter the mall at 2:00 PM and remain on the park until 4:29 PM, the end of the analysis day. At this time the incremental shadows would be greatest in size

for this analysis day though they would only cover a small section of the northwestern corner of the park (see Figure 6-34). On the May analysis day, incremental shadows would enter the park at 2:50 PM and would remain on the park until the end of the analysis period, 6:18 PM. At this time they would cover a small section of the park (see Figure 6-35). On the June analysis day, incremental shadows would enter the park at 4:15 PM and would remain on the park until the end of the analysis period, 7:01 PM. At the end of the analysis period the incremental shadows would cover the greatest amount of the park for any of the analysis days; though it would only be a small section along the western edge and would not reach any of the passive recreation areas (see Figure 6-36). On the December analysis day incremental shadows would enter the park at 12:20 and would remain on the park until 2:53 PM, the end of the analysis period. At this time they would cover a sliver of the park (see Figure 6-33).

With the proposed actions, Liberty Park would experience incremental shadows on the northwest corner only in all analysis periods (see Figures 6-34 through 6-37). These incremental shadows would only cover a very small section of the large park for about two hours, so there would not be a significant loss of sunlight on Liberty Park. In addition, the incremental shadows would only reach the active recreational areas, specifically the basketball and tennis courts; thus, there would not be a substantial reduction in sunlight to a sensitive use. The overall usability of the park would not be reduced, and therefore, it is concluded that there would be no significant adverse shadow impacts to Liberty Park with the proposed actions.

Atlantic Avenue Extension Park

Incremental shadows would reach the Atlantic Avenue Extension Park during the fall, spring and summer months. Potential development site 286 would not cast new shadows on the Atlantic Avenue Extension Park during the December analysis period.

On the March analysis day incremental shadows would enter the park at 7:36 AM, the beginning of the analysis period, and would remain on the park until 8:40 AM, for a total duration of 1 hour and 16 minutes. At the beginning of the analysis period, the incremental shadows would be greatest in size for this analysis day, though they would only reach the area of the park east of Atlantic Avenue (see Figure 6-38). Less than an hour later, at 8:15 AM, the incremental shadow would cover a very small section of the park (see Figure 6-39). On the May analysis day, incremental shadows would enter the park at the beginning of the analysis period, 7:27 AM, and would remain on the park until 9:08 AM, for a total duration of 1 hour and 41 minutes. At the beginning of the analysis period the incremental shadows from site 286 would completely cast the section of the park east of Atlantic Avenue in shadow and would reach a portion of the park west of Atlantic Avenue (see Figure 6-40). The incremental shadows would move quickly and less than an hour later, by 8:15 AM, they would only cover a small section of the northeastern corner of the park (see Figure 6-41) On the June analysis day, incremental shadows would enter the park at 6:57 AM and would remain on the park until 9:00 AM. At 6:57 AM, the beginning of the analysis period, the incremental shadow would cover almost all of the eastern and western sections of the park in shadow (see Figure 6-42). However, the incremental shadow would move quickly across the park and by 8:30 AM only a small section of the eastern edge of the park would be cast in shadow (see Figure 6-43).

In summary, with the proposed actions, the Atlantic Avenue Extension Park would experience incremental shadows from potential development site 286 during the spring, summer and fall months (see Figures 6-38 through 6-43). These incremental shadows would reach the park for at most 2 hours and 3 minutes during the morning hours. The park would experience sun during the afternoon and hours. As the Atlantic Avenue Extension Park is not yet programmed, it is

possible that incremental shadows may be cast on sun-sensitive features. Therefore, the proposed actions could result in a significant adverse impact on the proposed Atlantic Avenue Extension Park. Mitigation for this significant adverse impact is discussed in Chapter 22, "Mitigation."

HISTORIC RESOURCES

Grace Episcopal Church

In the future without the proposed actions, the western façade of Grace Episcopal Church would receive shadow on the March, May, and December analysis days, mostly at the end of the analysis period. On the March analysis day, the west façade would experience about 1 hour of shadow which by the end of the analysis period would cover almost the entire western façade while on the May analysis day, the No Action shadows only covers a small portion of the façade. On the December analysis day, the No Action shadows would reach the western façade for approximately 1 hour and by the end of the analysis period would cover almost the entire façade. On the June analysis day, the west façade of Grace Episcopal Church would not experience any shadows.

Incremental shadows from development site 119 fall on Grace Episcopal Church on each of the analysis days during in the afternoon and evening hours (see Figure 6–44 through 6–54). On the March analysis day, incremental shadow reach the church starting at 1:02 PM and by 2:15 PM would cover the western façade (see Figure 6-44). They would remain on the western façade until the end of the analysis period; however at 3:45 PM shadows from the No Action developments would also reach the church and by the 4:15 would also cover a portion of the western façade, leaving only a small amount of incremental shadow from the proposed developments (see Figure 6-45).

On the May analysis day, incremental shadows reach the western façade starting at 2:03 PM and would remain on the façade until the end of the analysis period, 6:18 PM. At 3:15 PM the incremental shadows from the proposed developments would cover almost the entire western façade (see Figure 6-46). They would move quickly and by 4:00 PM would only cover approximately half of the façade and by the end of the analysis period would only cover the bell tower (see Figure 6-47).

On the June analysis day, the incremental shadows would reach the church at 1:25 PM and would remain on the western façade until 6:15 PM. At 3:30 PM the shadows would cover about three-quarters of the façade; they would move quickly and by 4:30 PM would only cover about a quarter of the western façade (see Figures 6-48 and 6-49). A small incremental shadow would also move along the southwestern corner of the church, underneath the windows, after 4:30 PM and would exit by 6:05 PM.

On the December analysis day, incremental shadows would reach the church at 1:19 PM and would remain on the western façade until 2:53 PM. However, the incremental shadow from the no action developments would reach the façade at 1:30, and while smaller in size, they would be almost the same size by the end of the analysis period leaving only a small difference in the amount of incremental shadow between the no action and proposed developments (see Figure 6-50).

The eastern façade of Grace Church would receive new shadows from development site 118 during the morning hours of the May and June analysis periods. On the May analysis day the incremental shadows would reach the eastern façade at starting at the beginning of the analysis period, 7:27 AM and would remain on the façade until 9:20 AM (see Figures 6-51 and 6-52).

During the June analysis day the incremental shadow would cover most of the eastern façade at the beginning of the analysis period, 6:57 AM (see Figure 6-53). The shadow would move across the façade (see Figure 6-54) and would exit the eastern façade by 9:40 AM.

With the proposed actions, the western façade of the church would experience incremental shadows during the afternoon and evening hours on all four analysis days. On the March, May and June analysis day, the proposed actions would add over three hours of incremental shadow to the western façade of the church. On the December analysis day, the proposed actions would add approximately 1 hour and a half of new shadow to the façade, and by the end of the analysis period would remove all the sun from the western façade. While the proposed actions would remove sunlight from the western façade on all four of the analysis days, it would do so during the afternoon hours when the church is not open to the public. Therefore, users of the church would not be affected by the incremental shadows during the afternoon and evening hours.

Potential development site 122 would add new shadows to the eastern façade during the morning hours of the May and June analysis periods. These new shadows would only occur during the 8:00 AM services; they would exit the façade before the 10:00 AM services. While the incremental shadows would remove all of the sunlight at the beginning of the May analysis period, 7:27 AM, the shadows would move quickly and within an hour, less than half of the façade would be covered in shadow, allowing some sunlight onto the stained glass windows during the early morning service. During the morning hours of the June analysis period, shadows from potential development site 122 would not completely remove all of the sunlight from the stained-glass windows and would allow some sunlight on the some of the windows at all times during the 8:00 AM service. While the incremental shadows would remove sunlight from the eastern façade during the 8:00 AM services, this would only occur during two analysis periods and would not completely remove all of the sunlight from the windows. The incremental shadows would have a significant adverse impact on the eastern and western façades of Grace Episcopal Church, which are sunlight-sensitive elements of this architectural resource. Therefore, the proposed actions would result in a significant adverse impact on this historic resource. Mitigation for this significant adverse impact is discussed in Chapter 22, “Mitigation.”

F. CONCLUSIONS

Under the proposed actions, Rufus King Park would experience incremental shadows in both the morning and evening hours on each of the analysis days. However, the shadow duration would be for less than two hours in the morning and evening hours and would not cover any significant passive recreation areas. The proposed actions would also not significantly reduce the amount of sunlight on the park.

The incremental shadows on the PS 50 Playground are for a short duration and are limited to the morning hours. The incremental shadows would not significantly reduce the amount of sunlight the playground receives throughout the day.

Incremental shadows on the Norelli-Hargreaves Triangle would be present for a relatively short amount of time and would move quickly across the triangle. While the proposed actions would add new shadow on the triangle on each of the four analysis days, they would not remove a significant amount of sun from the vegetation in this park.

The Major Mark Park would experience incremental shadows at beginning and the end of the March, May and June analysis days for a total incremental shadow of approximately 4 to 6 hours

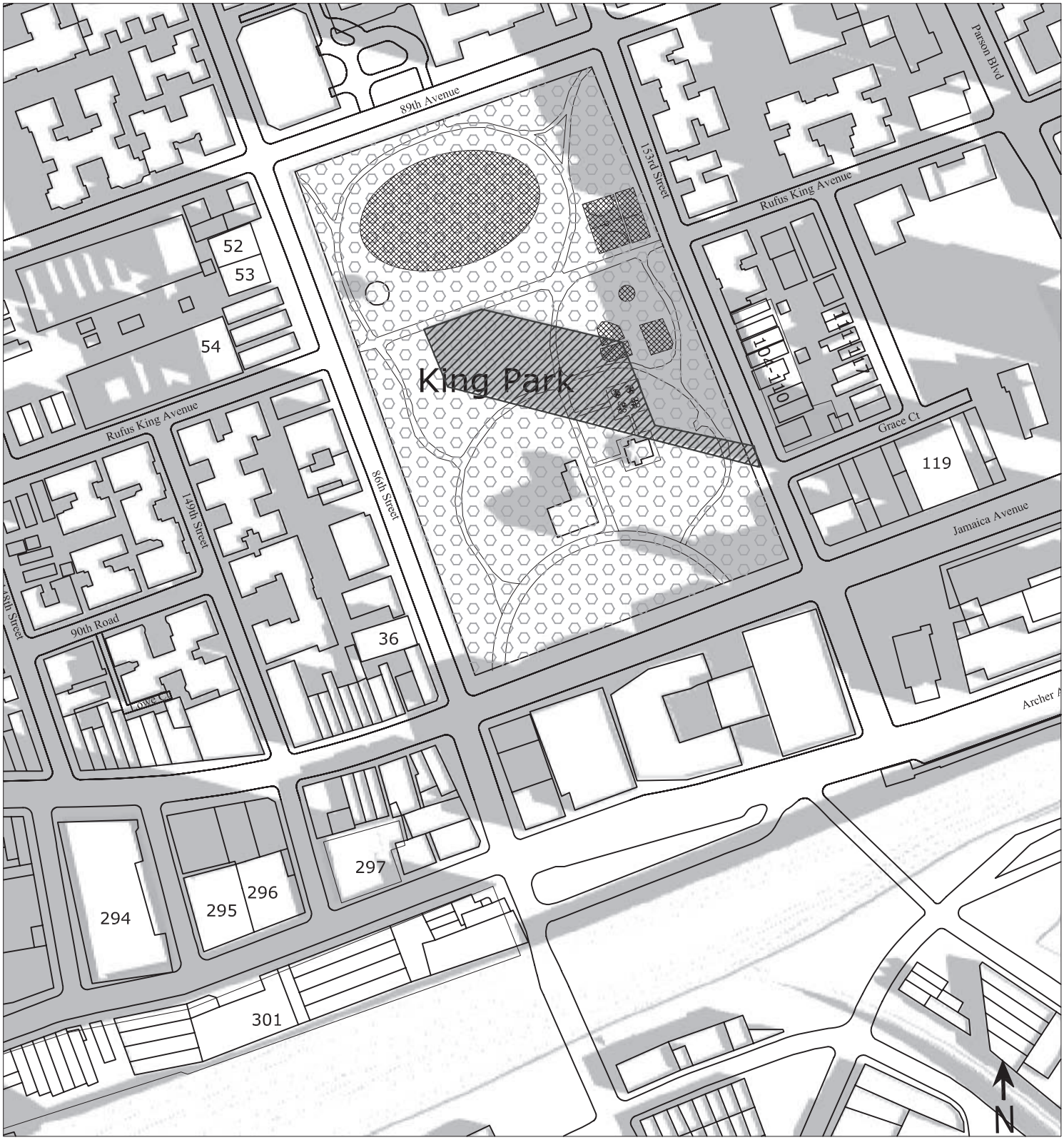
over the course of the day. While the proposed actions would create incremental shadows on these three analysis days, the park would have full sun during the afternoon hours.

Incremental shadows on the Brinkerhoff Mall would be for a short duration, and limited to the afternoon hours. There are no passive uses, such as seating areas, that would be impacted by new shadows. With the proposed actions the mall would remain in sun for the majority of the analysis period on each of the analysis days, and no adverse impacts are expected on the vegetation.

Liberty Park would experience small incremental shadows of short duration on the northwest corner of the park, where the basketball and tennis courts are located. The proposed actions would not add a significant amount of new shadow to this large park and the shadows would fall on active recreational areas.

Incremental shadows on the Atlantic Avenue Extension Park would be for a short duration, and limited to the early morning hours. With the proposed actions the park would remain in sun for the majority of the analysis day during the spring, summer and fall months. There would no incremental shadows on the park during the winter months. Because this park is not yet programmed, it is possible that incremental shadows may be cast on sun-sensitive features. Therefore, the proposed actions could result in a significant adverse impact on the proposed Atlantic Avenue Extension Park. Mitigation for this significant adverse impact is discussed in Chapter 22, "Mitigation."

Grace Church would experience incremental shadows on all four analysis days, in the morning and afternoon hours. The duration of the new shadows last from 1 hour 34 minutes in December to 4 hours and 40 minutes on June 21 and would cover both the eastern and western façades, depending upon the time of day. Incremental shadows on the eastern façade would occur during the early morning hours of the May and June analysis days before 9:40 AM. Shadows on the western façade could occur during all four analysis days but would not begin until after 1 PM. As stated above, the church is open to the public between 11 AM and 1 PM during the week, and shadows would not occur during these hours. It is recognized that incremental shadows from the proposed actions could fall on the eastern façade during the period of Sunday services (before 10 AM) in the May/August and June analysis periods. The incremental shadows would have a significant adverse impact on the eastern and western façades of Grace Episcopal Church, which are sunlight-sensitive elements of this architectural resource (see also Chapter 7 "Historic Resources," following). Mitigation for this significant adverse impact is discussed in Chapter 22, "Mitigation." ✷

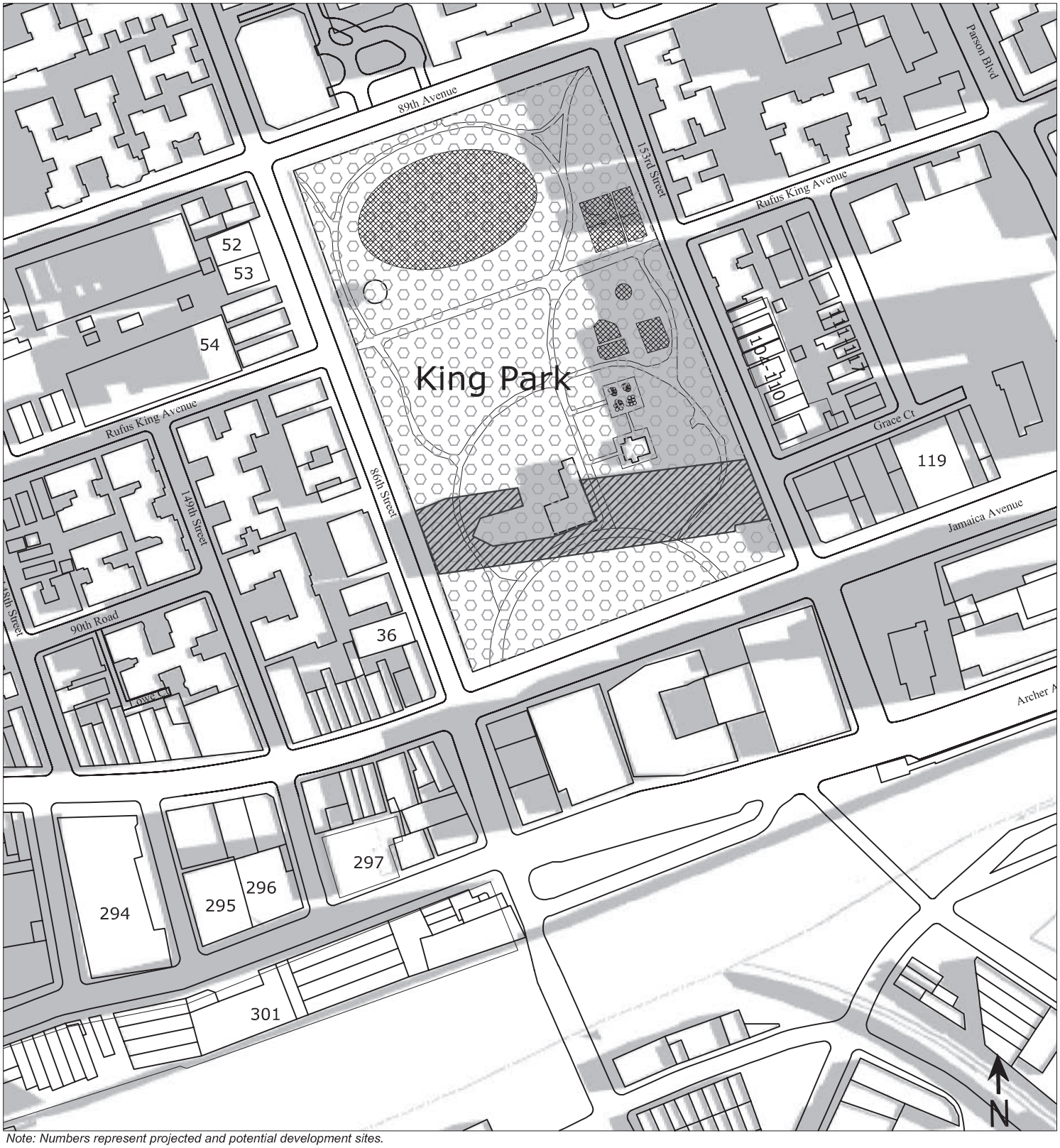


Note: Numbers represent projected and potential development sites.

Open Space
Shadow
Incremental Shadow on Open Space
Active Recreation Spaces
Decorative Plantings and Garden

FEET
0 100 200 300

Shadow Diagram
Rufus King Park
March 21 - 7:36 AM EST

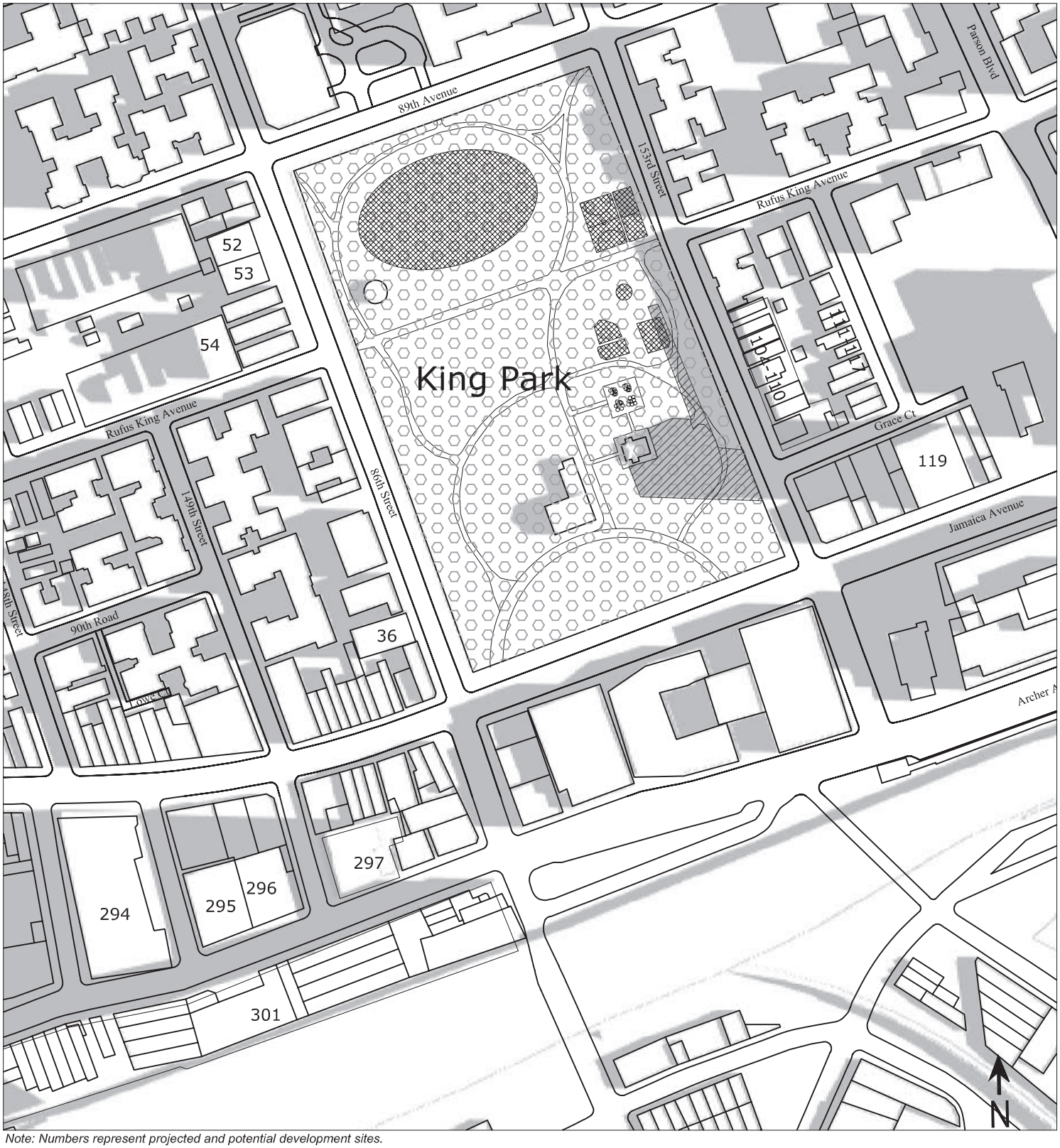


Note: Numbers represent projected and potential development sites.

0 100 200 300 FEET

Open Space
Shadow
Incremental Shadow on Open Space
Active Recreation Spaces
Decorative Plantings and Garden

Shadow Diagram
Rufus King Park
May 6 7:27 AM DST
Figure 6-2

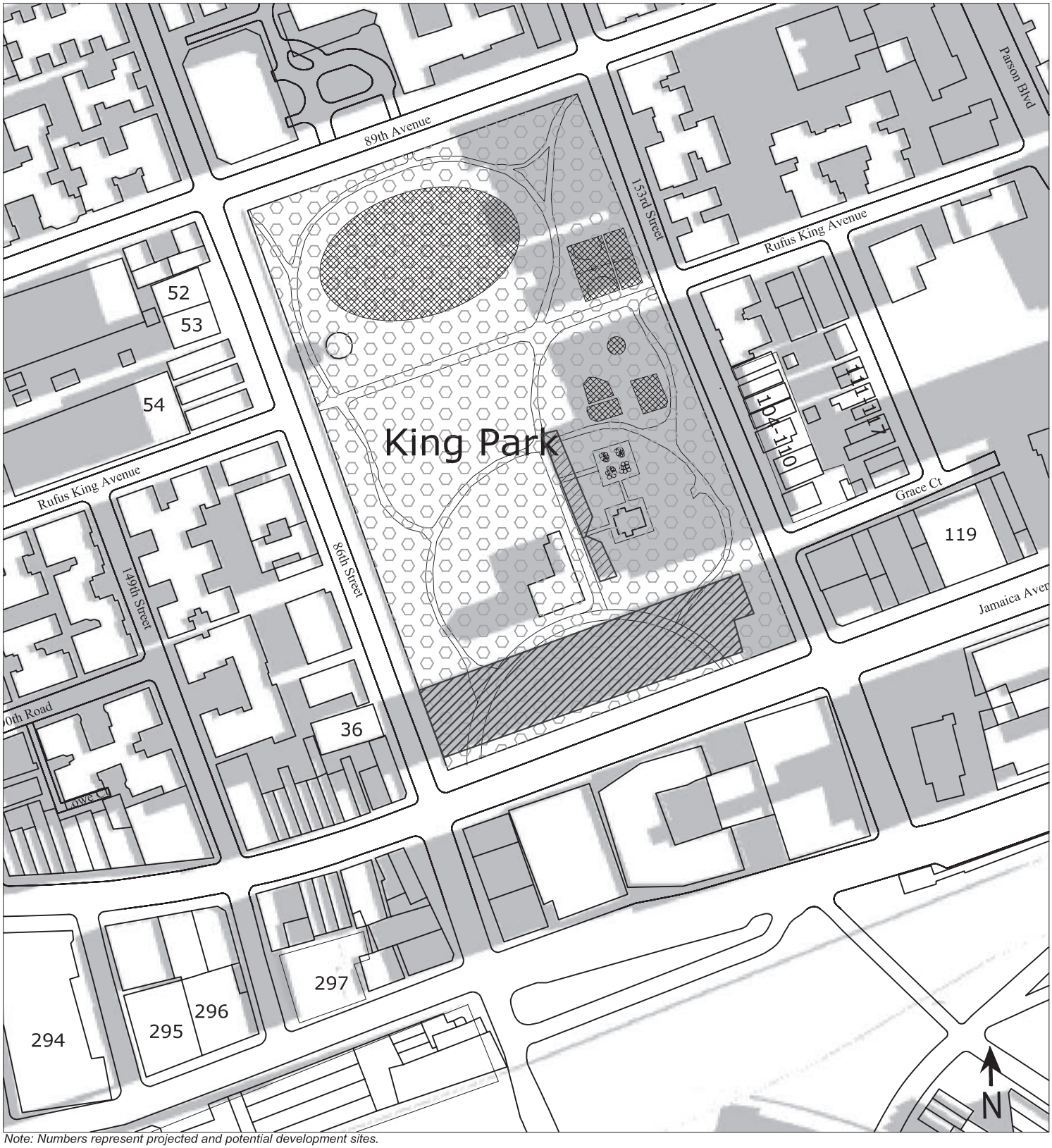


Note: Numbers represent projected and potential development sites.

0 100 200 300 FEET

Open Space
Shadow
Incremental Shadow on Open Space
Active Recreation Spaces
Decorative Plantings and Garden

Shadow Diagram
Rufus King Park
May 6 - 8:30 AM DST
Figure 6-3

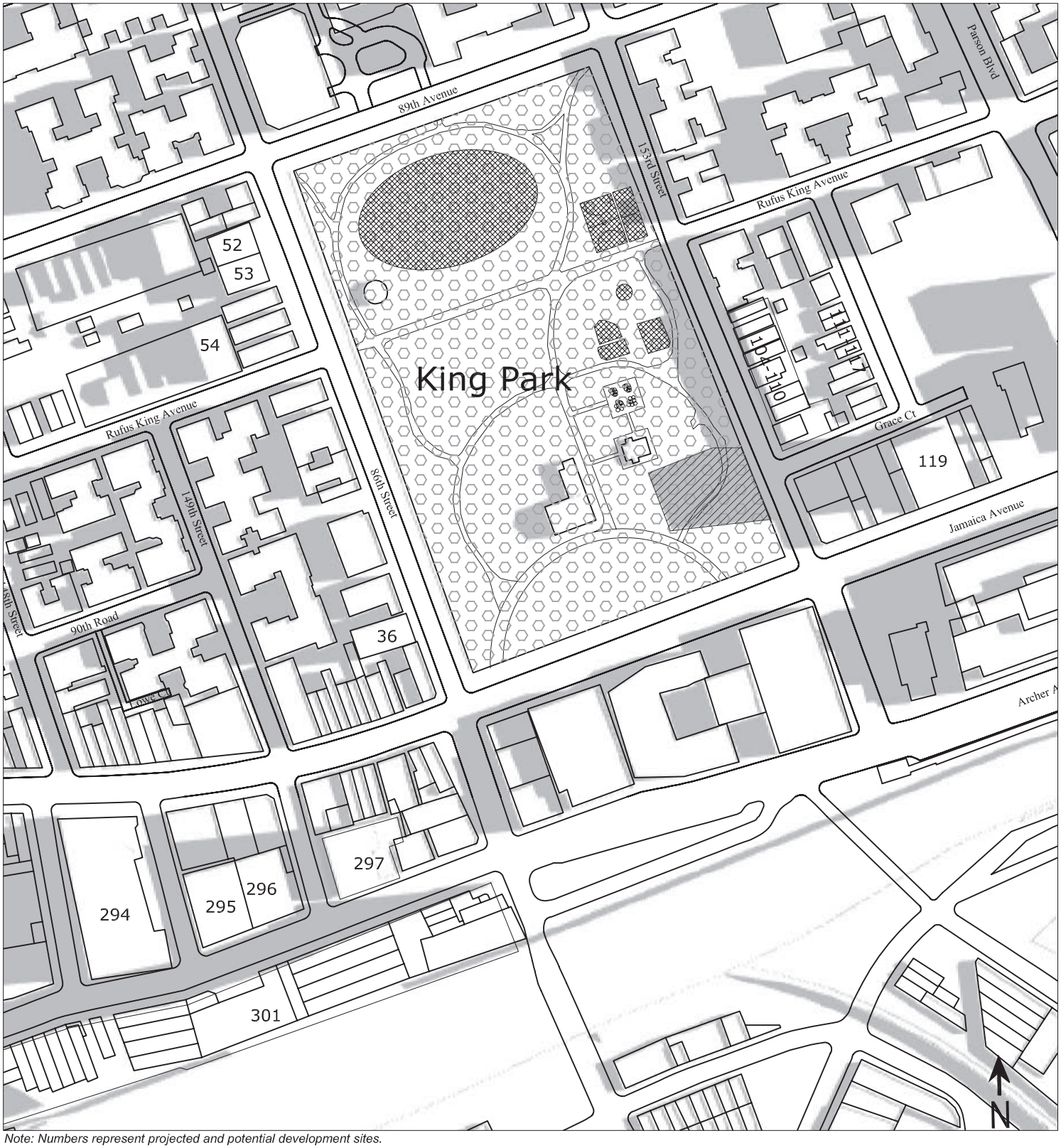


Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Active Recreation Spaces
Decorative Plantings and Garden

Shadow Diagram
Rufus King Park
June 21 - 6:57 AM DST
Figure 6-4

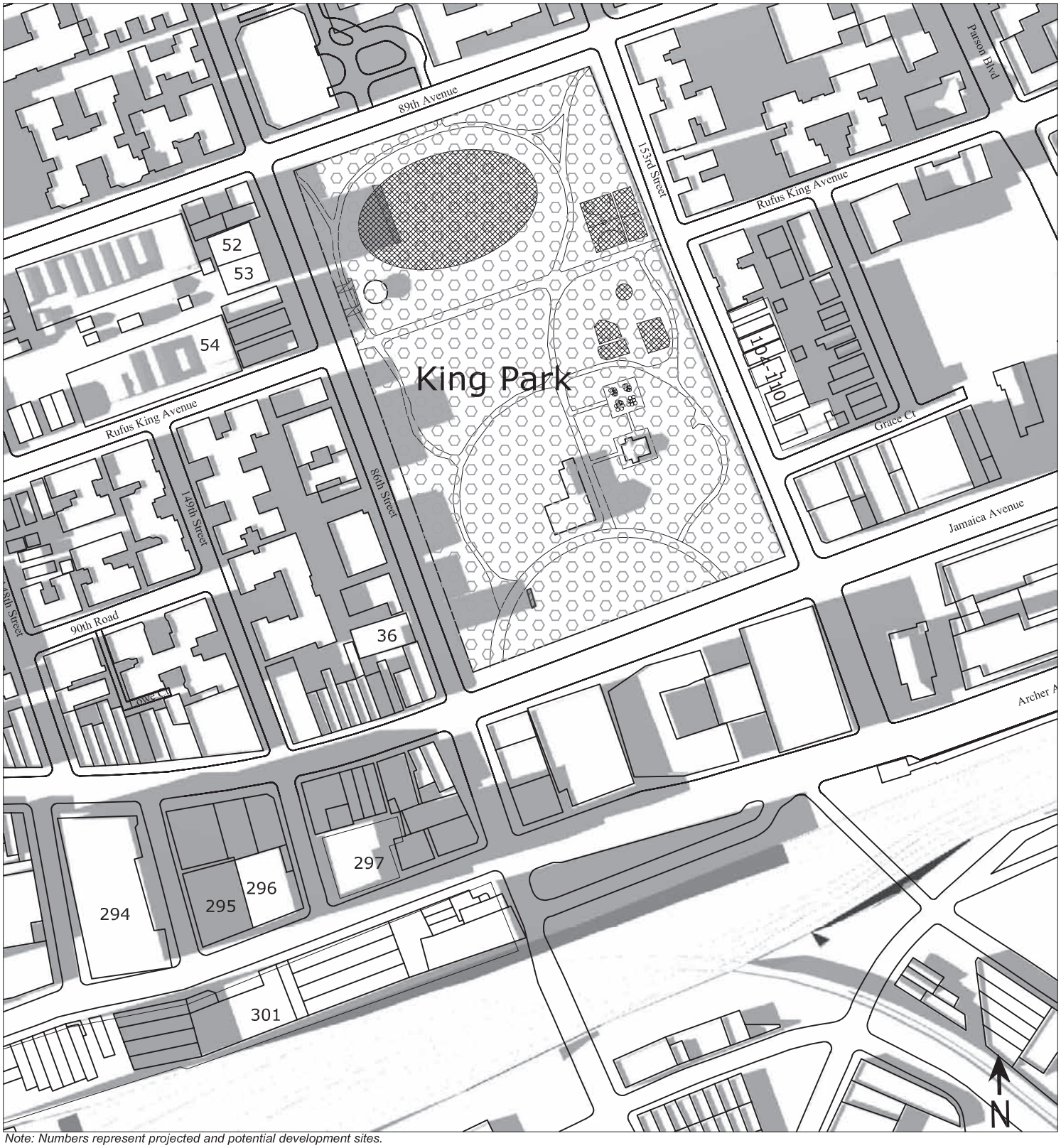


Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Active Recreation Spaces
Decorative Plantings and Garden

Shadow Diagram
Rufus King Park
June 21 - 8:30 AM DST
Figure 6-5

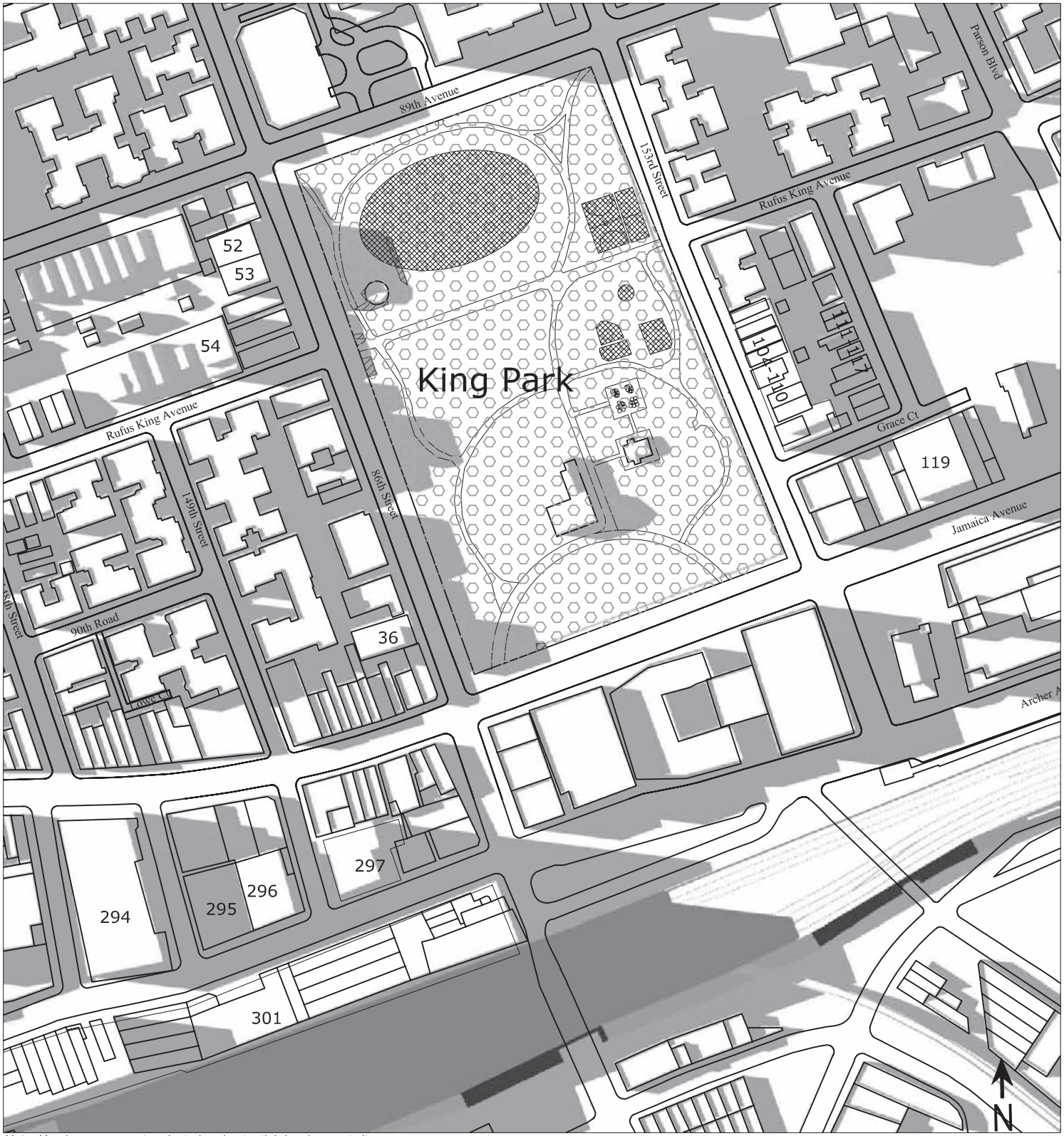


Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Active Recreation Spaces
Decorative Plantings and Garden

Shadow Diagram
Rufus King Park
March 21 - 4:29 PM EST
Figure 6-6



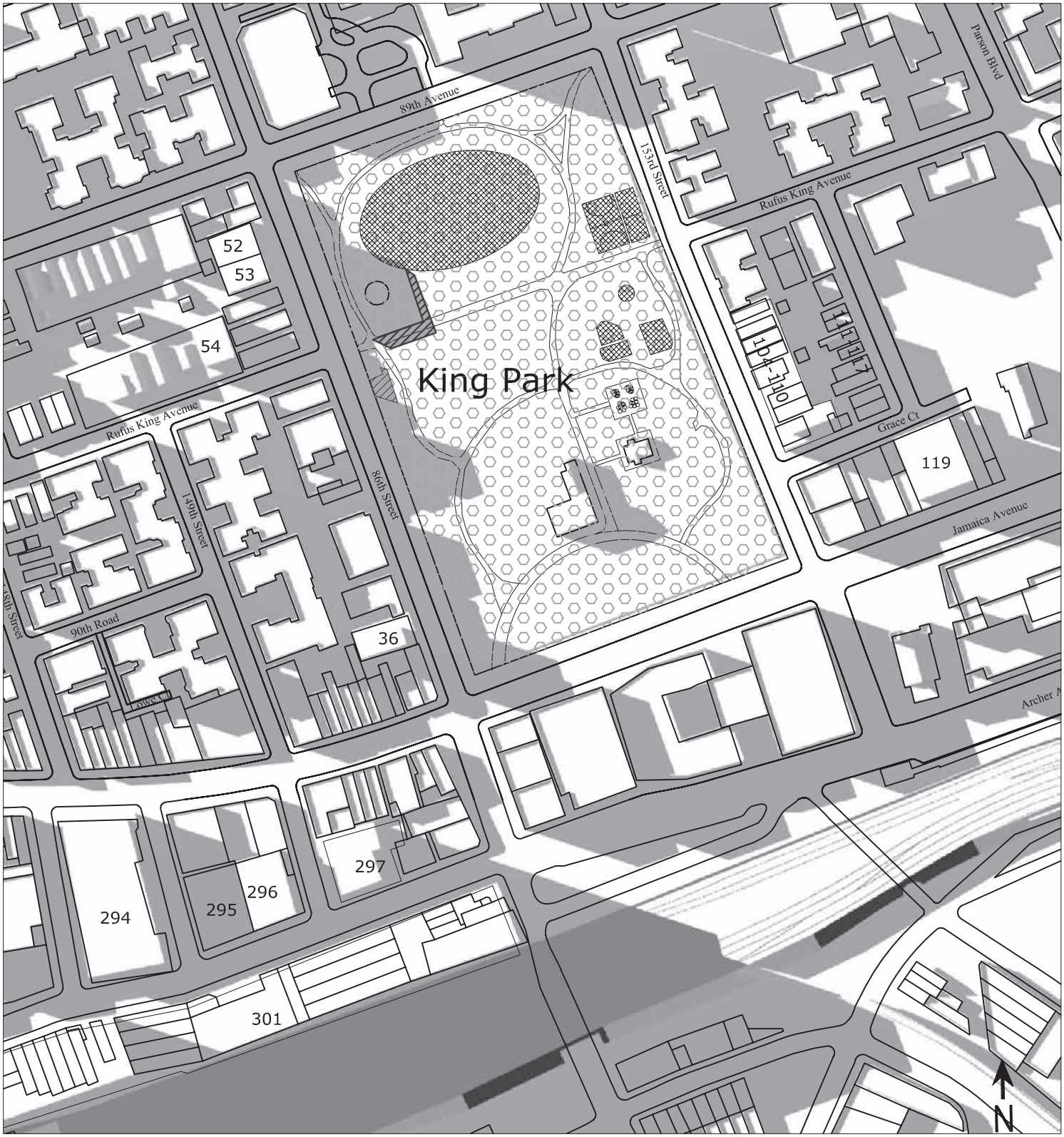
Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Active Recreation Spaces
Decorative Plantings and Garden

Shadow Diagram
Rufus King Park
May 6 - 6:18 PM DST
Figure 6-7

JAMAICA PLAN

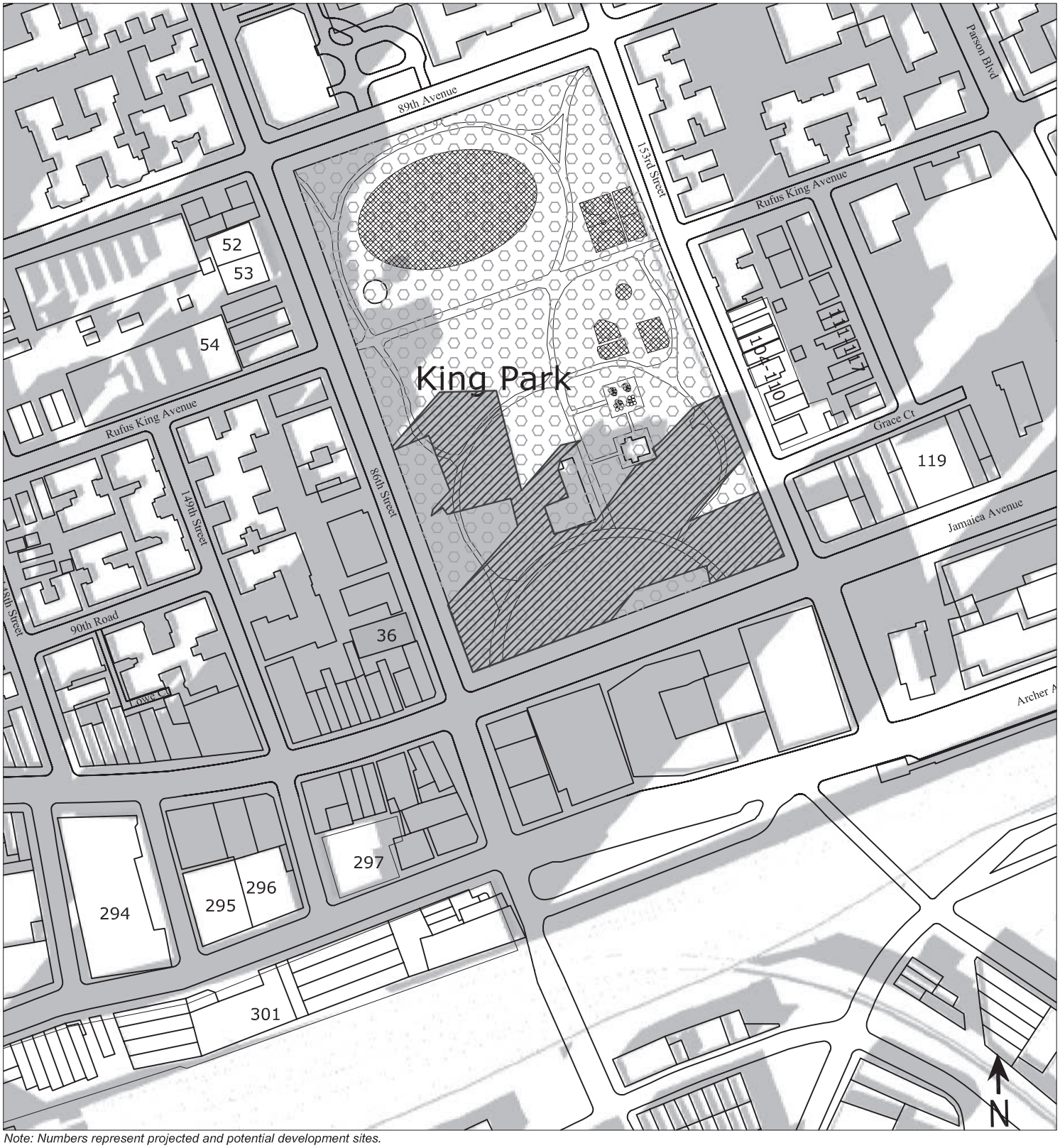


Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Active Recreation Spaces
Decorative Plantings and Garden

Shadow Diagram
Rufus King Park
June 21 - 7:01 PM DST
Figure 6-8



Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Active Recreation Spaces
Decorative Plantings and Garden

Shadow Diagram
Rufus King Park
December 21 - 2:53 PM EST
Figure 6-9

Note: Numbers represent projected and potential development sites.

Open Space
Shadow
Incremental Shadow on Open Space
Handball Court
Low Bushes and Plantings

Shadow Diagram
PS 50 Playground and Norelli Memorial Triangle
March 21 - 7:36 AM EST
Figure 6-10

Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Handball Court
Low Bushes and Plantings

JAMAICA PLAN

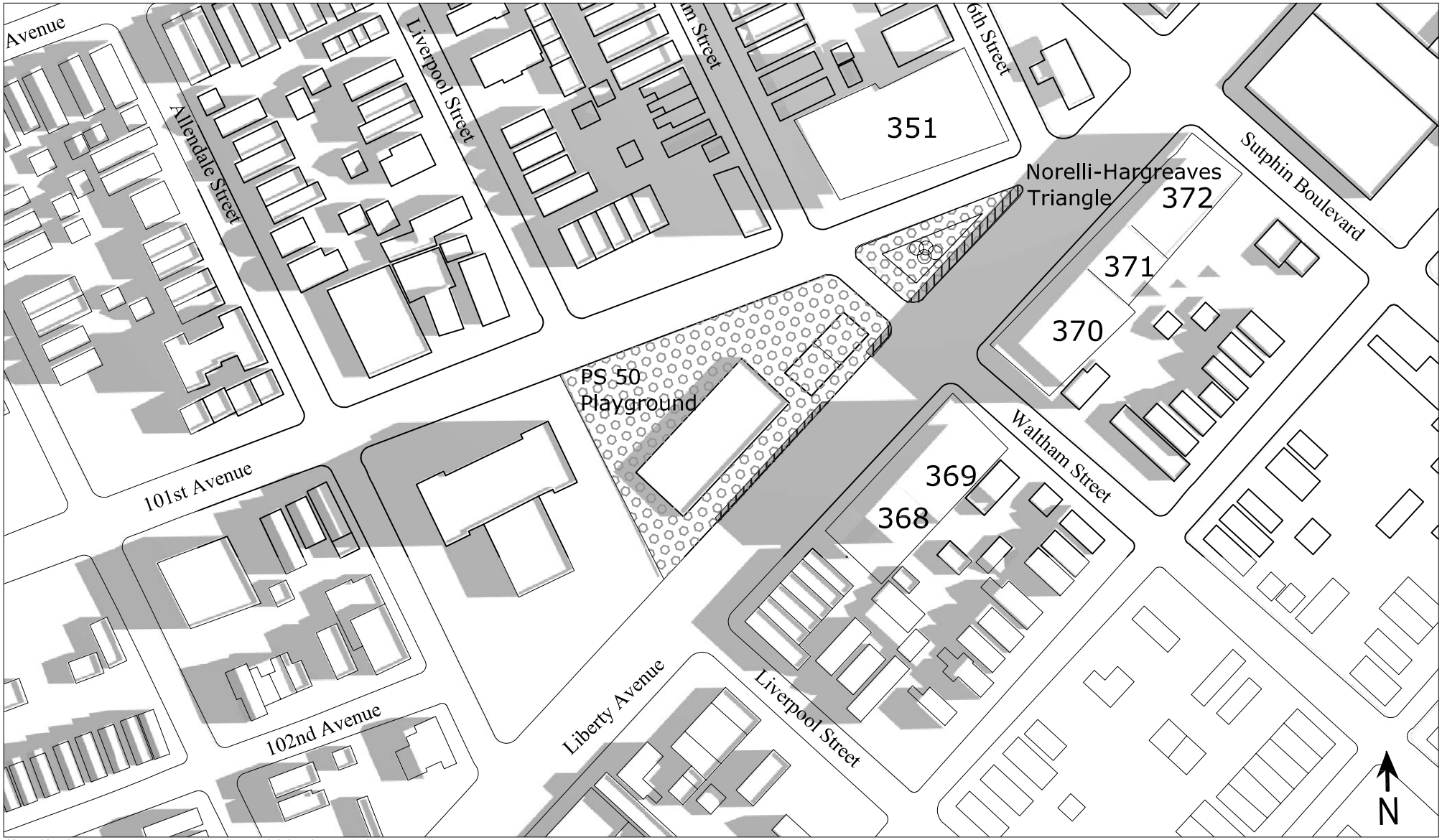
Shadow Diagram
PS 50 Playground and Norelli Memorial Triangle
March 21 - 8:30 AM EST
Figure 6-11

Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Handball Court
Low Bushes and Plantings

Shadow Diagram
PS 50 Playground and Norelli Memorial Triangle
May 6 - 7:27 AM DST
Figure 6-12



Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Handball Court
Low Bushes and Plantings

Shadow Diagram
PS 50 Playground and Norelli Memorial Triangle
May 6 - 8:15 AM DST
Figure 6-13

JAMAICA PLAN

Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Handball Court
Low Bushes and Plantings

Shadow Diagram
PS 50 Playground and Norelli Memorial Triangle
June 21 - 6:57 AM DST
Figure 6-14

Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Handball Court
Low Bushes and Plantings

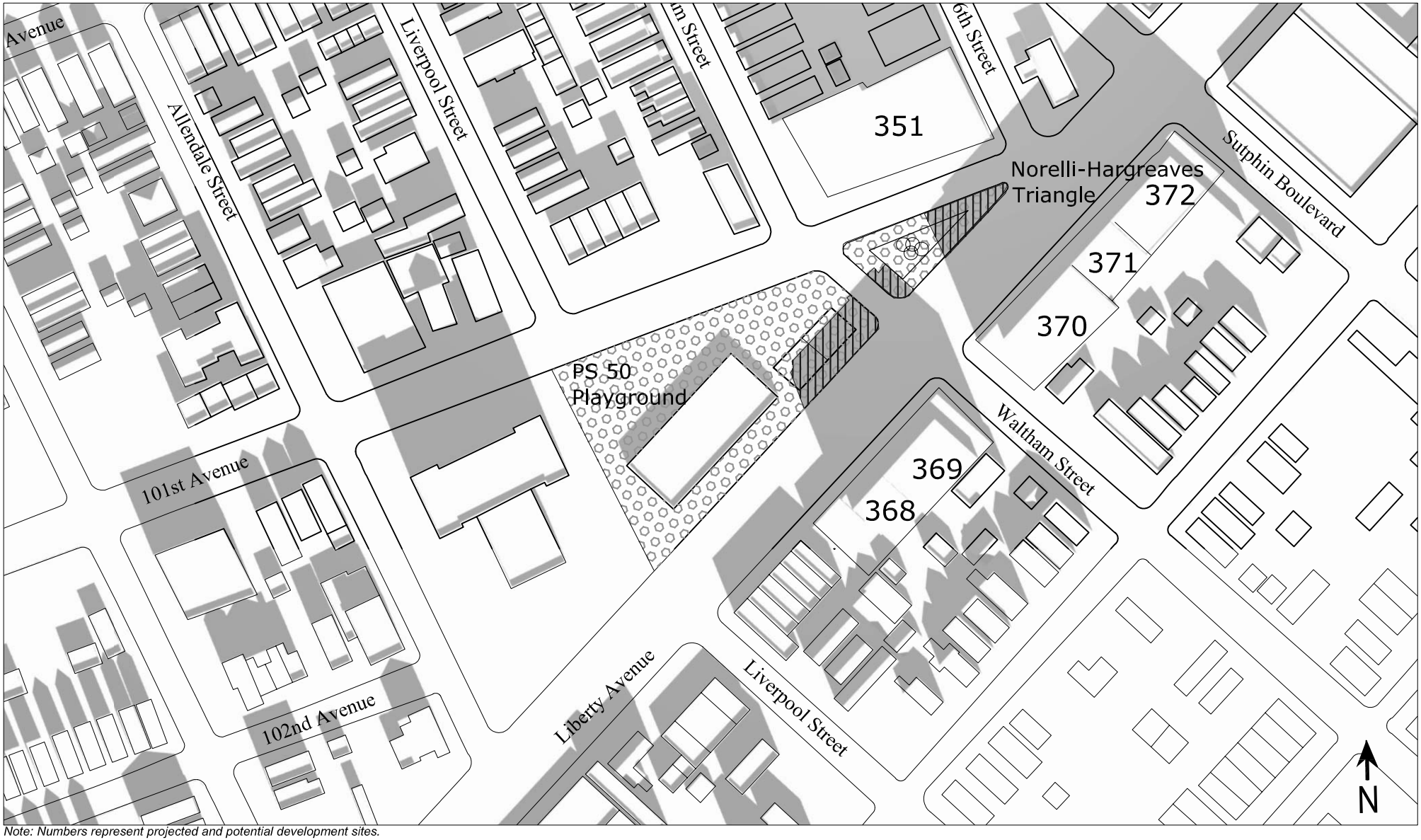
Shadow Diagram
PS 50 Playground and Norelli Memorial Triangle
December 21 - 8:51 AM EST
Figure 6-15

Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Handball Court
Low Bushes and Plantings

Shadow Diagram
PS 50 Playground and Norelli Memorial Triangle
December 21 - 9:30 AM EST
Figure 6-16

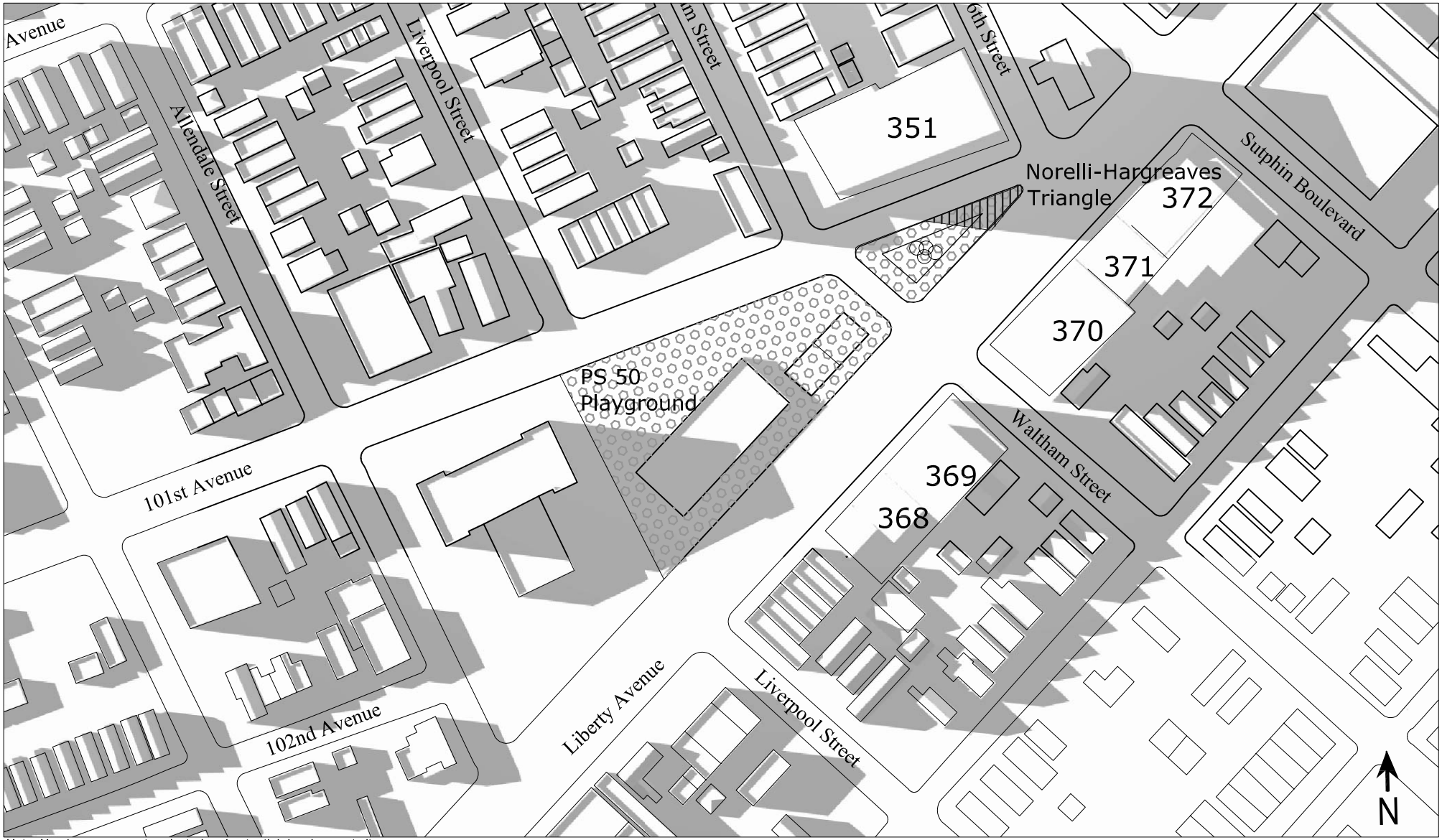


Note: Numbers represent projected and potential development sites.

0 100 200 300 FEET

- Open Space
- Shadow
- Incremental Shadow on Open Space
- Handball Court
- Low Bushes and Plantings

Shadow Diagram
PS 50 Playground and Norelli Memorial Triangle
December 21 - 10:30 AM EST
Figure 6-17

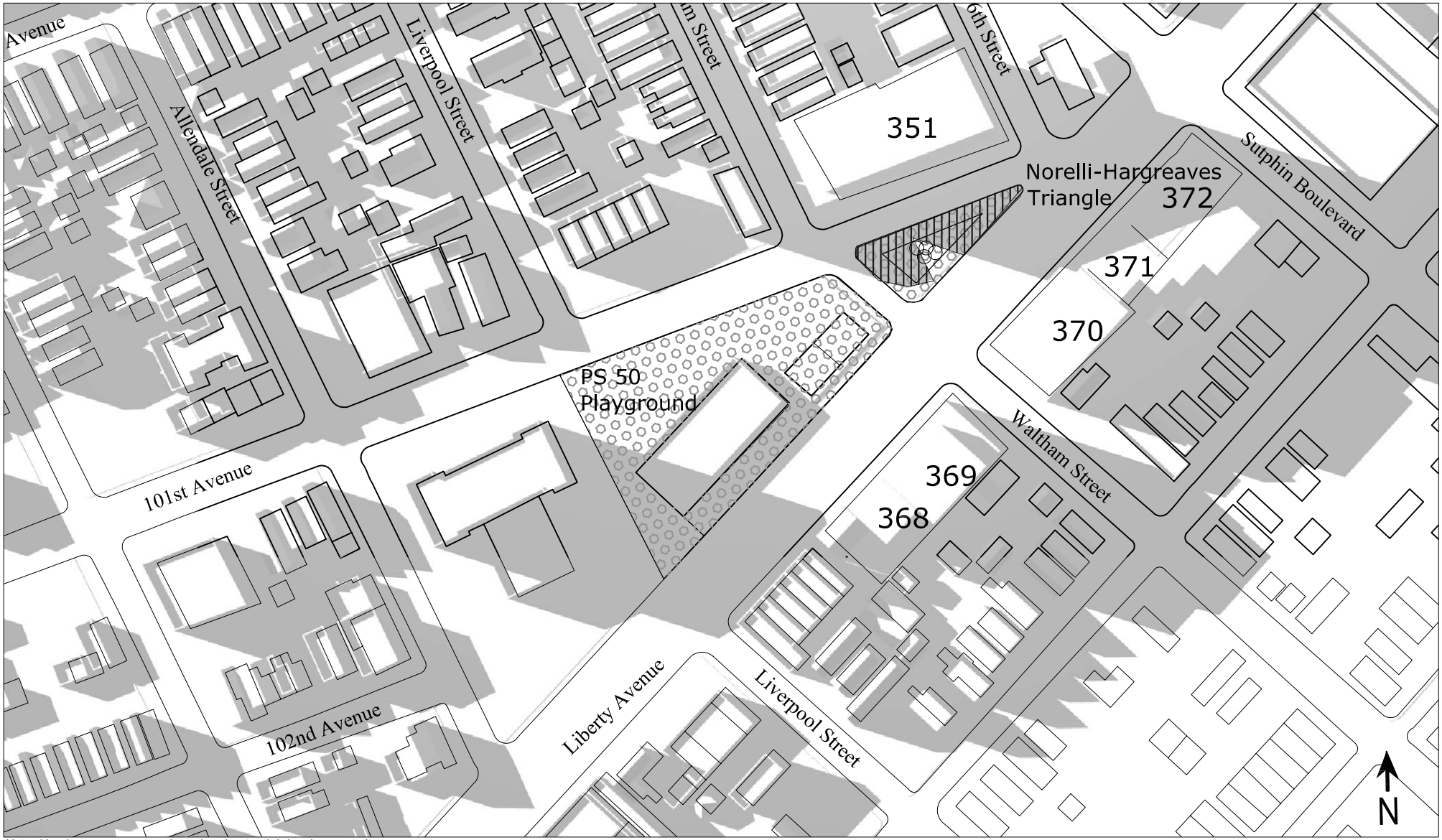


Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Handball Court
Low Bushes and Plantings

Shadow Diagram
PS 50 Playground and Norelli Memorial Triangle
May 6 - 6:18 PM DST
Figure 6-18



Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Handball Court
Low Bushes and Plantings

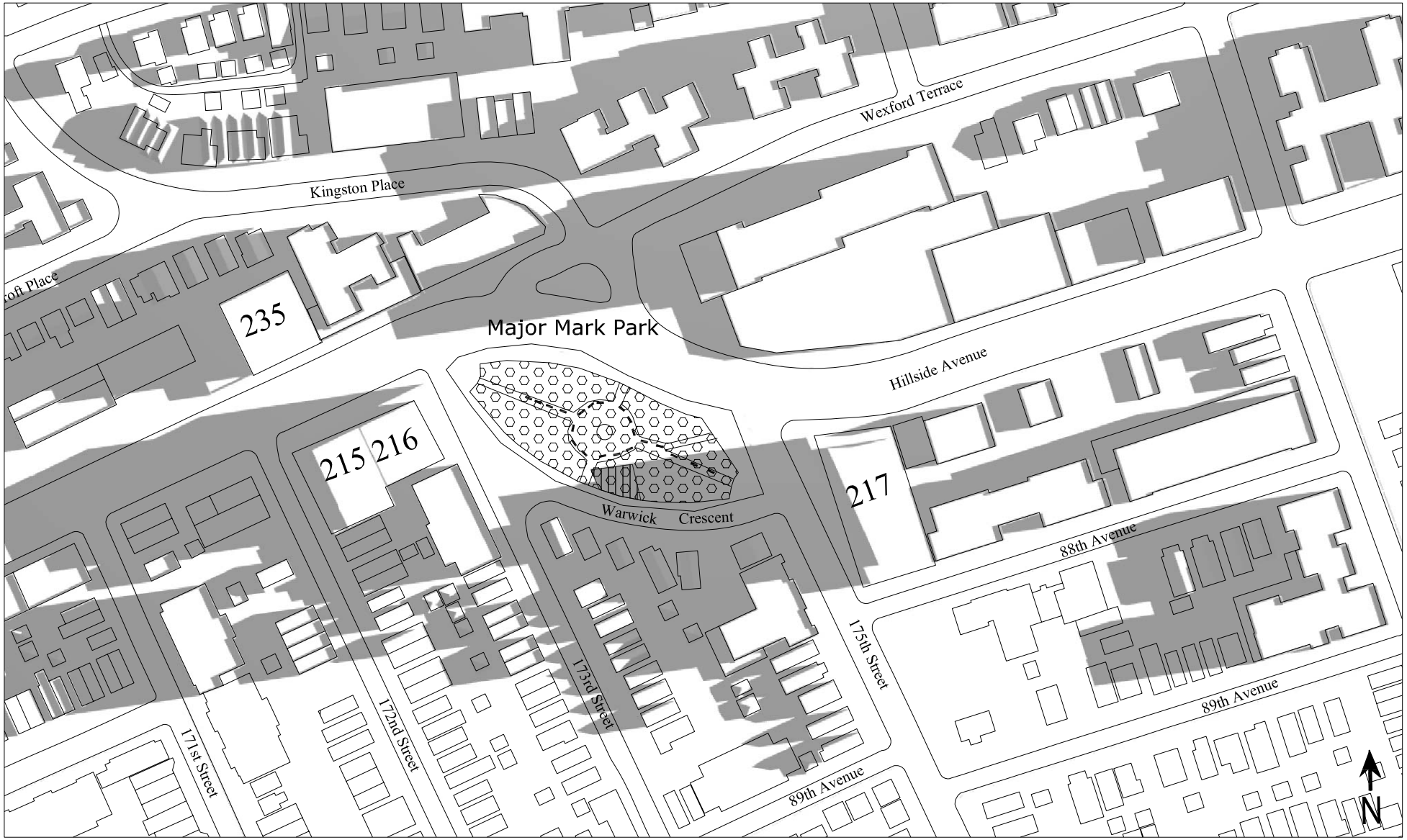
Shadow Diagram
PS 50 Playground and Norelli Memorial Triangle
June 21 - 7:01 PM DST
Figure 6-19

Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Benches
Statue

Shadow Diagram
Major Mark Park
March 21 - 7:36 AM EST
Figure 6-20



Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Benches
Statue

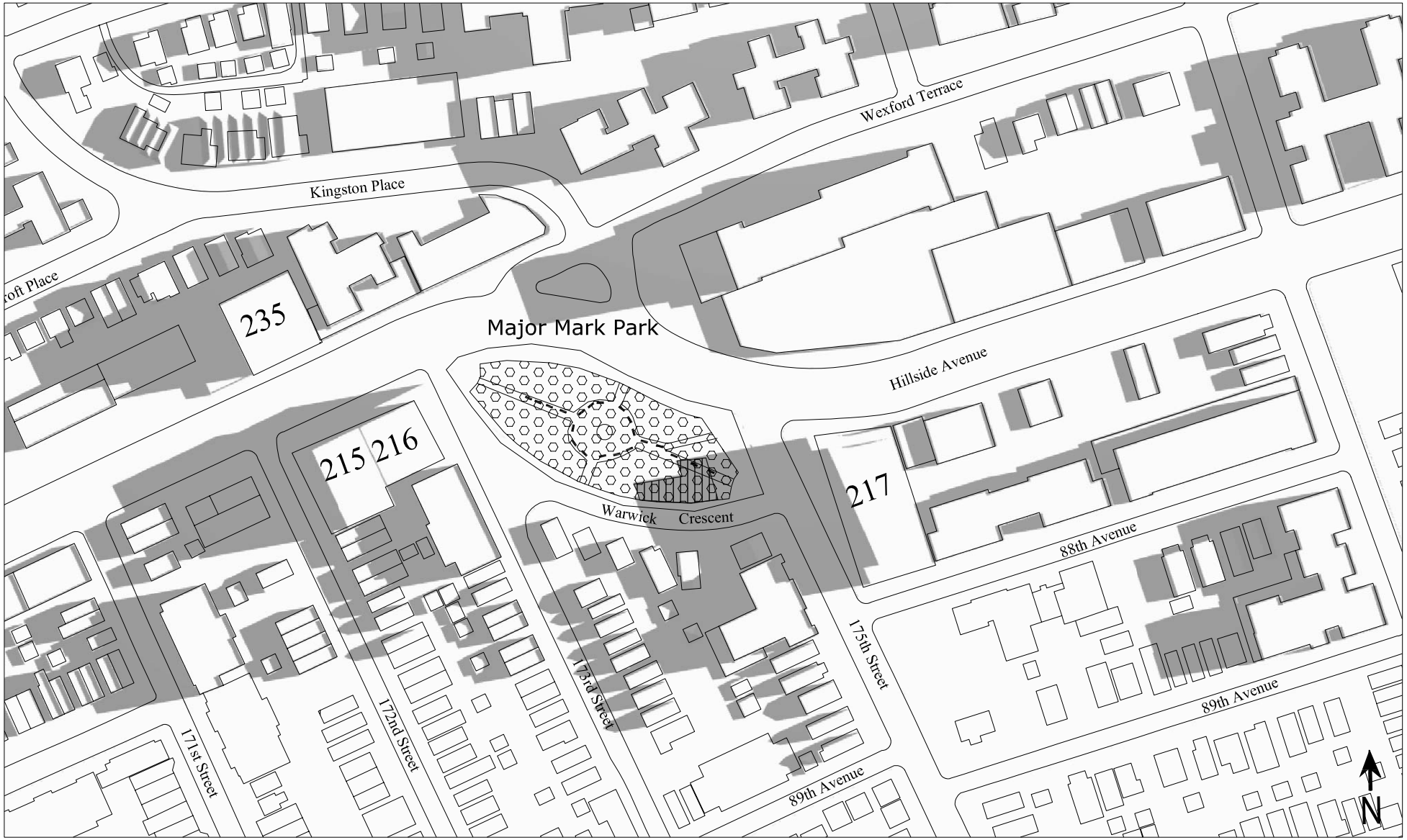
Shadow Diagram
Major Mark Park
May 6 - 7:27 AM EDT
Figure 6-21

Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Benches
Statue

Shadow Diagram
Major Mark Park
May 6 - 9:15 AM EDT
Figure 6-22

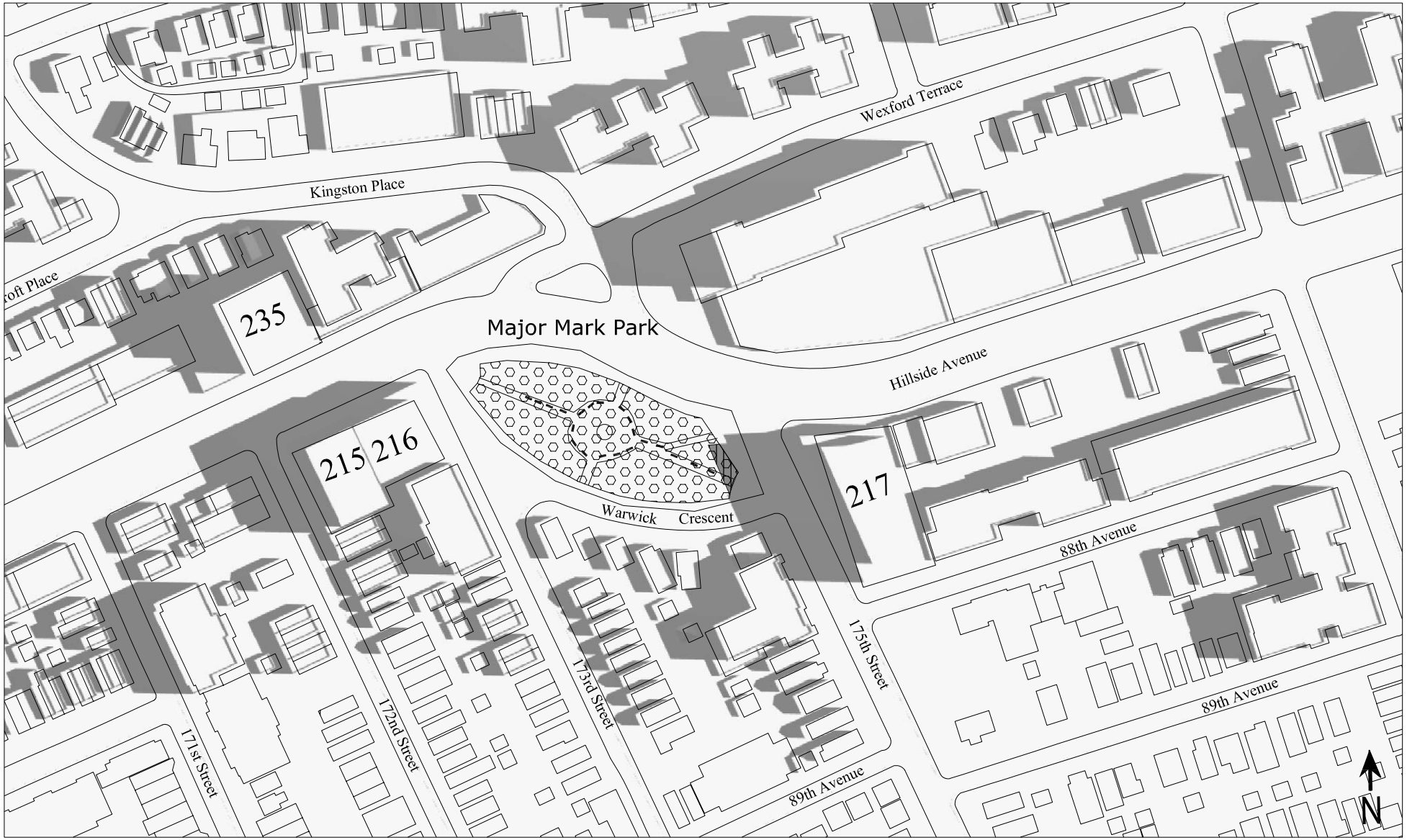


Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Benches
Statue

Shadow Diagram
Major Mark Park
June 21 - 8:00 AM EDT
Figure 6-23

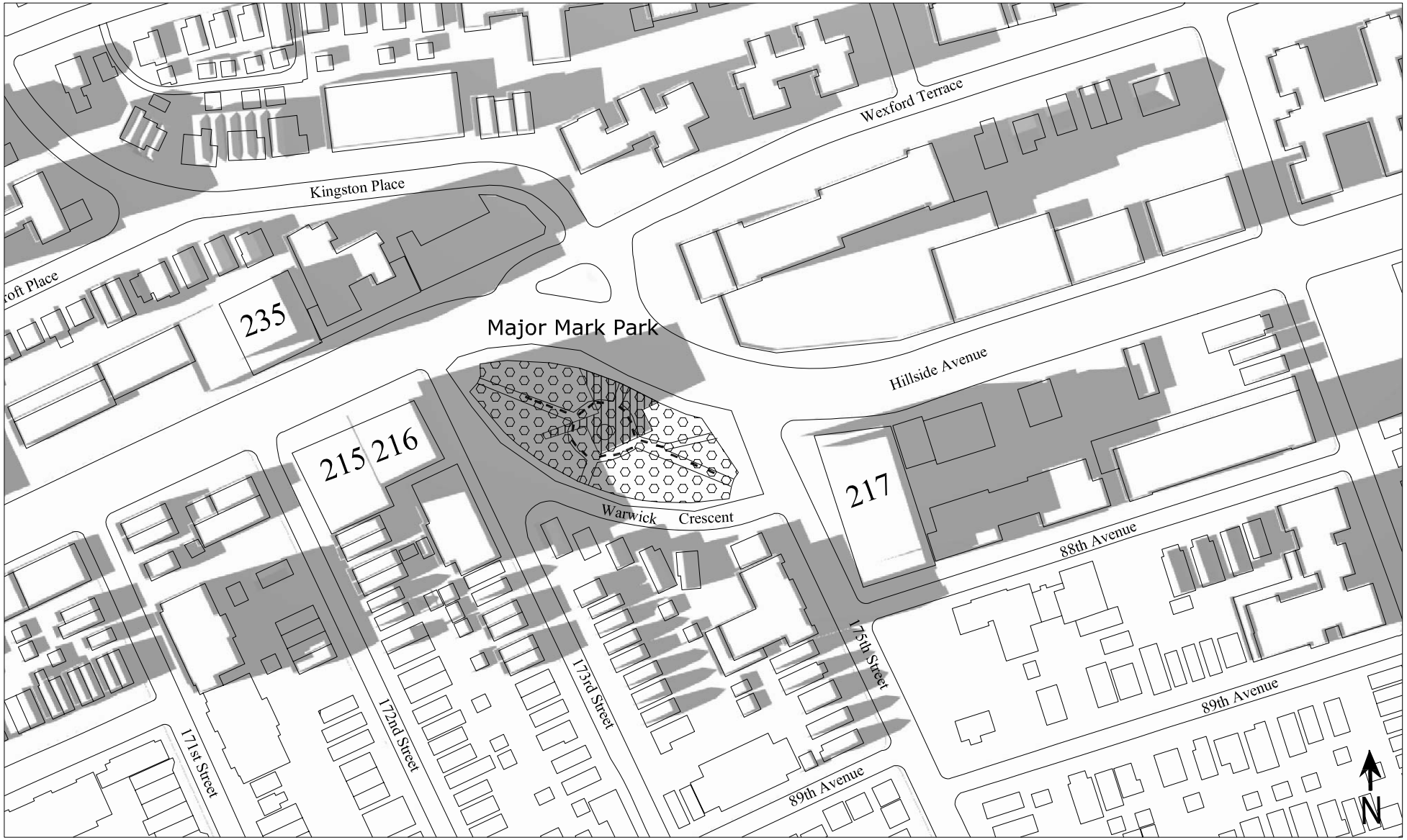


Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Benches
Statue

Shadow Diagram
Major Mark Park
June 21 - 9:15 AM EDT
Figure 6-24

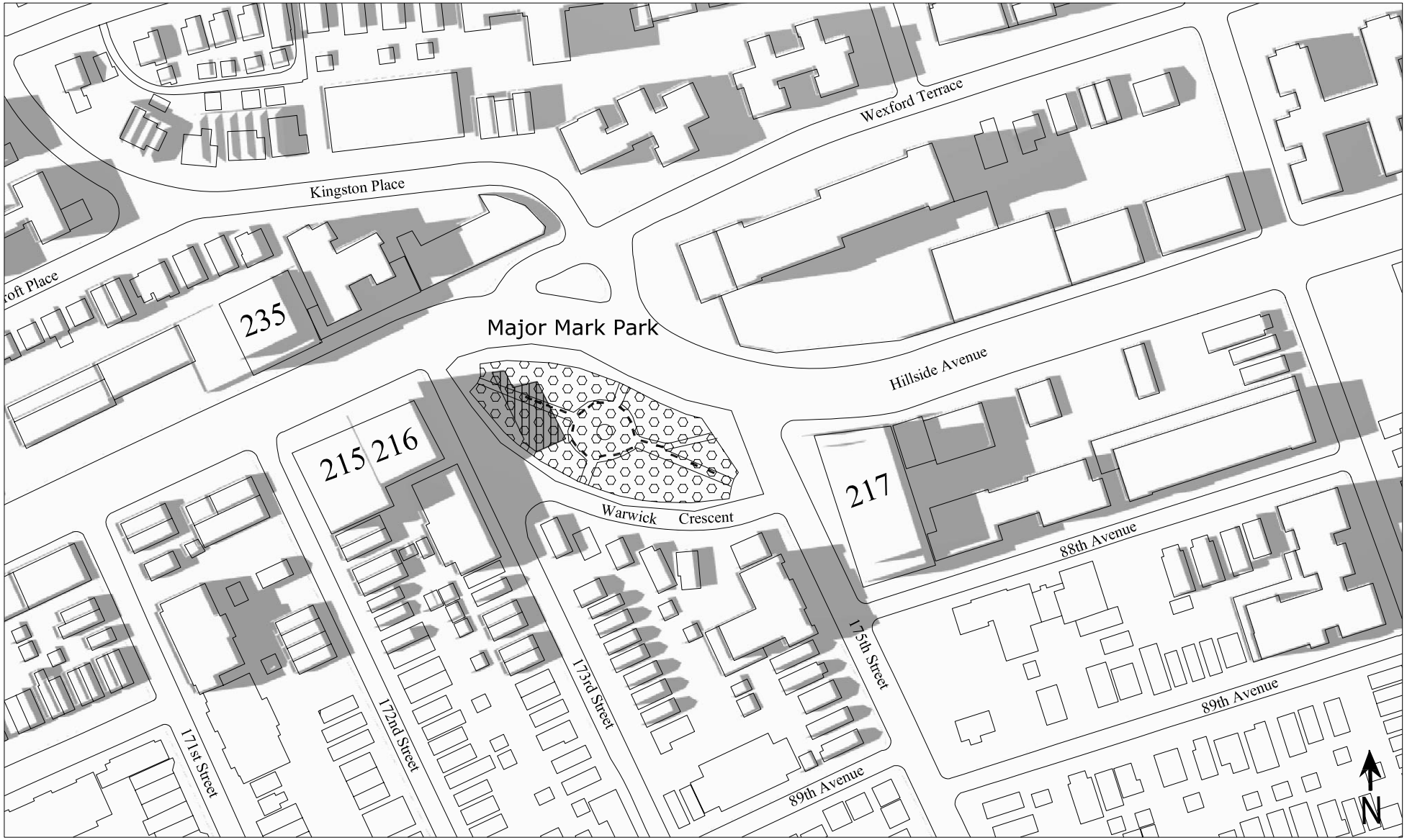


Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Benches
Statue

Shadow Diagram
Major Mark Park
March 21 - 4:29 PM EST
Figure 6-25

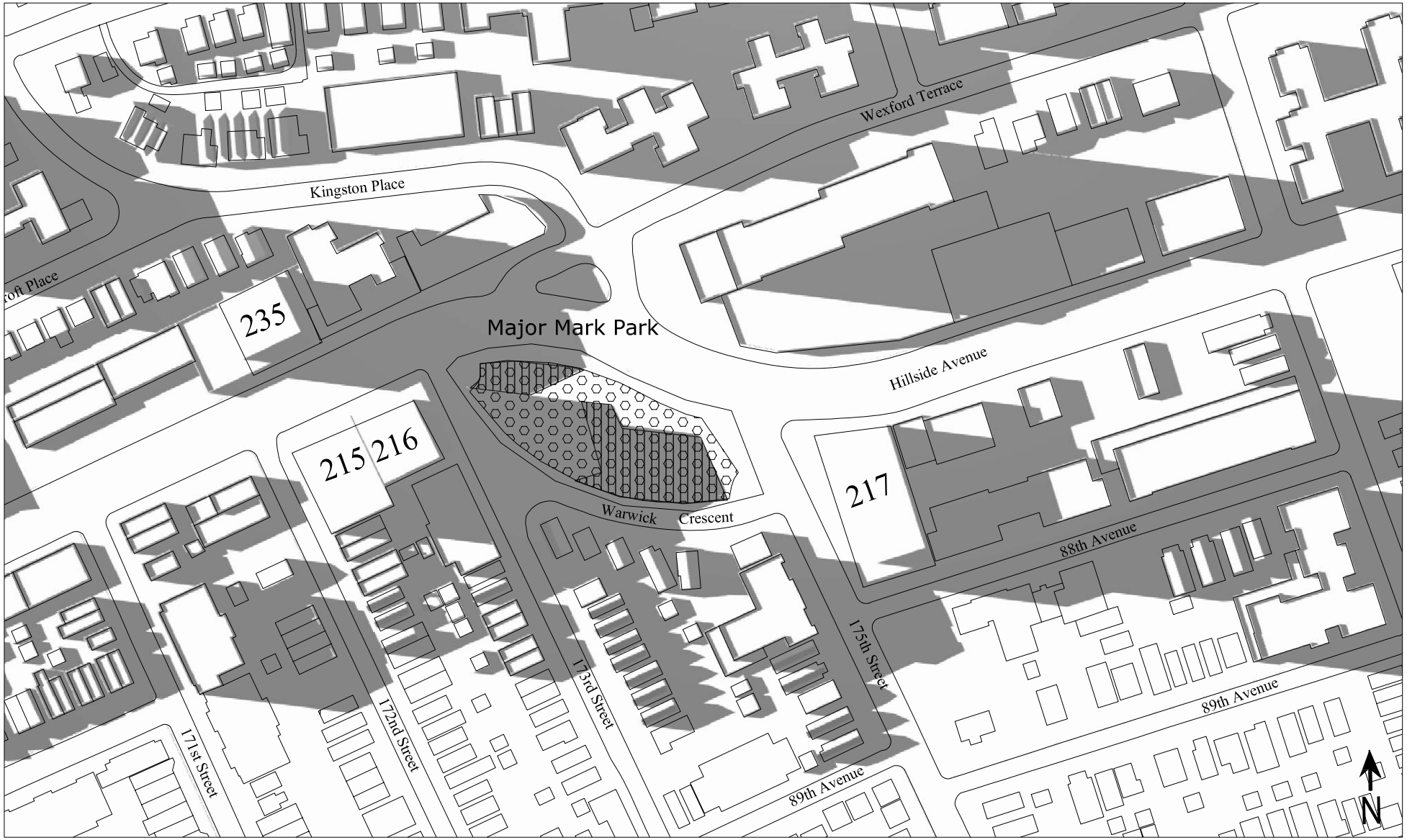


Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Benches
Statue

Shadow Diagram
Major Mark Park
May 6 - 4:45 PM EDT
Figure 6-26



Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Benches
Statue

Shadow Diagram
Major Mark Park
May 6 - 6:18 PM EDT
Figure 6-27

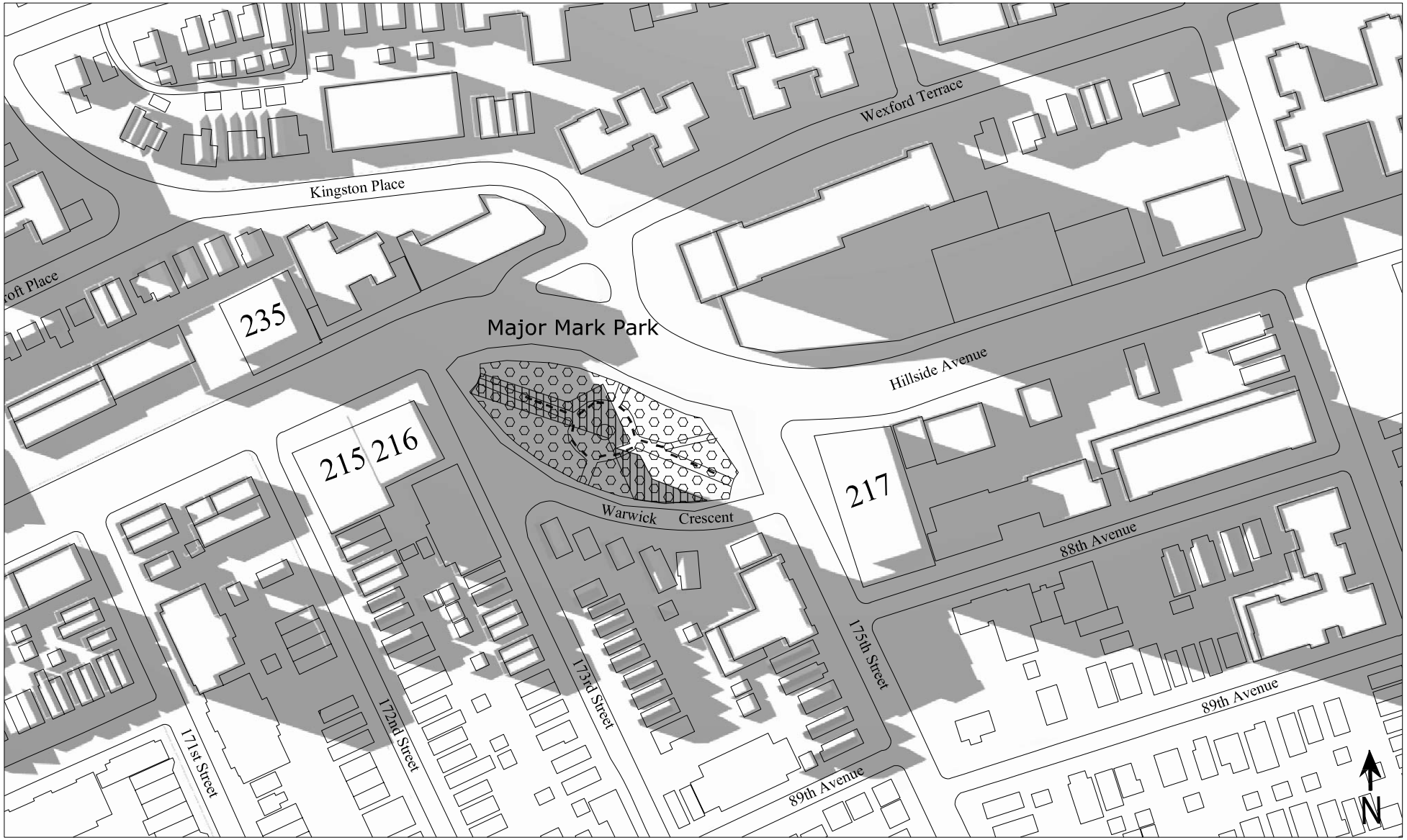
Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Benches
Statue

JAMAICA PLAN

Shadow Diagram
Major Mark Park
June 21 - 5:15 PM EDT
Figure 6-28

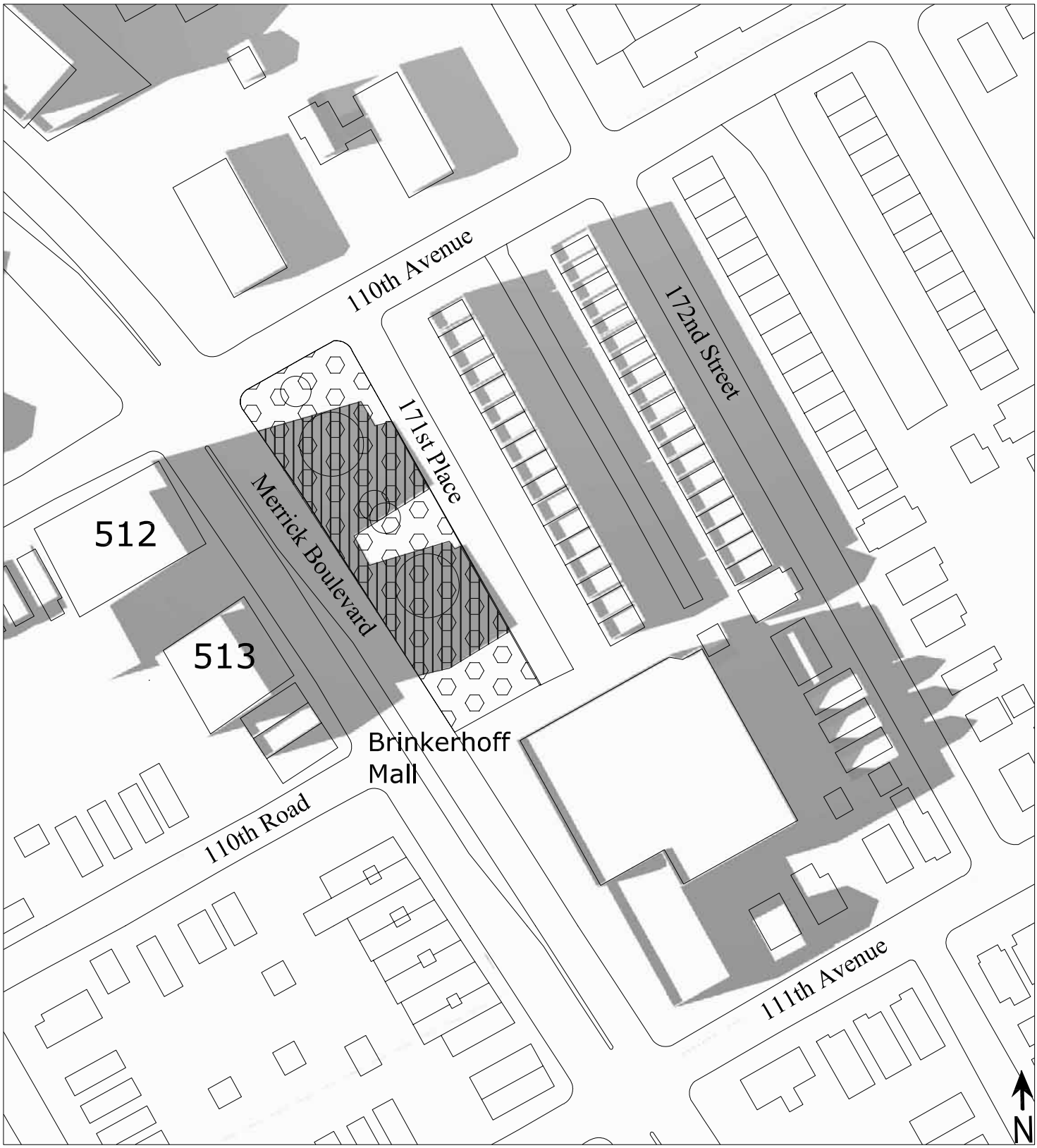


Note: Numbers represent projected and potential development sites.

FEET
0 100 200 300

Open Space
Shadow
Incremental Shadow on Open Space
Benches
Statue

Shadow Diagram
Major Mark Park
June 21 - 7:01 PM EDT
Figure 6-29



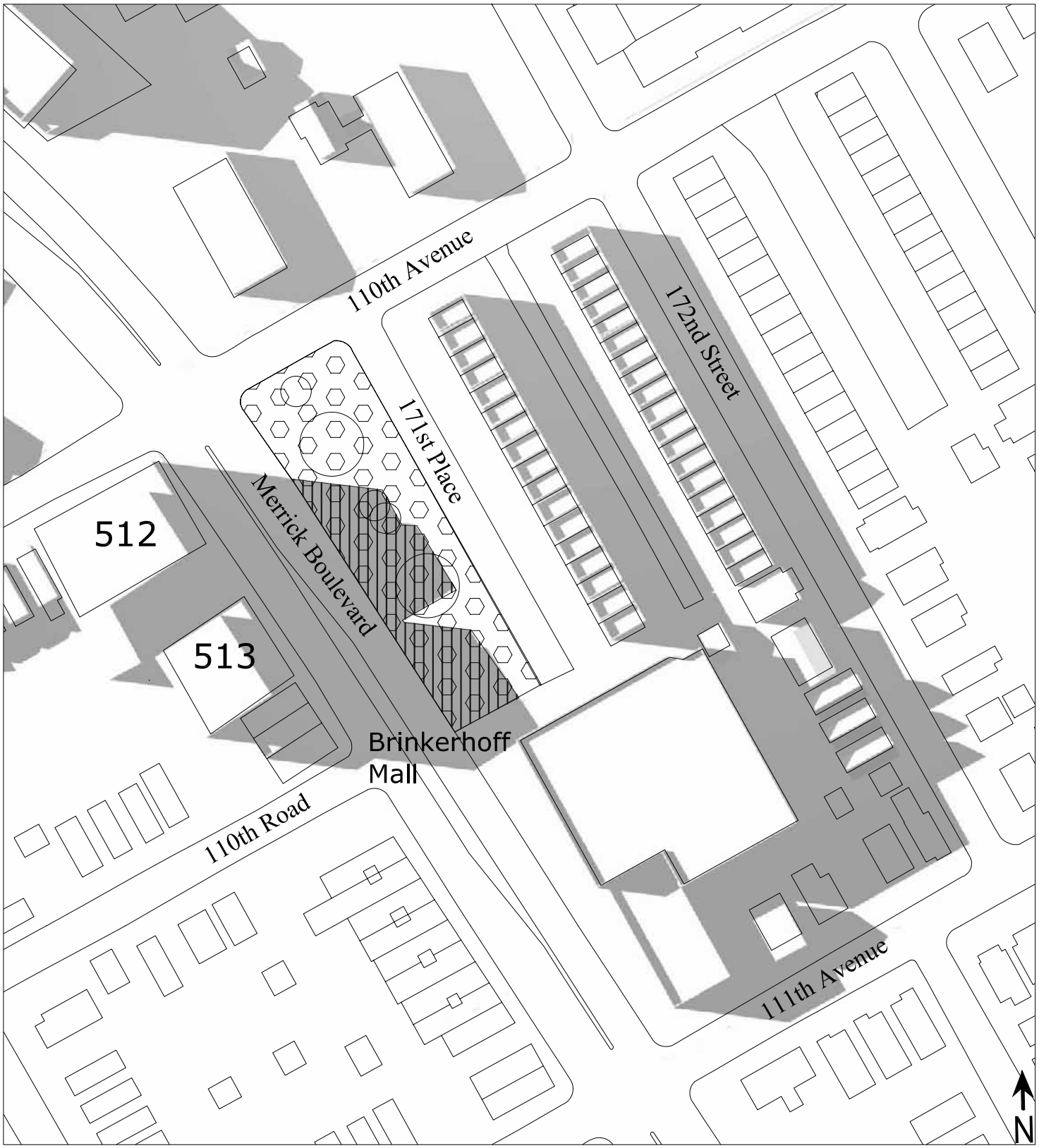
Note: Numbers represent projected and potential development sites.

0 50 100 150 FEET

Open Space
Shadow
Incremental Shadow on Open Space
Tree
Bushes and Low Shrubs

JAMAICA PLAN

Shadow Diagram
Brinkerhoff Mall
March 21 - 4:29 PM EST
Figure 6-30



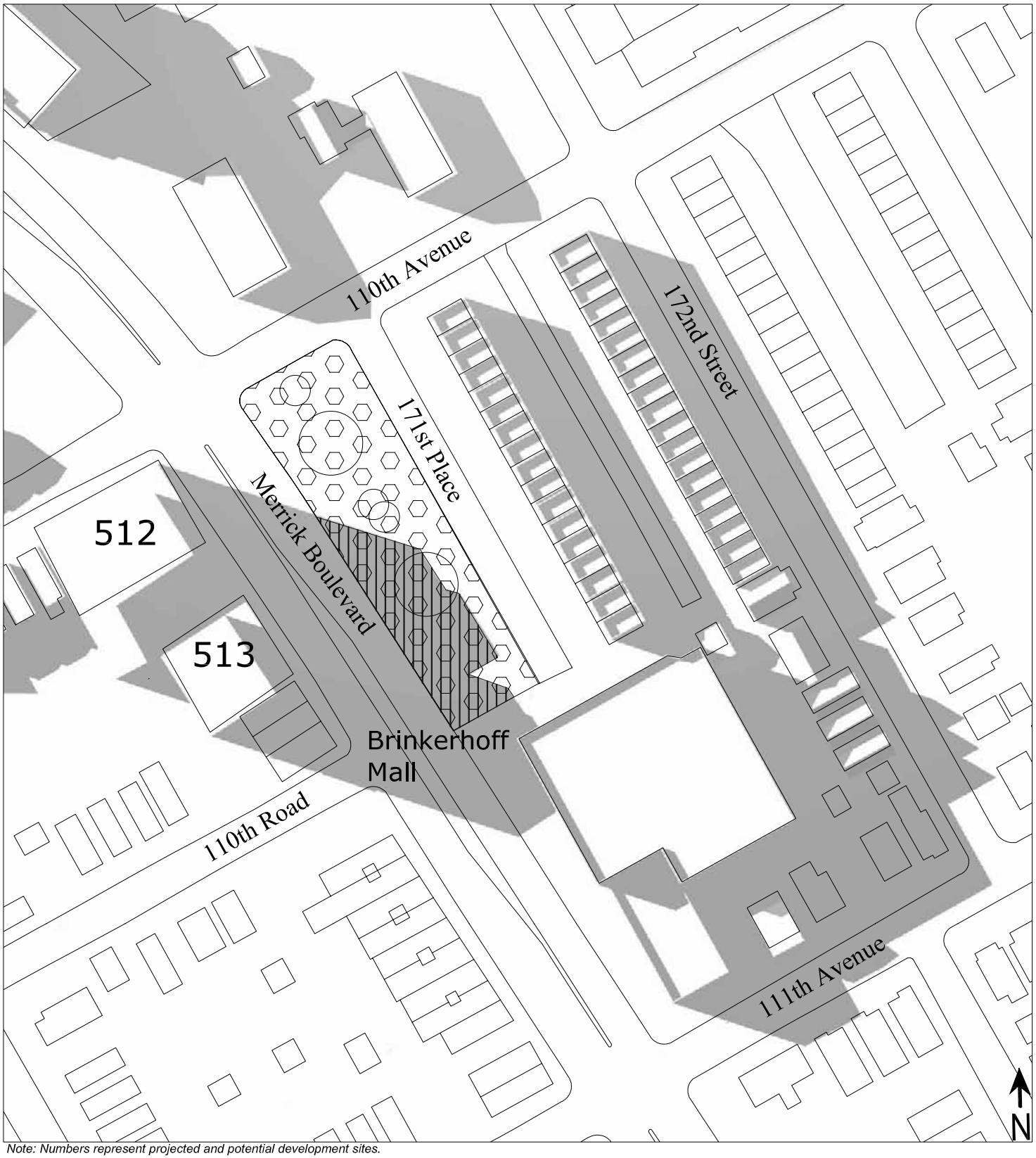
Note: Numbers represent projected and potential development sites.

0 50 100 150 FEET

Open Space
Shadow
Incremental Shadow on Open Space
Tree
Bushes and Low Shrubs

JAMAICA PLAN

Shadow Diagram
Brinkerhoff Mall
May 6 - 6:18 PM DST
Figure 6-31



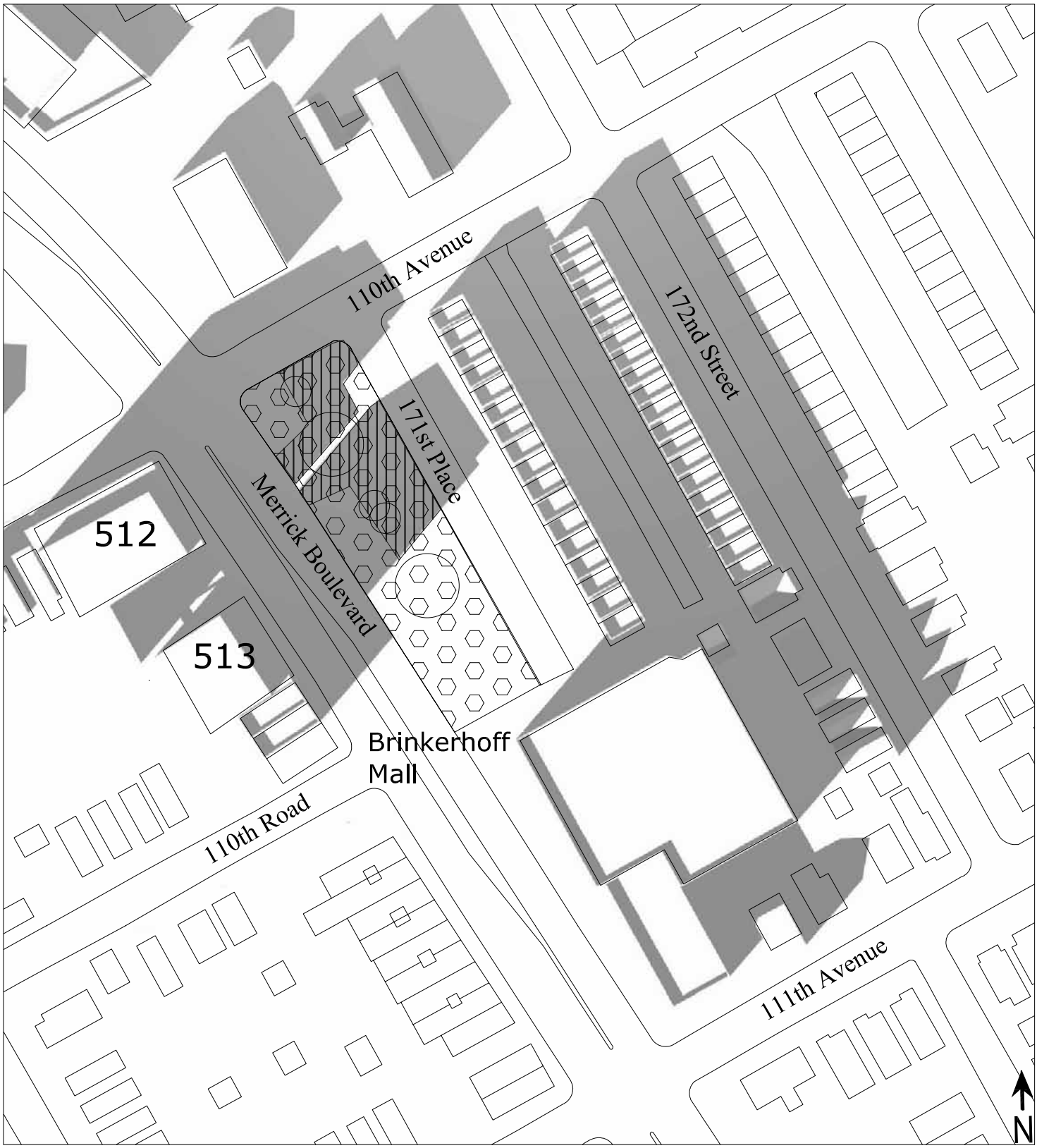
Note: Numbers represent projected and potential development sites.

0 50 100 150 FEET

Open Space
Shadow
Incremental Shadow on Open Space
Tree
Bushes and Low Shrubs

JAMAICA PLAN

Shadow Diagram
Brinkerhoff Mall
June 21 - 7:01 PM DST
Figure 6-32

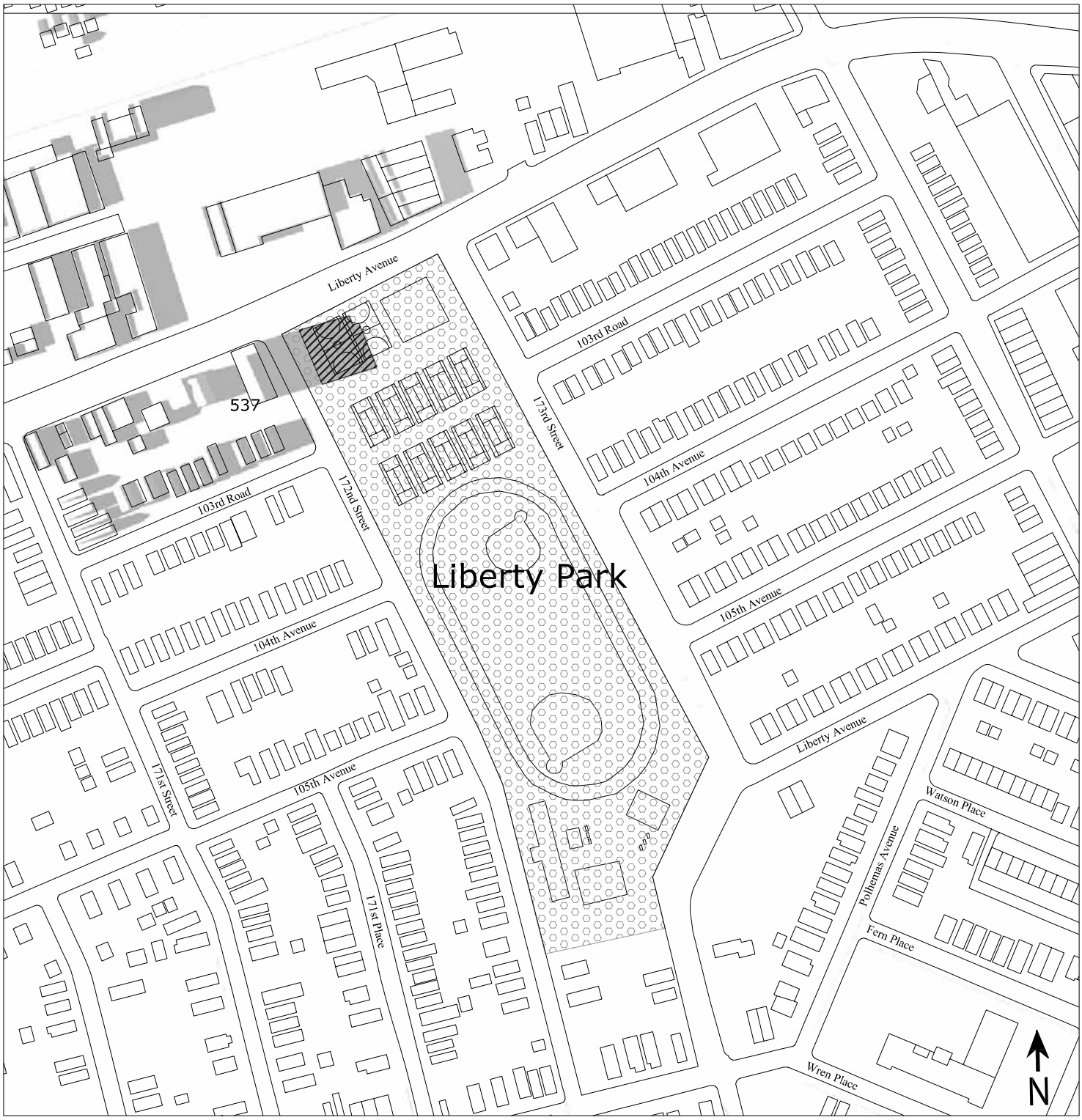


Note: Numbers represent projected and potential development sites.

0 50 100 150 FEET

Open Space
Shadow
Incremental Shadow on Open Space
Tree
Bushes and Low Shrubs

Shadow Diagram
Brinkerhoff Mall
December 21 - 2:53 PM EST
Figure 6-33

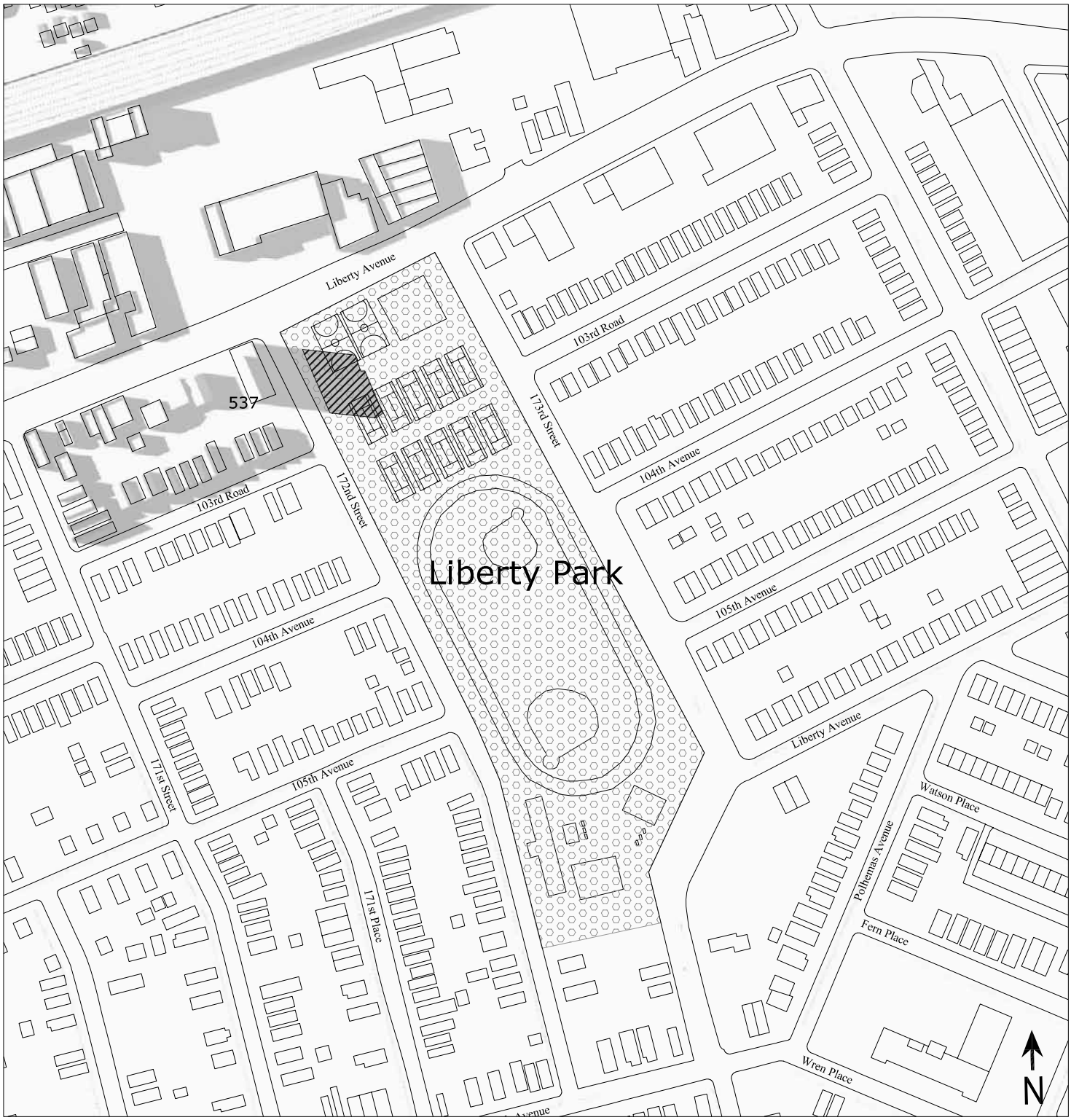


Note: Numbers represent projected and potential development sites.

0 100 200 300 FEET

Open Space
Shadow
Incremental Shadow on Open Space

Shadow Diagram
Liberty Park
March 21 - 4:29 PM EST
Figure 6-34

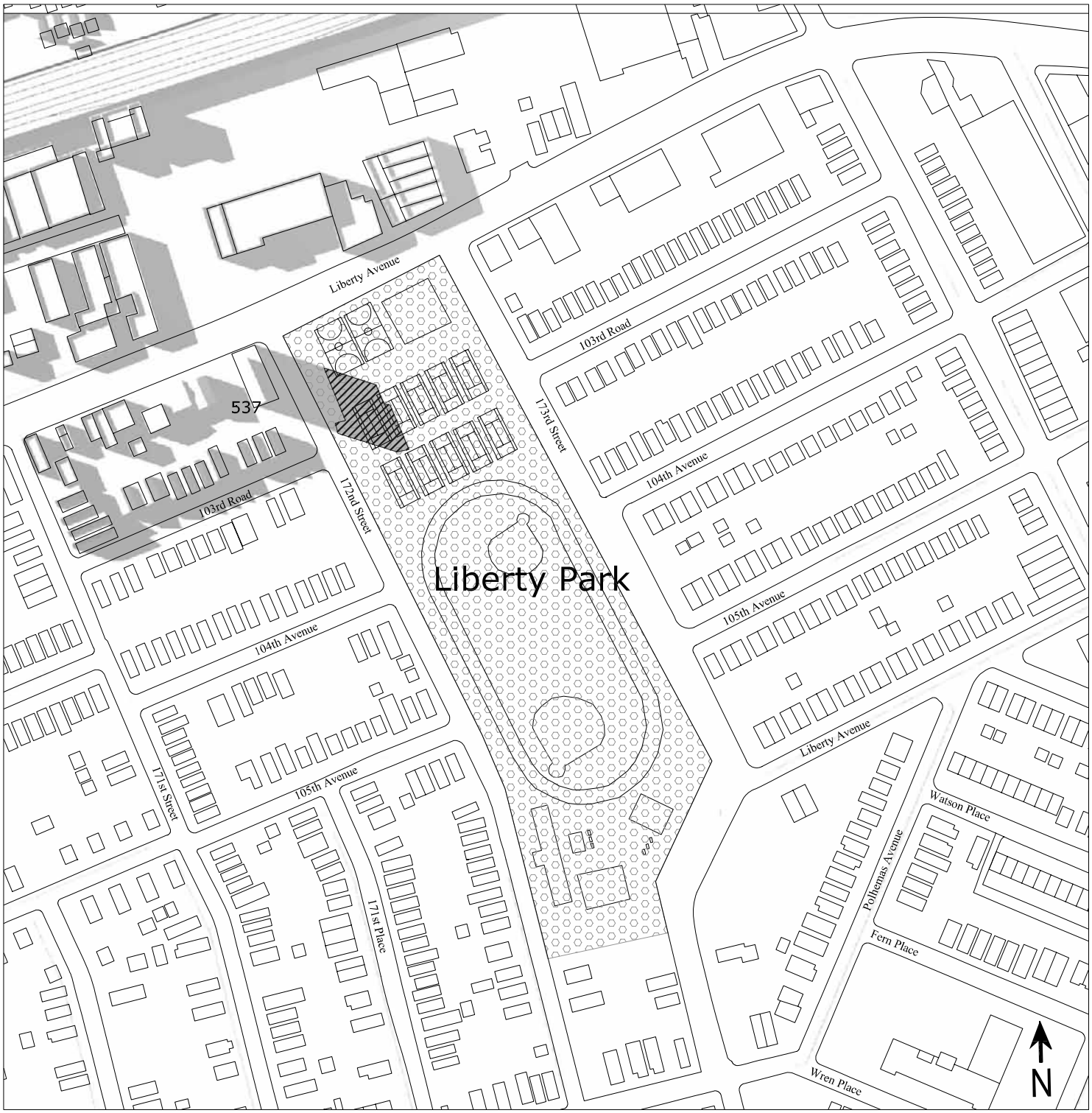


Note: Numbers represent projected and potential development sites.

0 100 200 300 FEET

Open Space
Shadow
Incremental Shadow on Open Space

Shadow Diagram
Liberty Park
May 6 - 6:18 PM DST
Figure 6-35



Note: Numbers represent projected and potential development sites.

0 100 200 300 FEET

Open Space
Shadow
Incremental Shadow on Open Space

Shadow Diagram
Liberty Park
June 21 - 7:01 PM DST
Figure 6-36

Note: Numbers represent projected and potential development sites.

0 100 200 300 FEET

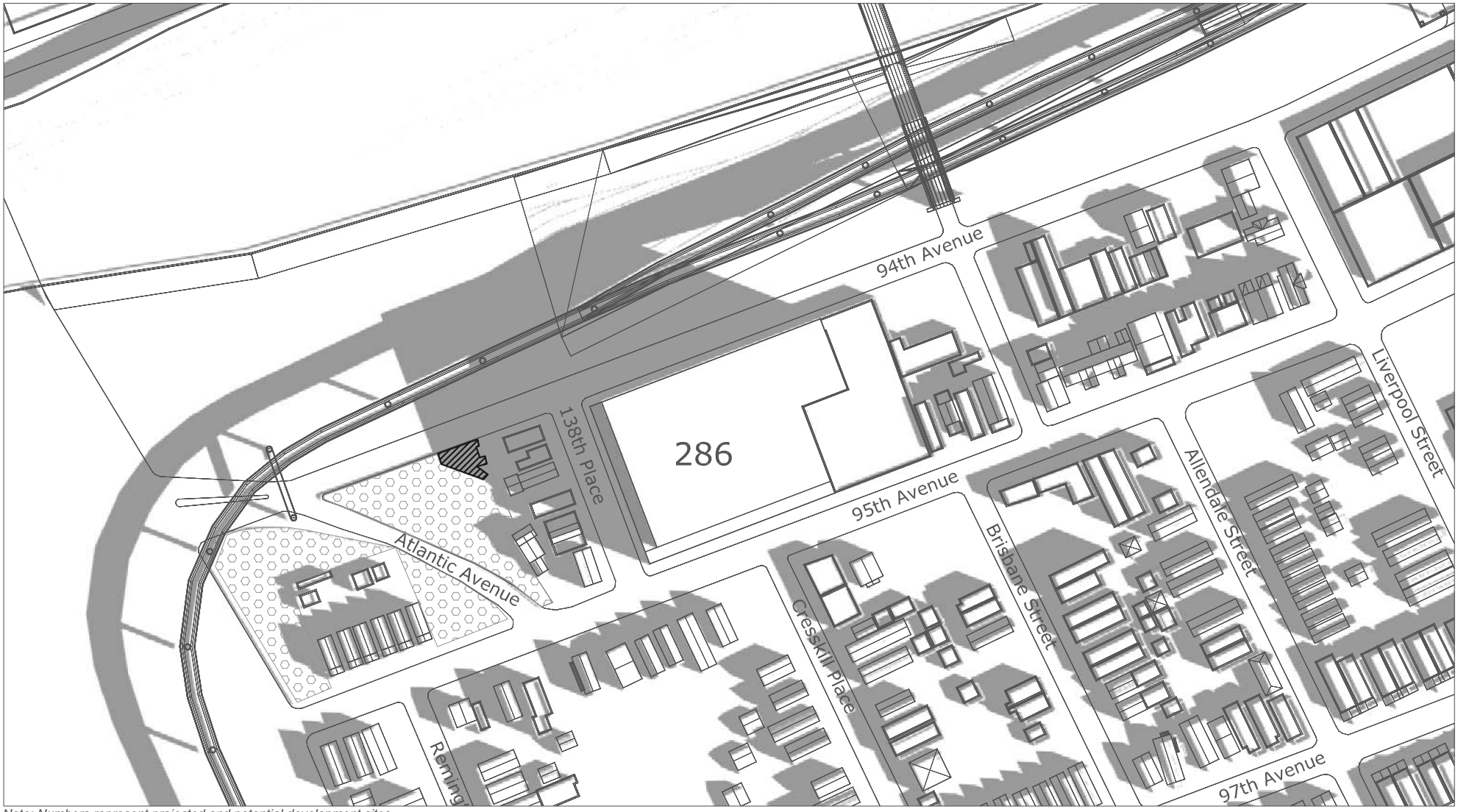
Open Space
Shadow
Incremental Shadow on Open Space

Shadow Diagram
Liberty Park
December 21 - 2:53 PM EST
Figure 6-37

Note: Numbers represent projected and potential development sites.

Open Space
Shadow
Incremental Shadow on Open Space

Shadow Diagram
Atlantic Avenue Extension
March 21 - 7:36 AM EST
Figure 6-38

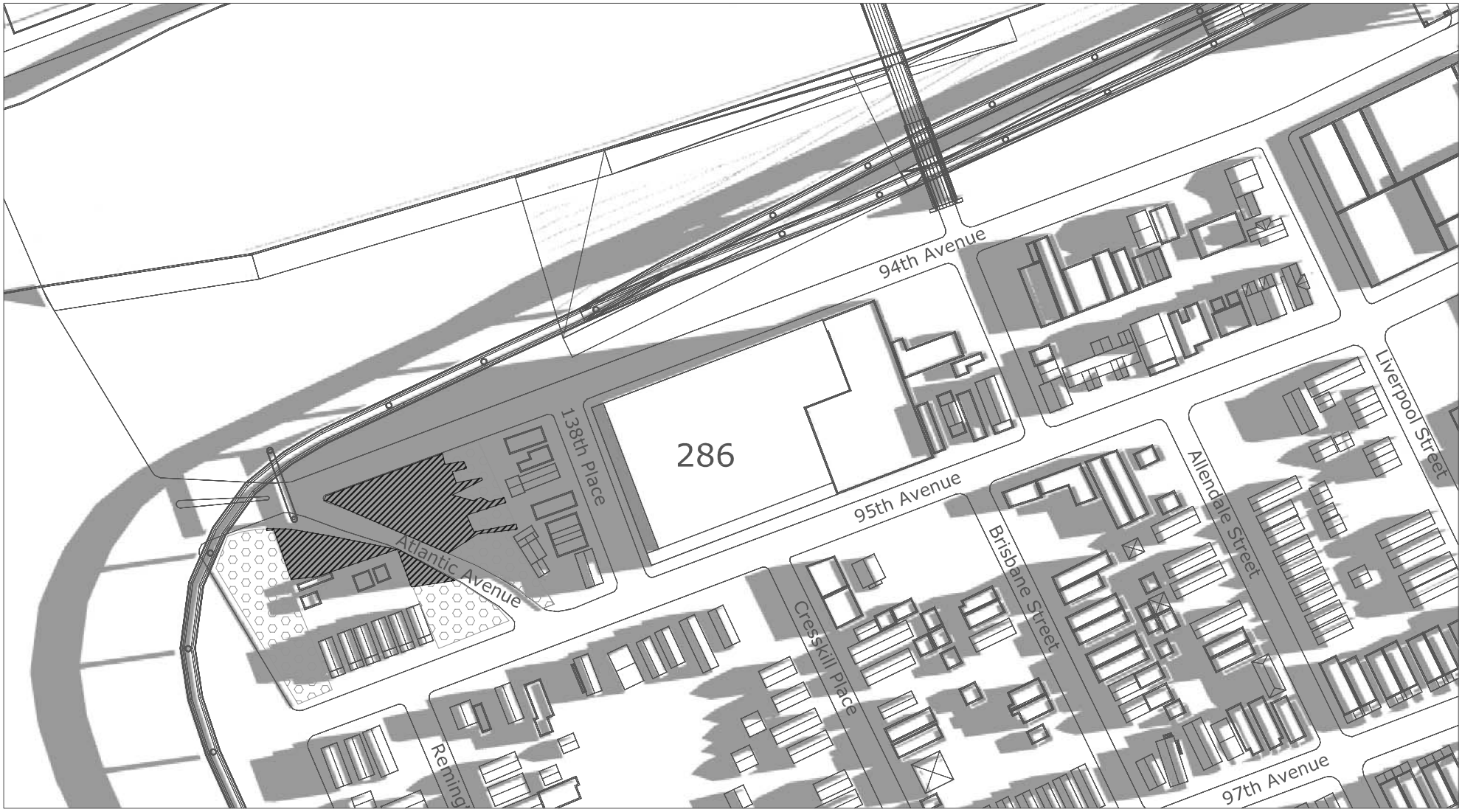


Note: Numbers represent projected and potential development sites.

Open Space
Shadow
Incremental Shadow on Open Space

Shadow Diagram
Atlantic Avenue Extension
March 21 - 8:15 AM EST
Figure 6-39

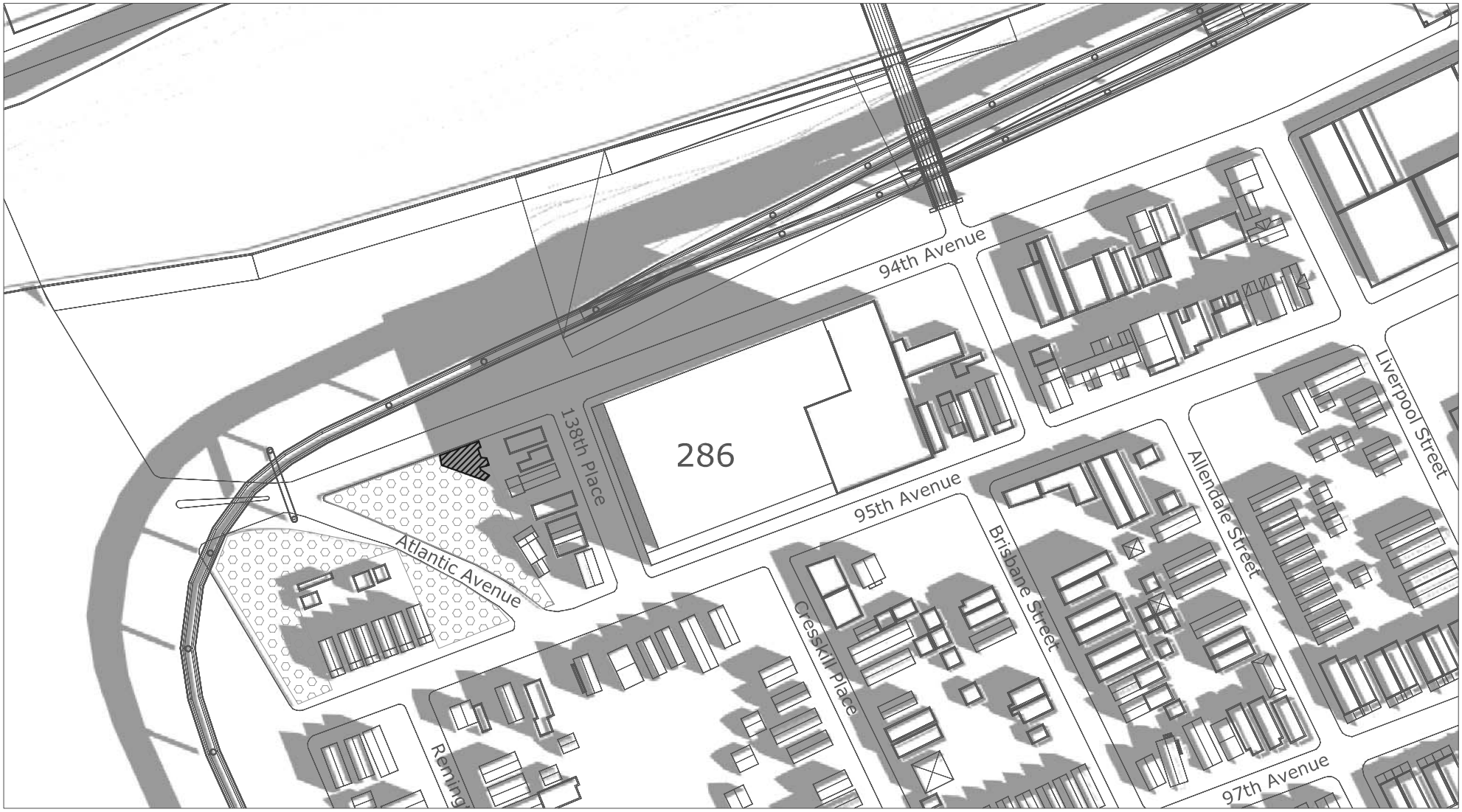
JAMAICA PLAN



Note: Numbers represent projected and potential development sites.

Open Space
Shadow
Incremental Shadow on Open Space

Shadow Diagram
Atlantic Avenue Extension
May 6 - 7:27 AM DST
Figure 6-40



Note: Numbers represent projected and potential development sites.

Open Space
Shadow
Incremental Shadow on Open Space

Shadow Diagram
Atlantic Avenue Extension
May 6 - 8:15 AM DST
Figure 6-41

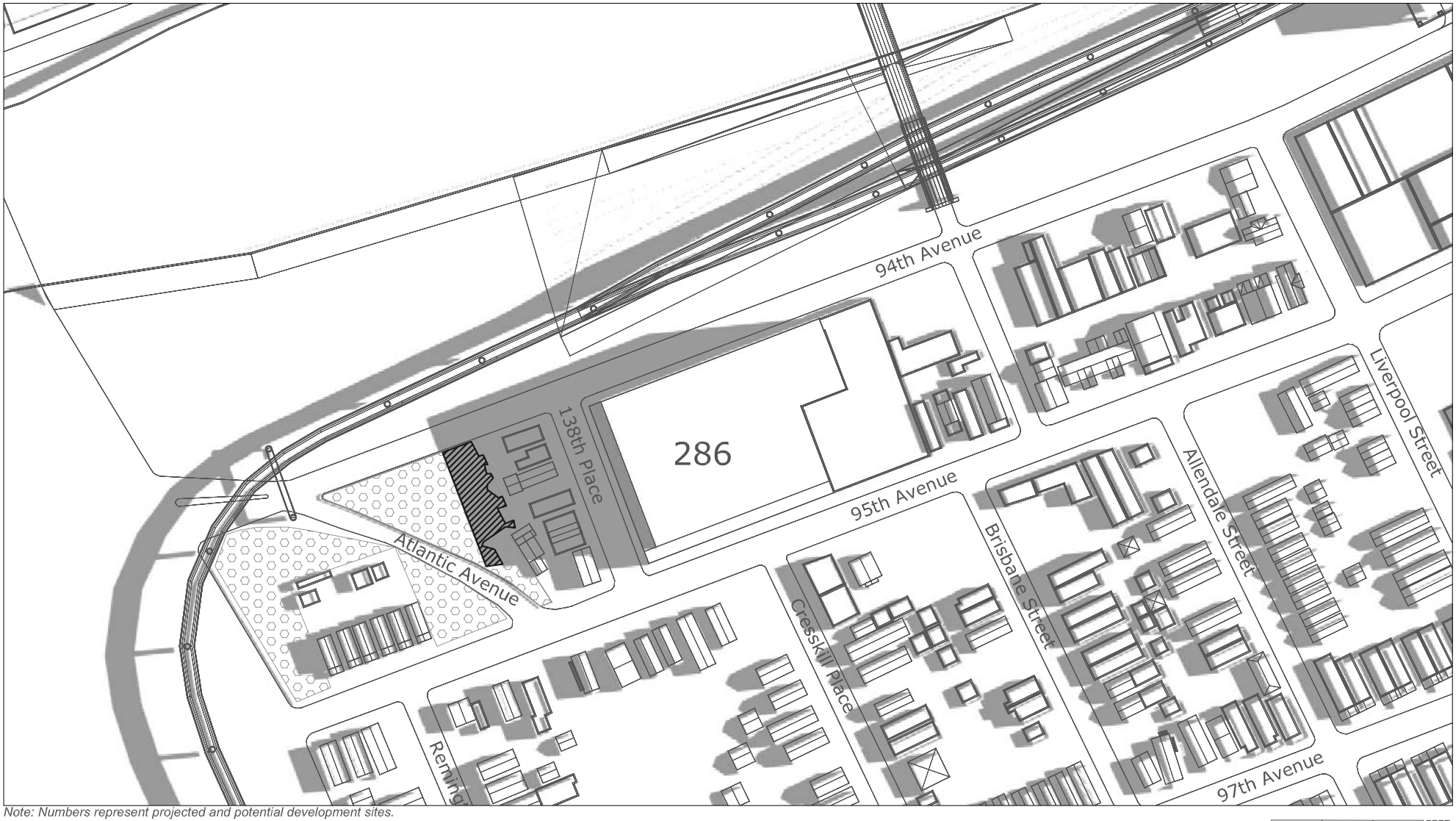
JAMAICA PLAN

Note: Numbers represent projected and potential development sites.

Open Space
Shadow
Incremental Shadow on Open Space

Shadow Diagram
Atlantic Avenue Extension
June 21 - 6:57 AM DST
Figure 6-42

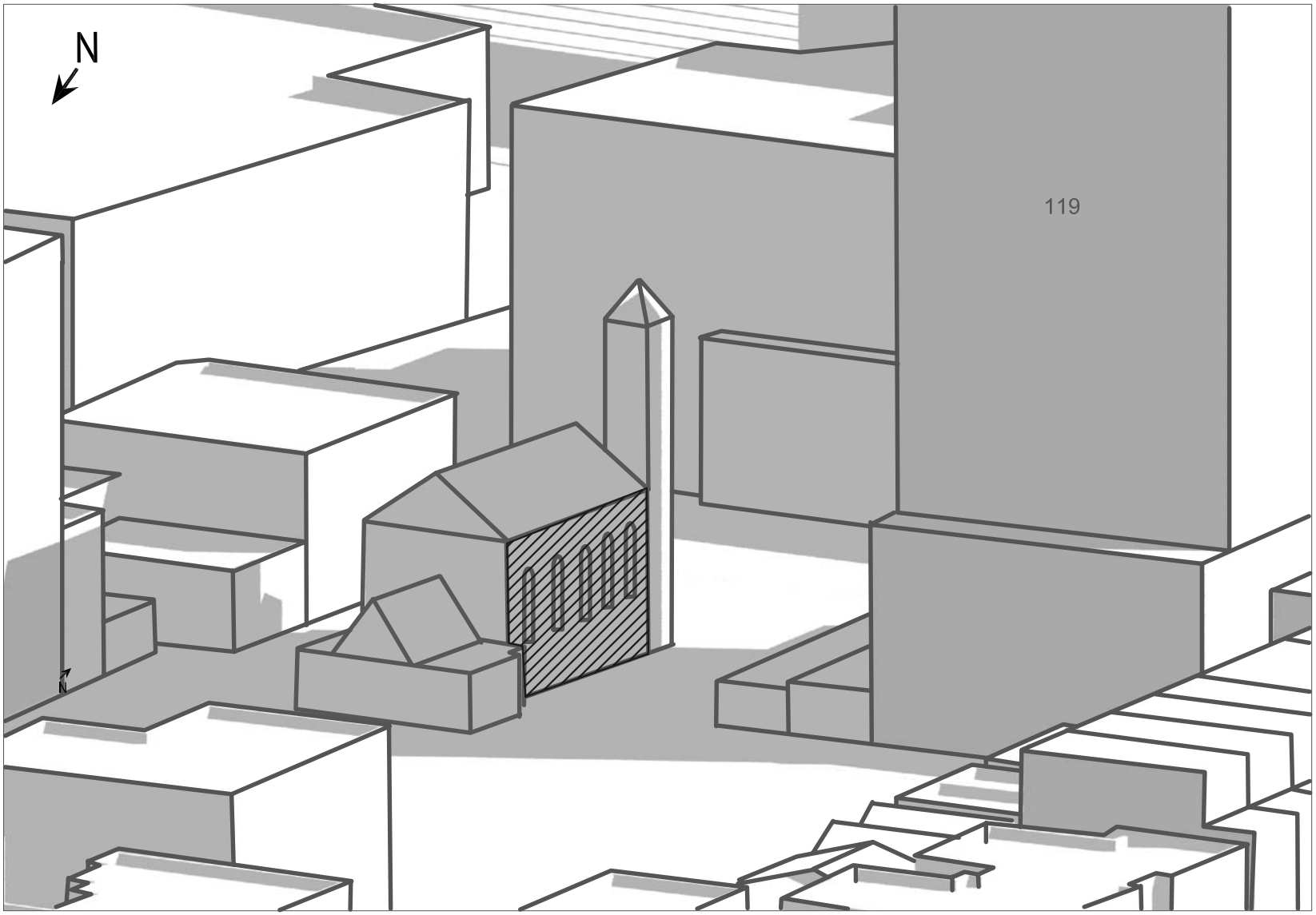
JAMAICA PLAN



Note: Numbers represent projected and potential development sites.

Open Space
Shadow
Incremental Shadow on Open Space

Shadow Diagram
Atlantic Avenue Extension
June 21 - 8:30 AM DST
Figure 6-43



Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

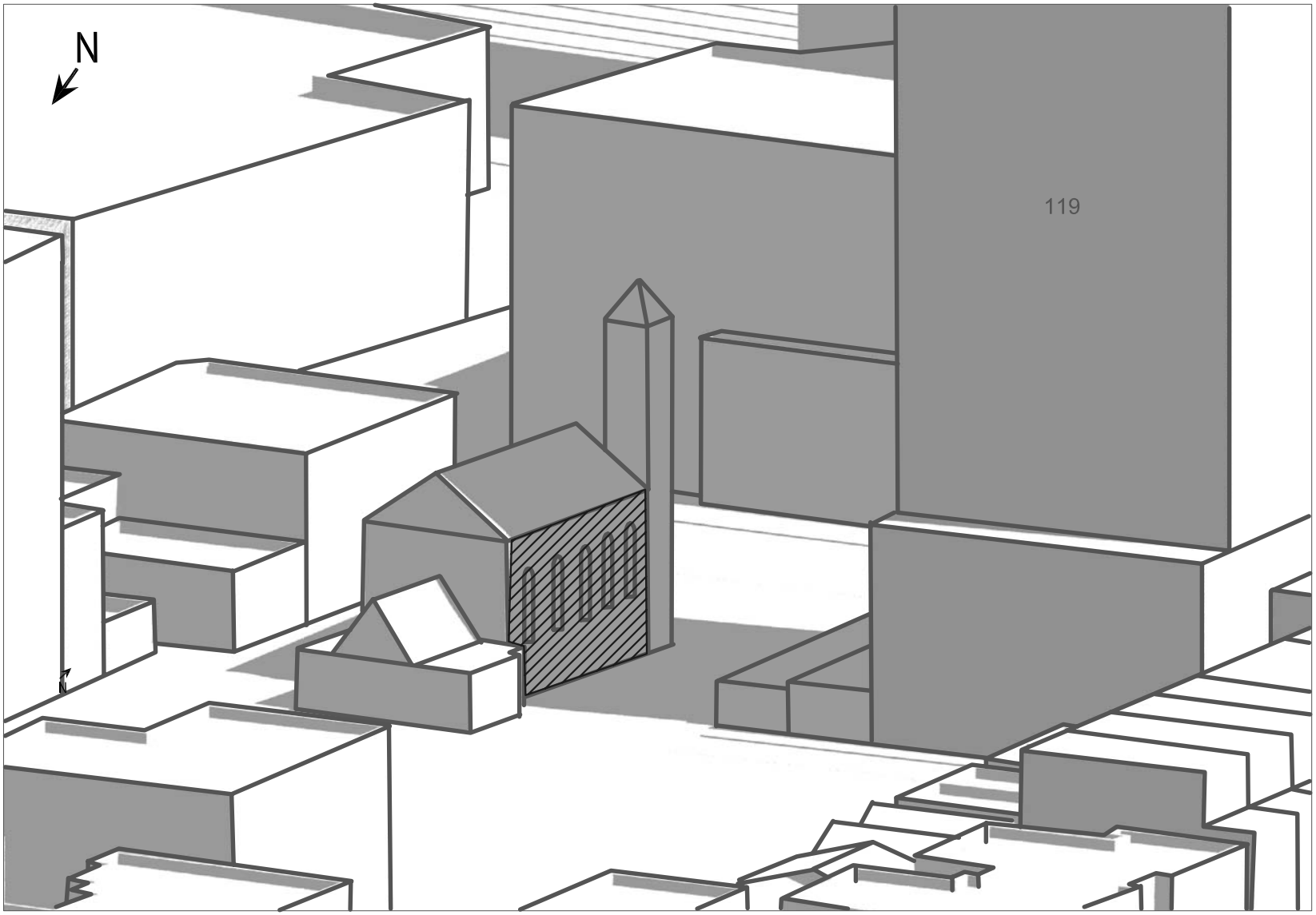
Shadow Diagram
Grace Church
March 21 - 2:15 PM EST
Figure 6-44

Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

Shadow Diagram
Grace Church
March 21 - 4:15 PM EST
Figure 6-45

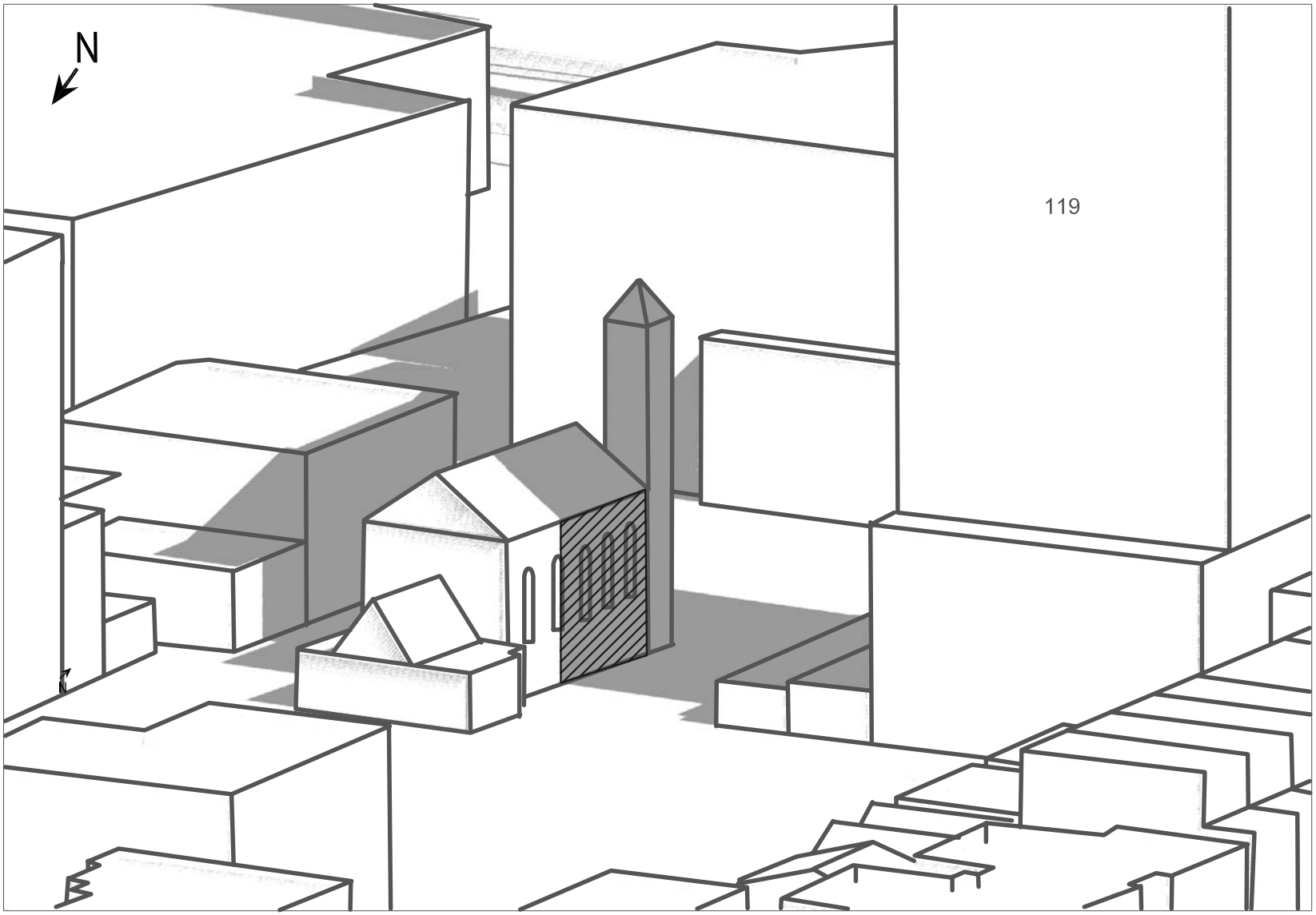


Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

Shadow Diagram
Grace Church
May 6 - 3:15 PM DST
Figure 6-46

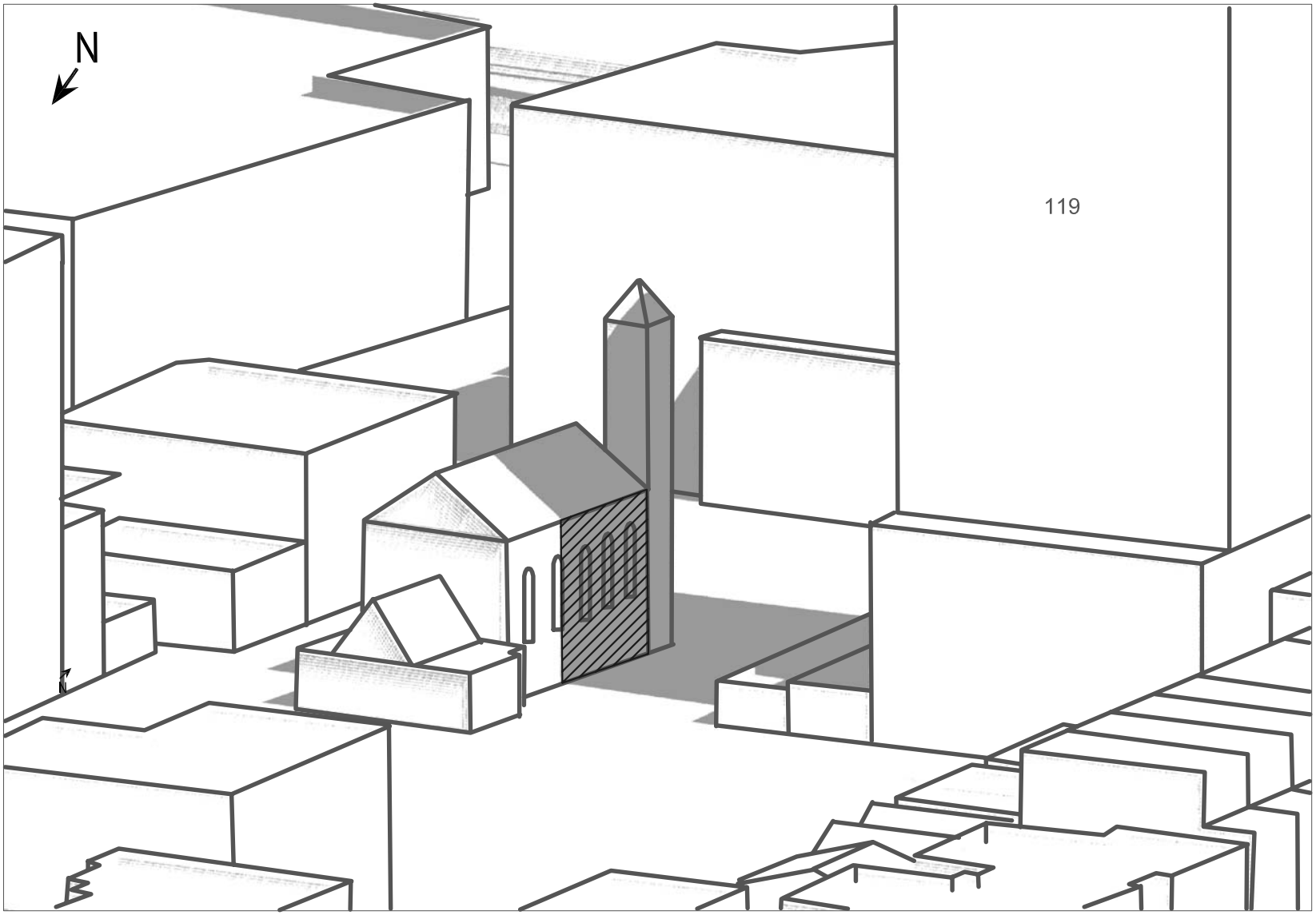


Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

Shadow Diagram
Grace Church
May 6 - 4:00 PM DST
Figure 6-47

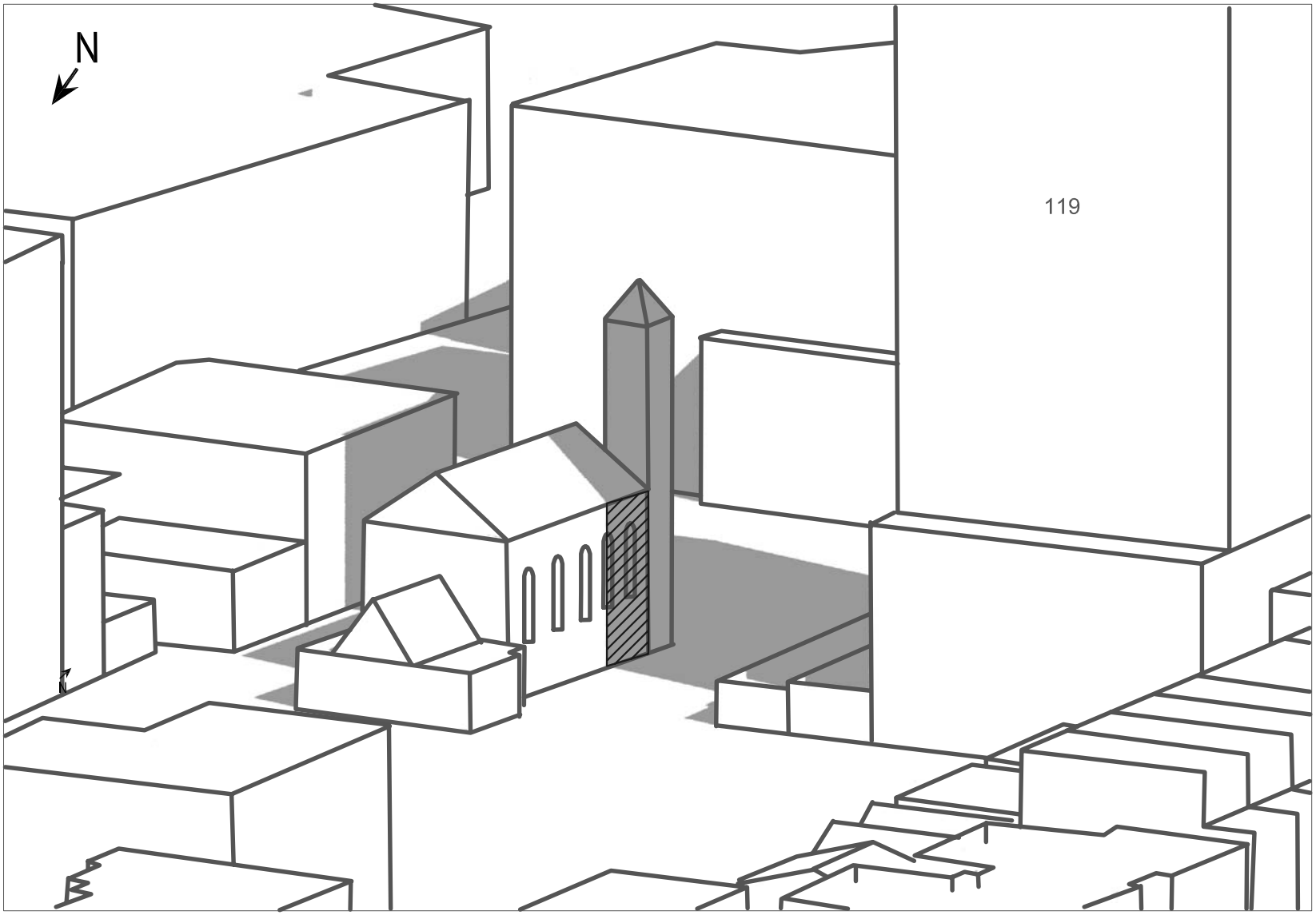


Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

Shadow Diagram
Grace Church
June 21 - 3:30 PM DST
Figure 6-48

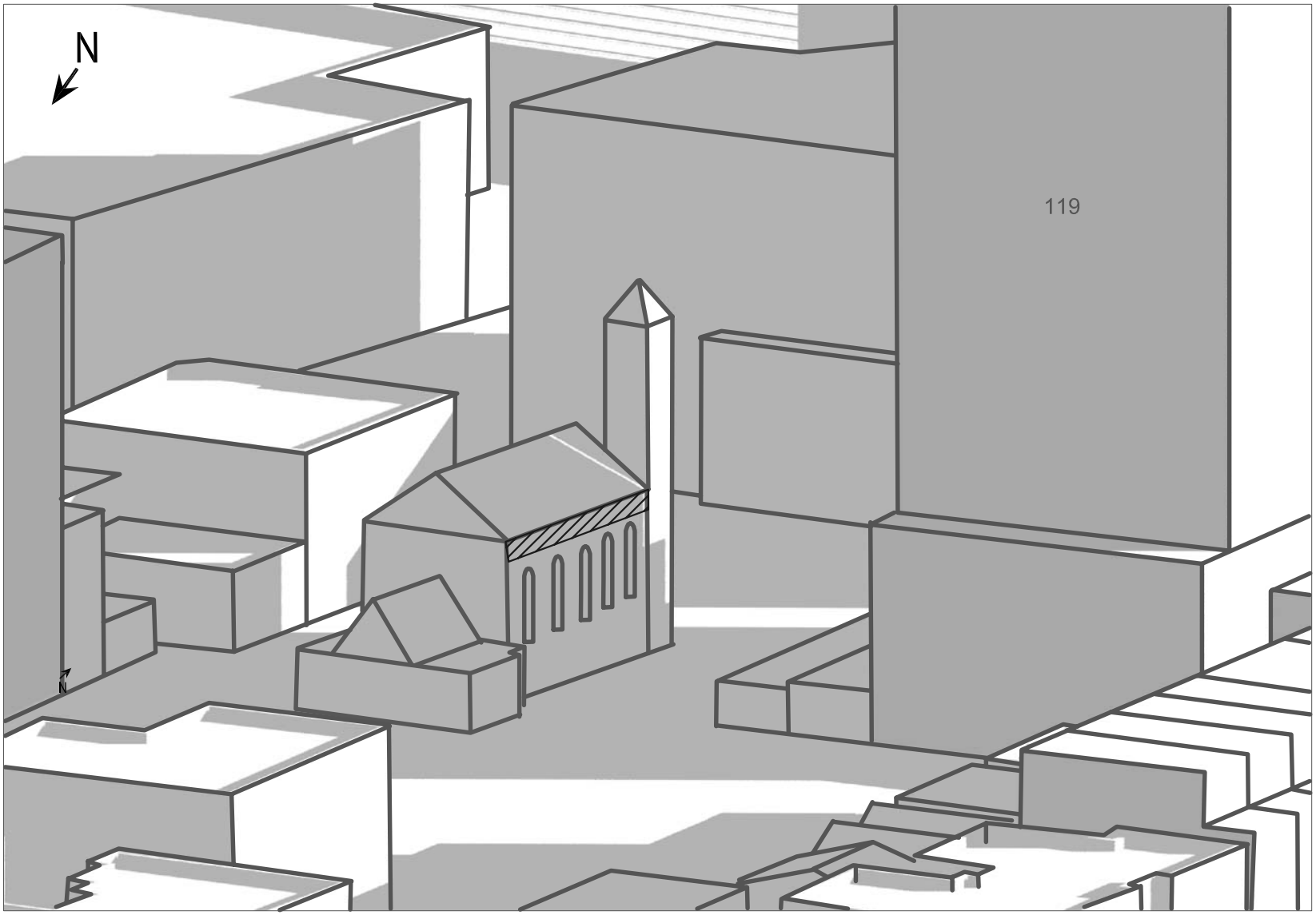


Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

Shadow Diagram
Grace Church
June 21 - 4:30 PM DST
Figure 6-49

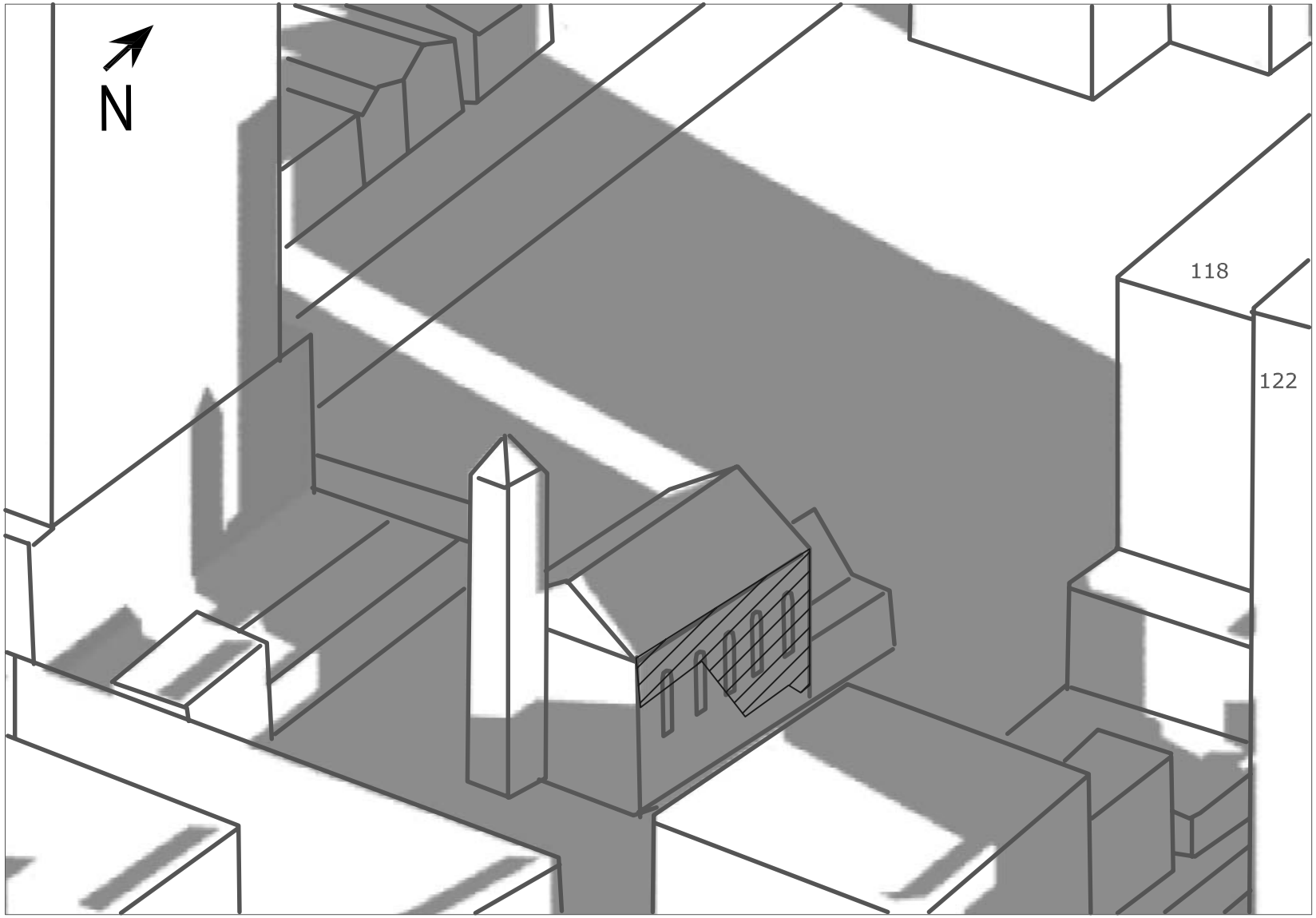


Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

Shadow Diagram
Grace Church
December 21 - 2:53 PM EST
Figure 6-50

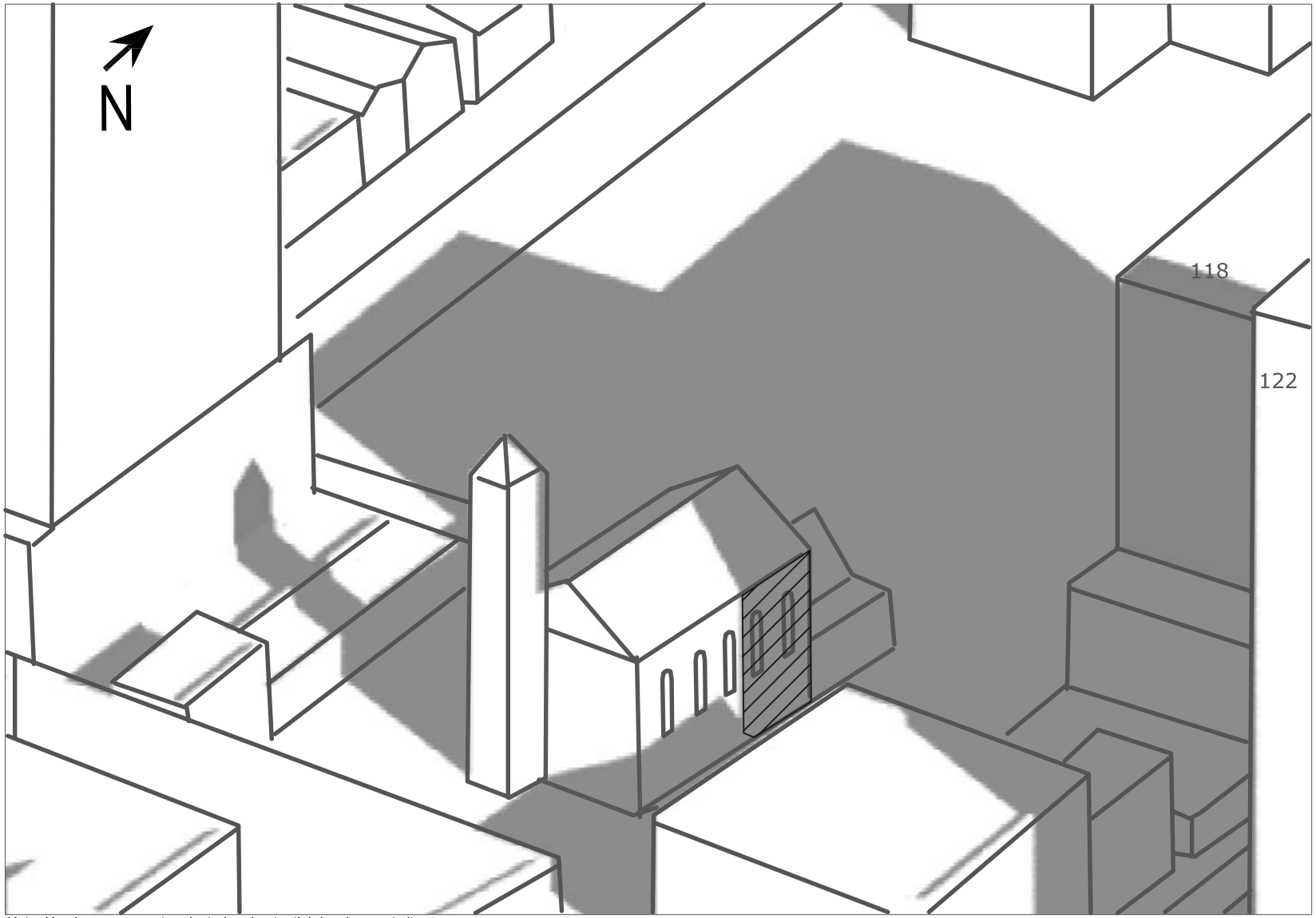


Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

Shadow Diagram
Grace Church
May 6 - 7:27 AM DST
Figure 6-51

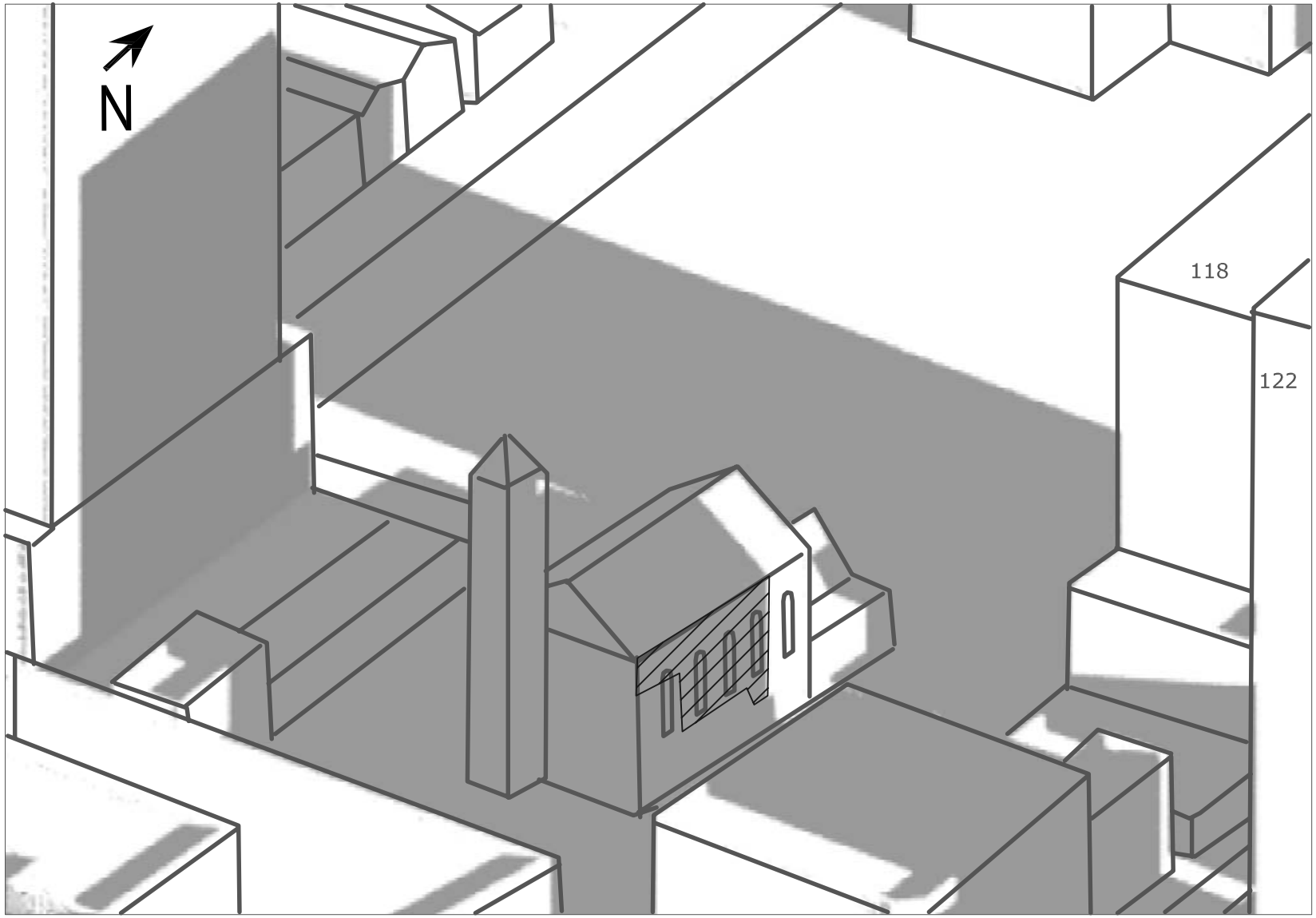


Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

Shadow Diagram
Grace Church
May 6 - 8:30 AM DST
Figure 6-52

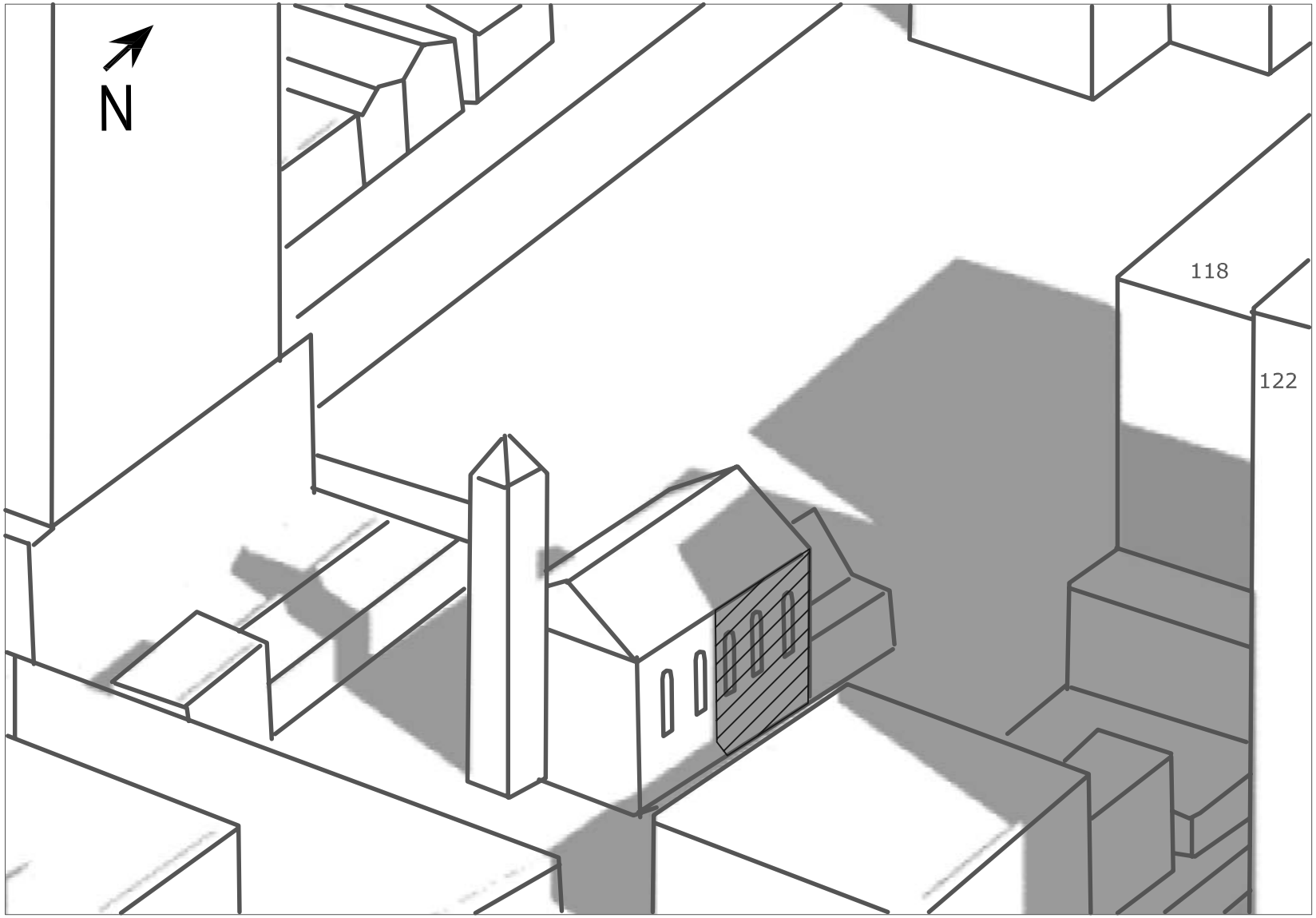


Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

Shadow Diagram
Grace Church
June 21 - 6:57 AM DST
Figure 6-53



Note: Numbers represent projected and potential development sites.

Grace Church
Shadow
Incremental Shadow on Grace Church

0 50 100 150 FEET

Shadow Diagram
Grace Church
June 21 - 9:00 AM DST
Figure 6-54