

A. INTRODUCTION

The proposed Brooklyn Bridge Park would develop new buildings in three areas: at Pier 6, Pier 1, and the John Street Site east of the Manhattan Bridge. These buildings would range in height from approximately 45 feet to up to approximately 315 feet, and would cast new shadows on nearby public open spaces—both existing open spaces and the proposed park itself—and on historic resources. This chapter examines the incremental shadows from these buildings following the guidance of the 2001 *New York City Environmental Quality Review (CEQR) Technical Manual*.

As presented in this chapter, shadows cast by the proposed buildings are not expected to have significant adverse impacts on any open spaces or historic resources in the study area. The largest increments are anticipated in the winter. On the December analysis day, the shadow from the building on the John Street Site would cover much of the waterfront open space to its immediate north, covering more of an open space resource than any other project shadow would. The landscape design for this portion of the park would take these sunlight and shadow conditions into consideration. Since this open space is being created as part of the proposed Brooklyn Bridge Park project, which would also include construction of the new building on the John Street Site, the shadows on this open space are not considered a significant adverse impact.

B. METHODOLOGY

Following the guidelines of the *CEQR Technical Manual*, the analysis focuses on uses and users of the open space, landscaping and vegetation, significant natural features, and historic resources with features or details that are sunlight-dependent and make such resources significant. The analyses are performed for four representative days of the year: March 21, which is the equivalent of September 21 (the equinoxes); May 6, the equivalent of August 6 (midpoints between the summer solstice and the equinoxes); 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.

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 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.

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

C. SCREENING

A shadow screening analysis was performed to identify open spaces or sun-sensitive historic resources that could be affected by shadows from structures that would be developed as part of Brooklyn Bridge Park.

To identify resources of concern, the potential maximum length of the shadows is first considered. For example, on the December 21 analysis day, a building has a maximum shadow length factor equal to 4.3 times its height at the beginning and end of the analysis period when shadows are cast to the northwest and northeast, respectively. Toward midday, as the sun rises in the sky, the shadow length factor is reduced to 2.07 times the height of the building. Since the tallest proposed building (upland at Pier 6) would be approximately 315 feet in height (including mechanical space on the roof), it would have a maximum shadow length of approximately 1,355 feet at the beginning and end of the December 21 analysis period, and of approximately 562 feet at noon. 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 east and west. Open spaces in the southern portion of this shadow sweep in June would not be in the December shadow sweep. After the shadow sweep for each of the proposed buildings was determined for each analysis day, open spaces and sun-sensitive historic resources within the shadow sweeps were identified.

Because of the size and layout of the park, and since the proposed buildings are limited to three areas—Pier 6, Pier 1, and the John Street Site just east of the Manhattan Bridge—this analysis focuses on only those three areas. Two buildings are proposed in the upland area of Pier 6. One would be approximately 315 feet tall, and the other would be approximately 95 feet tall. Their proposed location is immediately south of the existing building located at 360 Furman Street, which is a bulky 13-story building. The north building in the upland area of Pier 1 would be about 110 feet tall;¹ the south building would be about 55 feet tall; the restaurant on the pier itself would be up to 45 feet high. The building at the John Street Site east of the Manhattan Bridge would be up to 170 feet tall.

The park would also have lower (approximately 36 feet tall) shade structures provided directly along the waterfront. These structures are not considered in this analysis as they are designed to provide shadow on specific areas of the park where park users might most want or need relief from the sun and glare off the water. Further, the shadows of existing buildings in or adjacent to the park and shadows from low level sheds or minor buildings are not considered to be significant impacts and are therefore not analyzed.

¹ While the proposed height of the building has been reduced to 100 feet, a height of 110 feet has been assumed as a conservative measure.

D. POTENTIALLY AFFECTED RESOURCES

PIER 6 AREA

PUBLIC OPEN SPACES

The Palmetto Playground is located east of the buildings proposed upland at Pier 6. It is on the north side of the ramp from Atlantic Avenue up to the Brooklyn-Queens Expressway. In addition to standard playground amenities, this park also contains a fitness area with exercise equipment and how-to signage, a community garden, and a dog run. Due to the proposed location of the Pier 6 structures, they would cast some late-day shadows on this open space.

PROPOSED PARK

Piers 5 and 6 and the waterfront promenade in between are in the shadow sweep of the proposed buildings in the upland area of Pier 6. Pier 5 is expected to have Astroturf soccer fields and a limited amount of parking. Historic boats would be moored on the north side of Pier 6 and the south side of Pier 5. Pier 6 is expected to have a landscaped area with paths, a water play area, sand volley ball courts, a shade structure, and a walkway around its outer edges. There would be a shade structure on the north side of the west end of Pier 1.

Along Furman Street on the east edge of the park, there are two areas intended for landscaping adjacent to the two proposed buildings. Located north and east of these buildings, this open space would receive their shadows from the midday through the afternoon.

POTENTIALLY AFFECTED SUN-SENSITIVE HISTORIC RESOURCES

Shadows from the proposed buildings at Pier 6 would fall on the southwest corner of the Brooklyn Heights Historic District late in the day in some seasons. Historic resources in this corner of the district that may have sun-sensitive features include the Willow Place Chapel and Grace Church.

PIER 1 AREA

EXISTING OPEN SPACES

Fulton Ferry Pier, a pier at the foot of Old Fulton Street along the East River, features a nautical and historical theme. The railings surrounding the pier were designed to resemble the cable webbing of the Brooklyn Bridge, and the benches mimic nautical cleats. A small building that formerly housed a marine fireboat station and later a museum devoted to the Fulton Ferry is also contained in this waterfront open space. Only the longest shadows of the north building at Pier 1 would reach this open space.

Shadows of the proposed buildings shadows would not reach Squibb Park, Hillside Park, or the Chapin Playground because of topography and intervening structures.

PROPOSED PARK

In the Pier 1 area the proposed park would contain marsh, a hill with a lawn, landscaped areas with paths, a waterfront promenade, and a rooftop open space on the south building. To accommodate visitors arriving by automobile to the restaurant and the park, there would be an

Brooklyn Bridge Park FEIS

entry plaza/vehicle drop-off area along the north side of this pier. This area would receive shadows from the two proposed buildings on the upland area in the morning to the midday because it is west of the buildings.

POTENTIALLY AFFECTED SUN-SENSITIVE HISTORIC RESOURCES

Shadows from the proposed Pier 1 structures would reach the Fulton Ferry Historic District to the north and northeast in the afternoon. Shadows from the project would not fall on the Brooklyn Heights Historic District because the district is at a higher elevation.

JOHN STREET SITE

EXISTING OPEN SPACES

Main Street Playground is a new playground and open space at the north end of Main Street and just west of the John Street Site beyond the Manhattan Bridge. The children's play area includes play equipment with a nautical theme and a sandbox. The open area includes a beach area, grassy fields, and an esplanade with seating and viewing areas. Shadows from the proposed building would reach this open space in the early morning on the March to September analysis days.

PROPOSED PARK

The waterfront park in front of the John Street site would have a landscaped hill and paths. There would be a waterfront walkway along the west side of the proposed building and the open space. At the outboard end of the walkway there would be a foot bridge on concrete piles that would travel beneath the Manhattan Bridge to the existing Main Street Playground. Shadows would fall on a portion of this open space all day since the proposed building is immediately adjacent to its south side.

POTENTIALLY AFFECTED SUN-SENSITIVE HISTORIC RESOURCES

Because it is located in the D.U.M.B.O. (Down Under the Manhattan Bridge Overpass) Historic District, shadows from the proposed Con Edison site building would fall on the D.U.M.B.O. Historic District. Shadows from the proposed buildings would also fall on the Fulton Ferry Historic District. Shadows would fall on the small portion of the D.U.M.B.O Historic District immediately adjacent to the proposed building at all times. They would only reach the Fulton Ferry Historic District in the early morning on the March to September analysis days.

E. SHADOWS BY SEASON

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 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 creates shadows earlier in the morning and later in the evening than in other seasons.

This section considers the overall incremental shadows at specific times on each analysis day. It concludes that there are ample areas of the park in full sunlight at all times of the analysis period and in all seasons of the year. As shown in the following section, “D. Shadow Effects by Resource,” no significant adverse impacts are anticipated on any open space or historic resource.

PIER 6 AREA

MARCH 21/SEPTEMBER 21—ANALYSIS PERIOD: 7:36 AM TO 4:29 PM EST

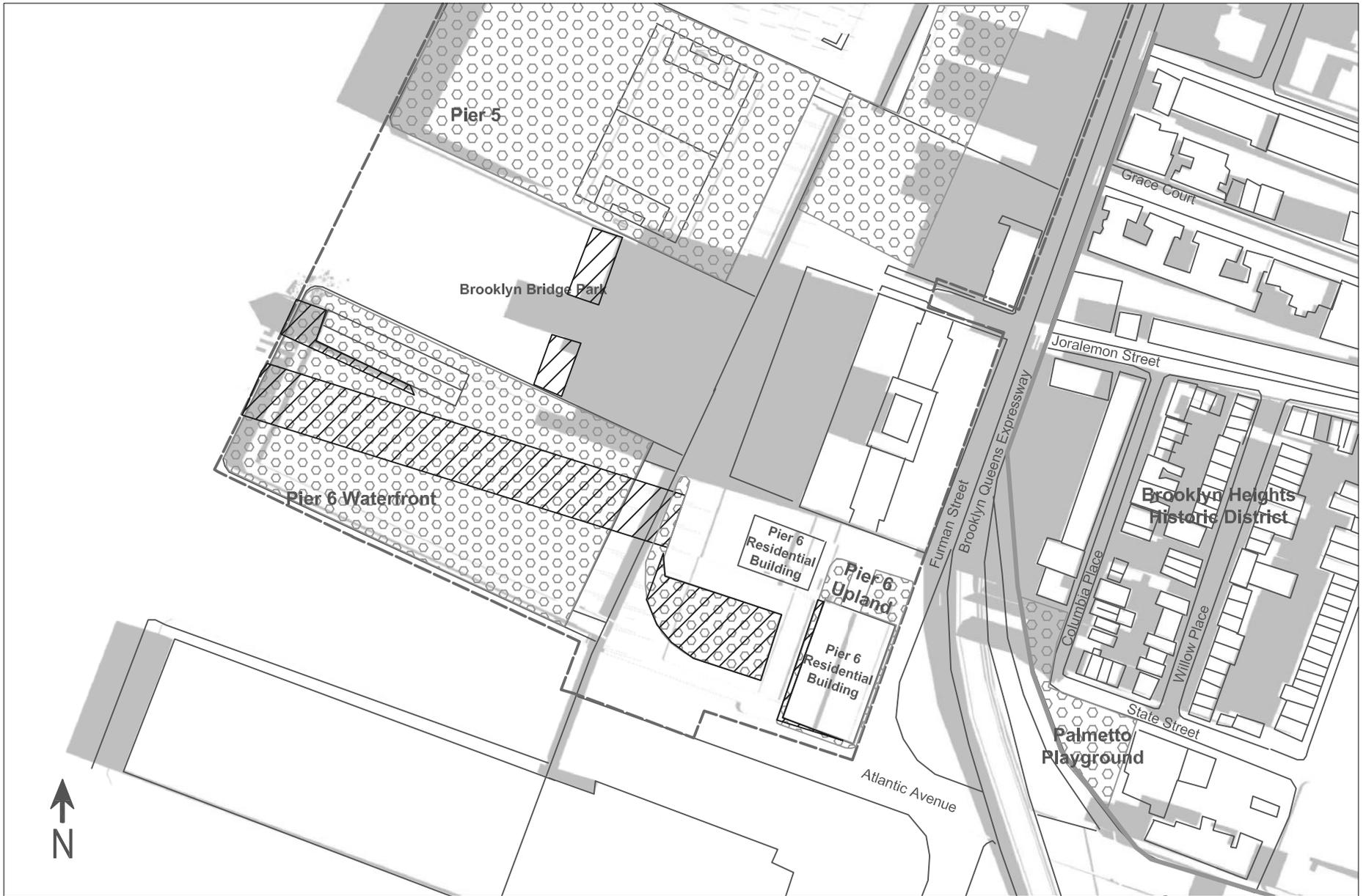
Near the beginning of the analysis period, at 7:45 AM, the taller of the two proposed buildings would cast a sliver of shadow across Pier 6 (see Figure 6-1). The shorter building would cast shadow on the upland park area to its west. The addition to 360 Furman Street would cast shadows on the water between Piers 6 and 5. By noon the longer shadow would be off the Pier and fall on part of the upland park (see Figure 6-2). At 4:15 PM near the end of the analysis period, both buildings would cast shadow on the open spaces in the park along Furman Street (see Figure 6-3). The addition to 360 Furman Street would cast shadows on the roofs and backyards of buildings along the north side of Joralemon Street west of Columbia Place. The shade structure would cast shadow at the west end of Pier 6 through the day, as intended.

MAY 8/AUGUST 8—ANALYSIS PERIOD: 7:27 AM TO 6:18 PM DST

At 9 AM the taller building would cast a small swath of shadow across about half the length of Pier 6, but by noon the only incremental shadow would be cast by the shorter building on the upland open space (see Figures 6-4 and 6-5). The addition to 360 Furman Street would cast shadows on the water between Piers 6 and 5. Near the end of the analysis period in the afternoon at 5:45 PM, the building shadows would again fall on the Furman Street open spaces in the park. Shadows cast by the taller building would reach into the southwest corner of the Brooklyn Heights Historic District but would only fall on the roofs and backyards of a small number of houses along Columbia Heights (see Figure 6-6). The addition to 360 Furman Street would cast shadows on the sidewalks along the north side of Joralemon Street west of Columbia Place. The shade structure would cast shadow at the west end of Pier 6, as intended.

JUNE 21—ANALYSIS PERIOD: 6:57 AM TO 7:01 PM DST

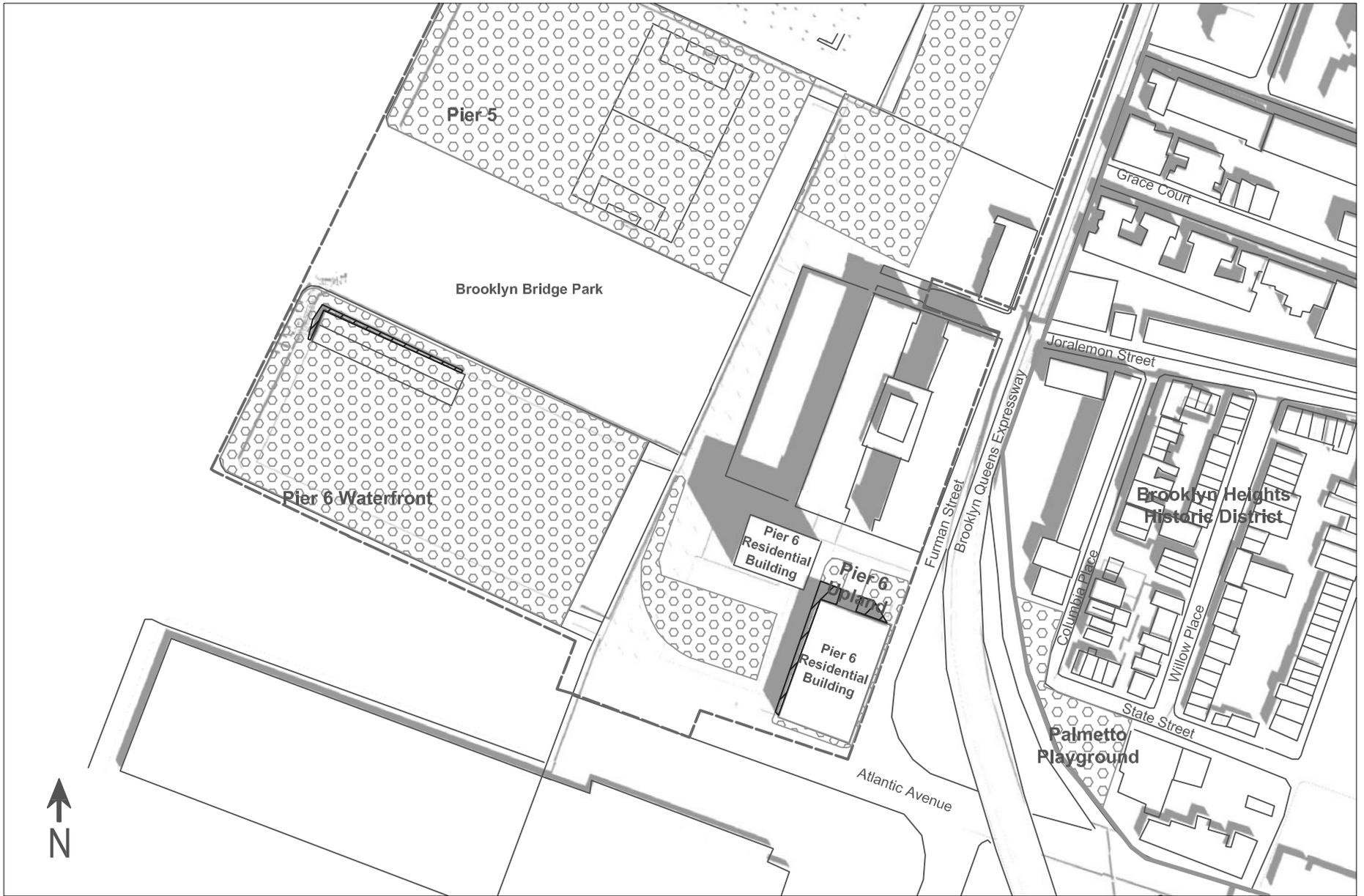
On June 21 at 9 AM, the small swath of shadow from the taller building would fall across less than half the length of Pier 6 (see Figures 6-7 and 6-8). The addition to 360 Furman Street would cast shadows on the waterfront open space from Pier 6 to Pier 5. Near the end of the analysis period, in the afternoon at 6 PM, the building shadows would again fall on the Furman Street open spaces in the park. Shadows cast by the taller building would reach into the Brooklyn Heights Historic District but would fall only on a small portion of Palmetto Playground (see Figure 6-9). By the end of the analysis period, at 7:01 PM, the shadow would cover somewhat more of the playground and reach the facades and roofs of buildings on Columbia Heights and State Street (see Figure 6-10). The addition to 360 Furman Street would cast shadows on the roof of a building on the south side of Joralemon Street during the 6-7:15 PM time period. The shade structure would cast shadow at the west end of Pier 6, as intended.



-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

Brooklyn Bridge Park

Pier 6 Area:Shadow Diagram
 March 21 7:45 AM EST
 Figure 6-1

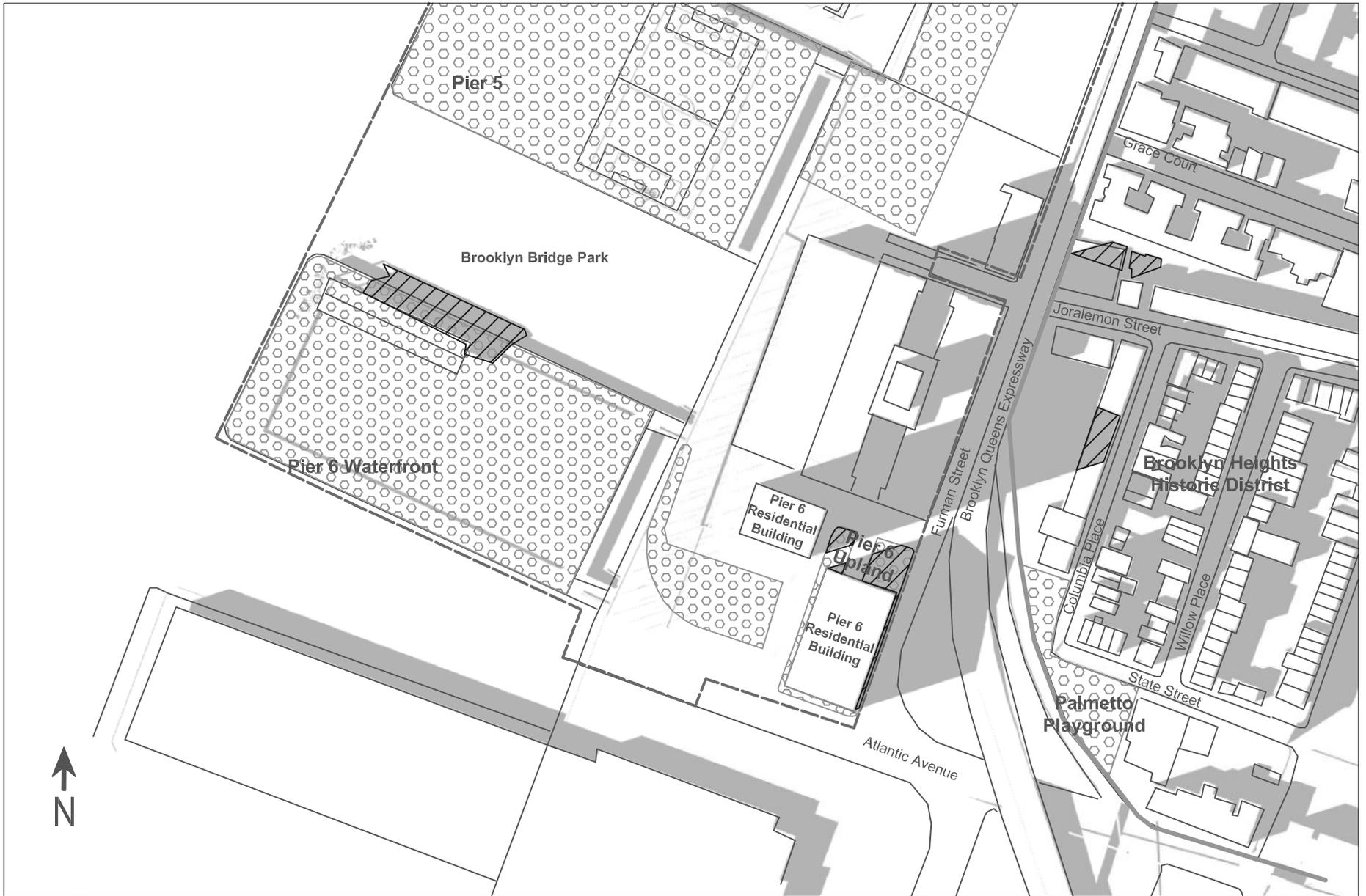


-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

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Pier 6 Area:Shadow Diagram
 March 21 12:00 PM EST
 Figure 6-2

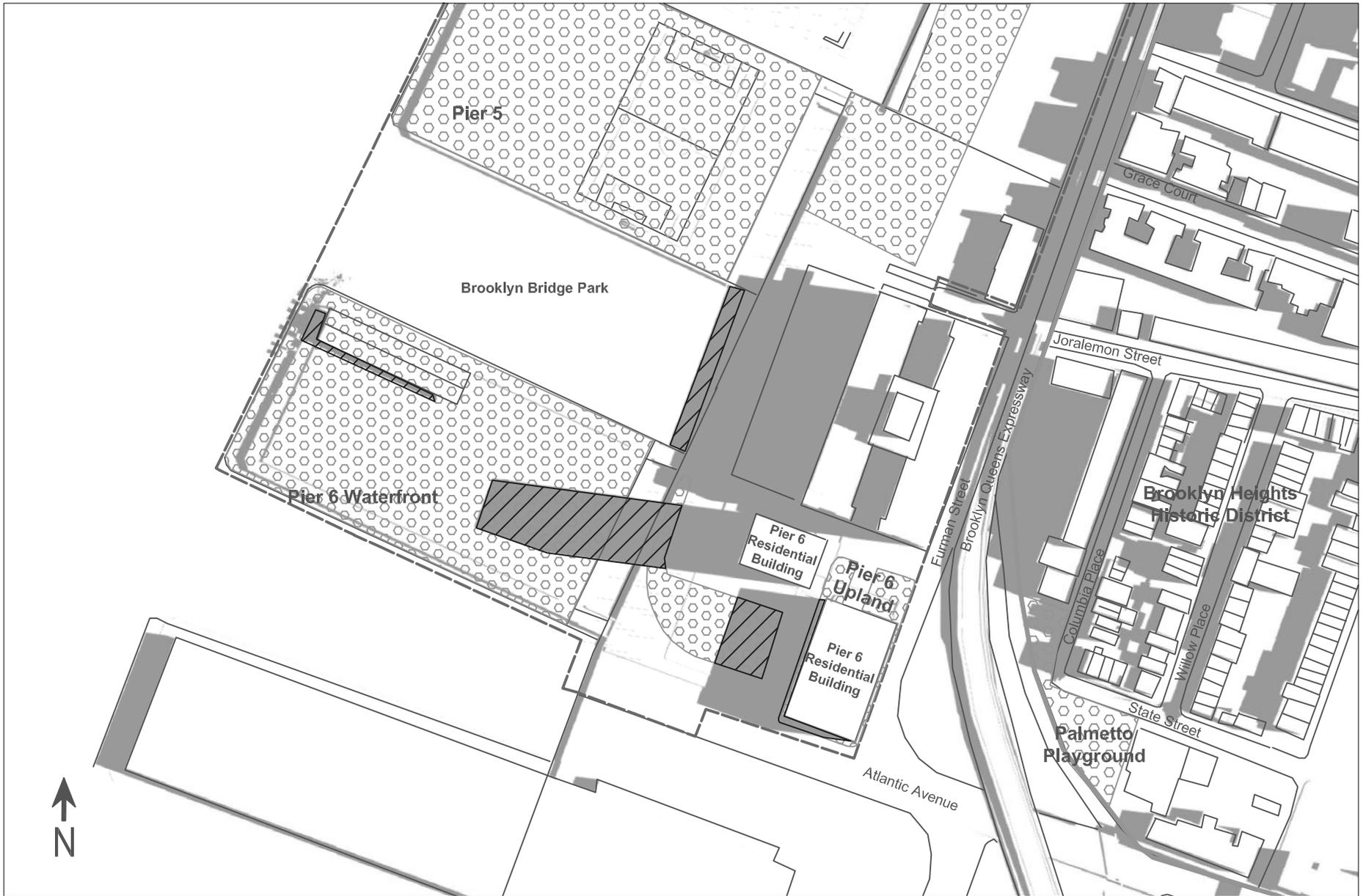
Brooklyn Bridge Park



-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

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Pier 6 Area:Shadow Diagram
 March 21 4:15 PM EST
 Figure 6-3

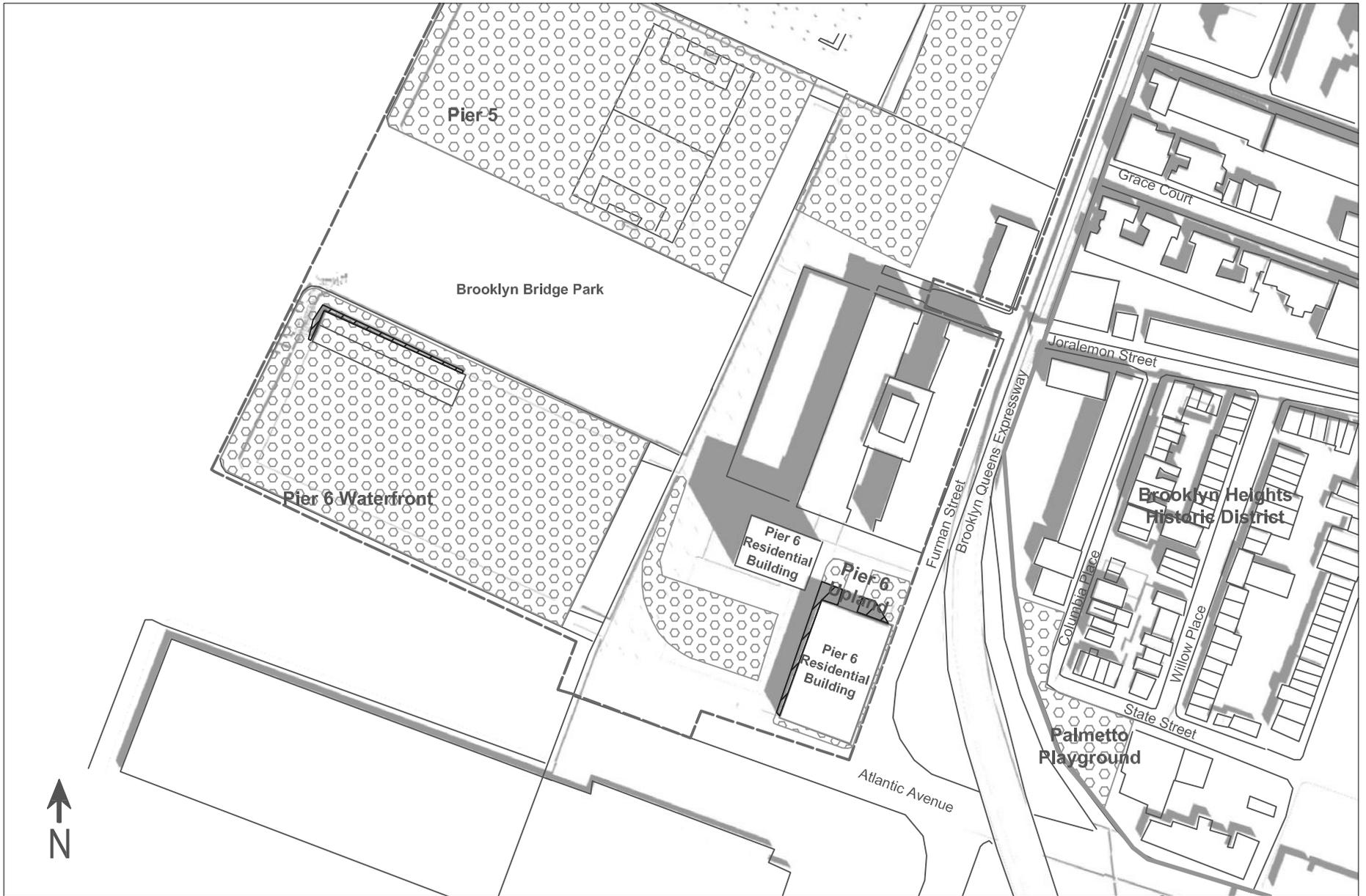


-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

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Pier 6 Area:Shadow Diagram
 May 6 9:00 AM DST
 Figure 6-4

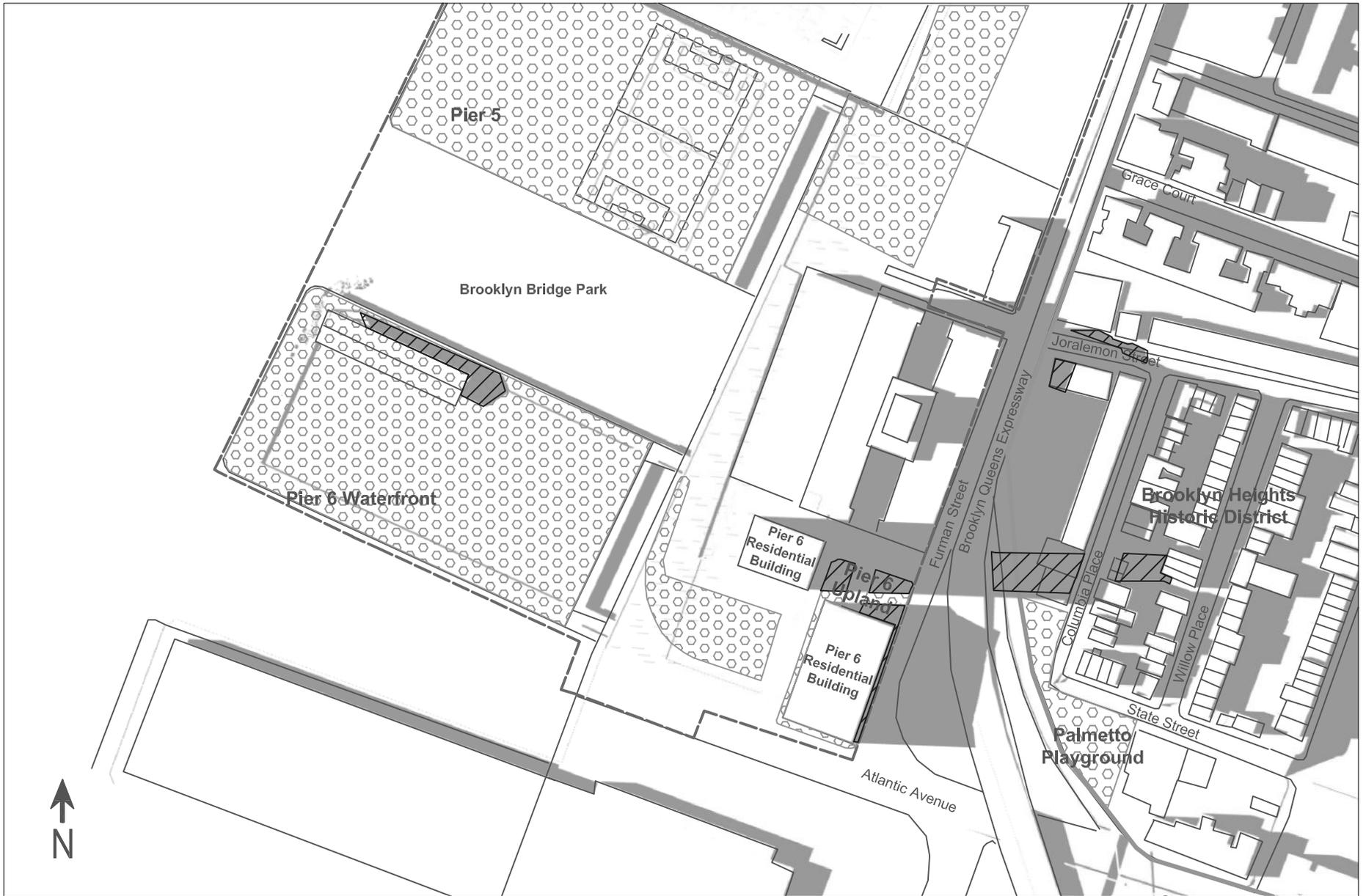
Brooklyn Bridge Park



-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

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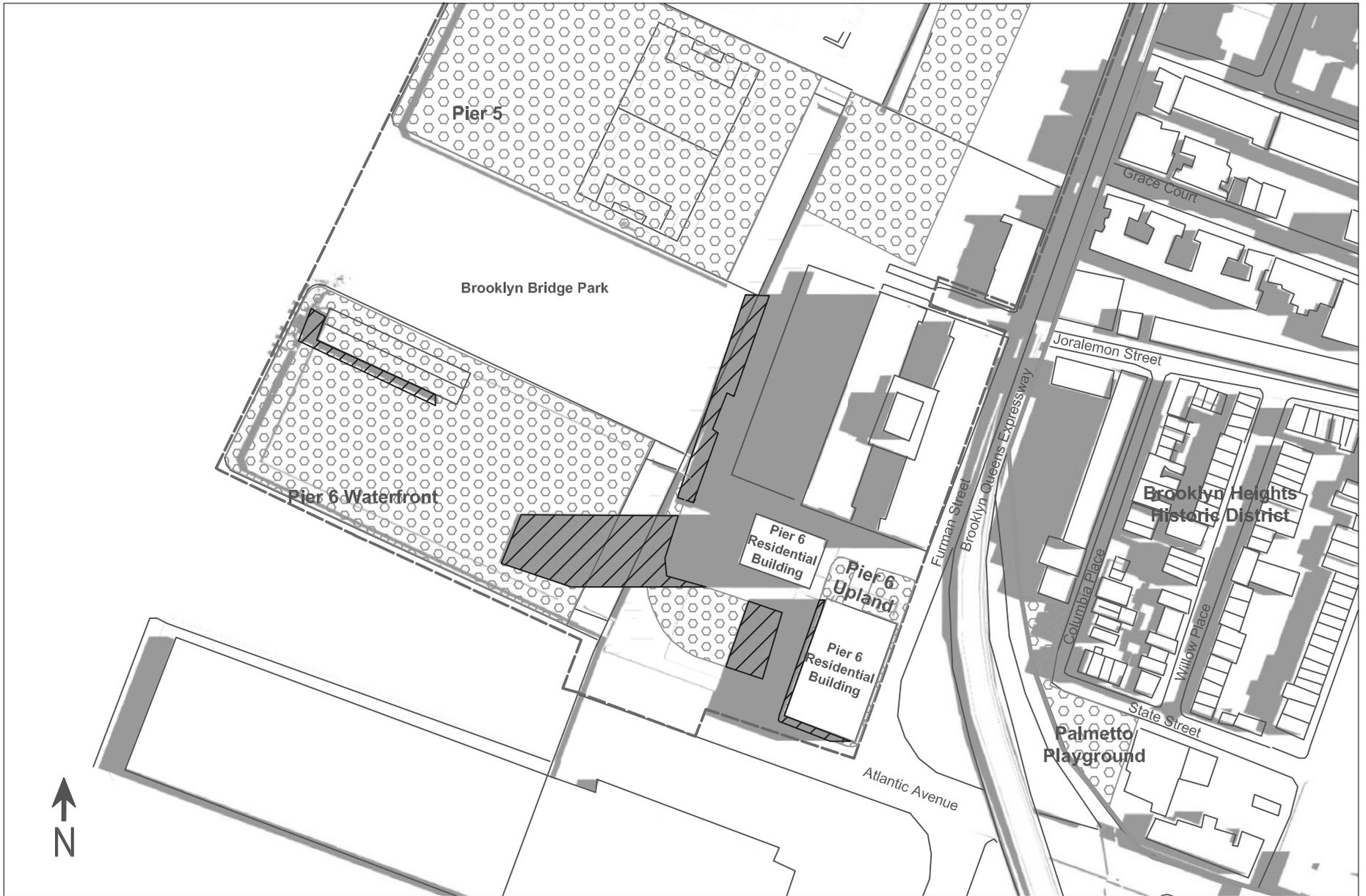
Pier 6 Area:Shadow Diagram
 May 6 12:00 PM DST
 Figure 6-5



-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

Brooklyn Bridge Park

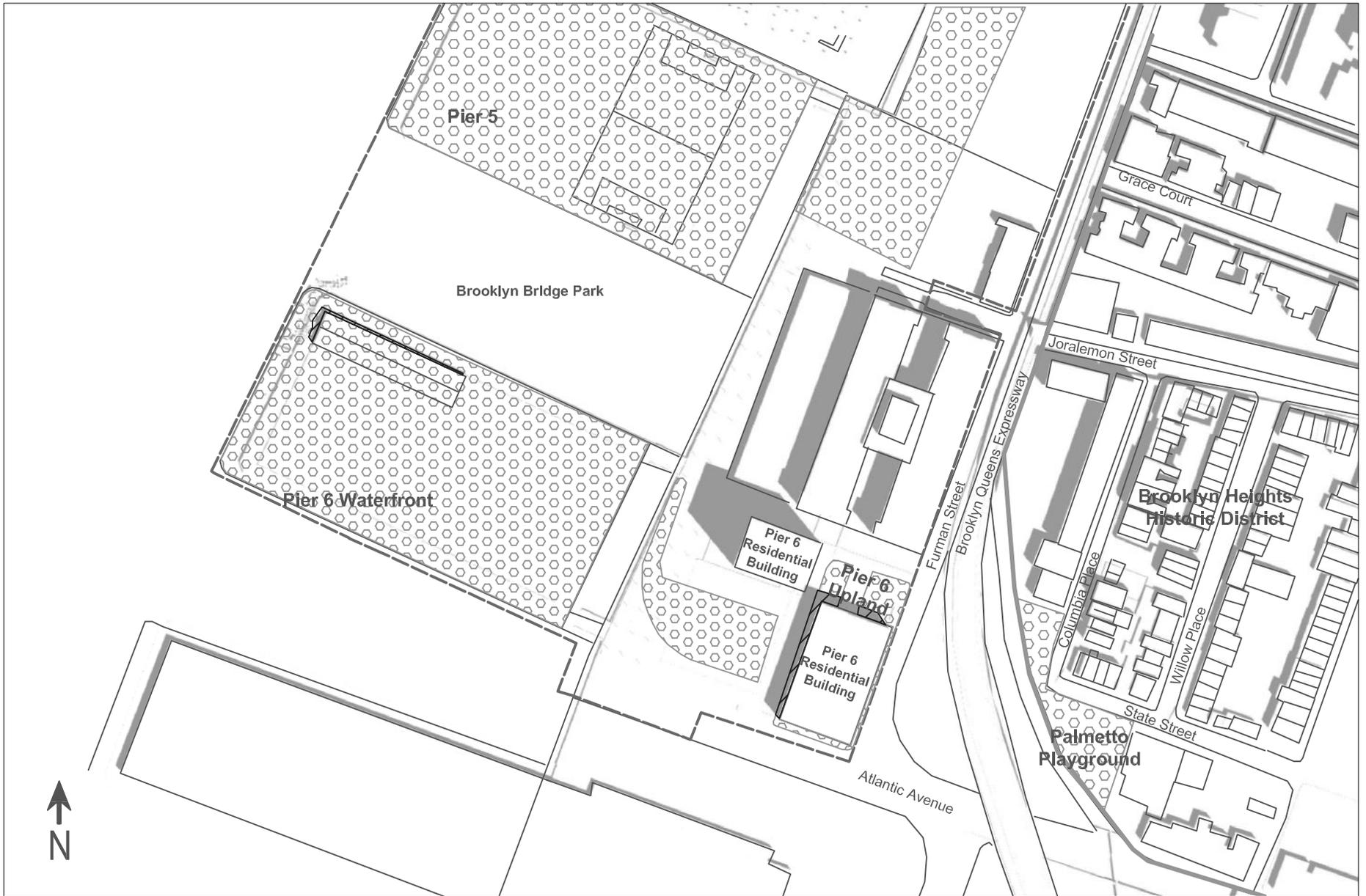
Pier 6 Area:Shadow Diagram
 May 6 5:45 PM DST
 Figure 6-6



-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

Brooklyn Bridge Park

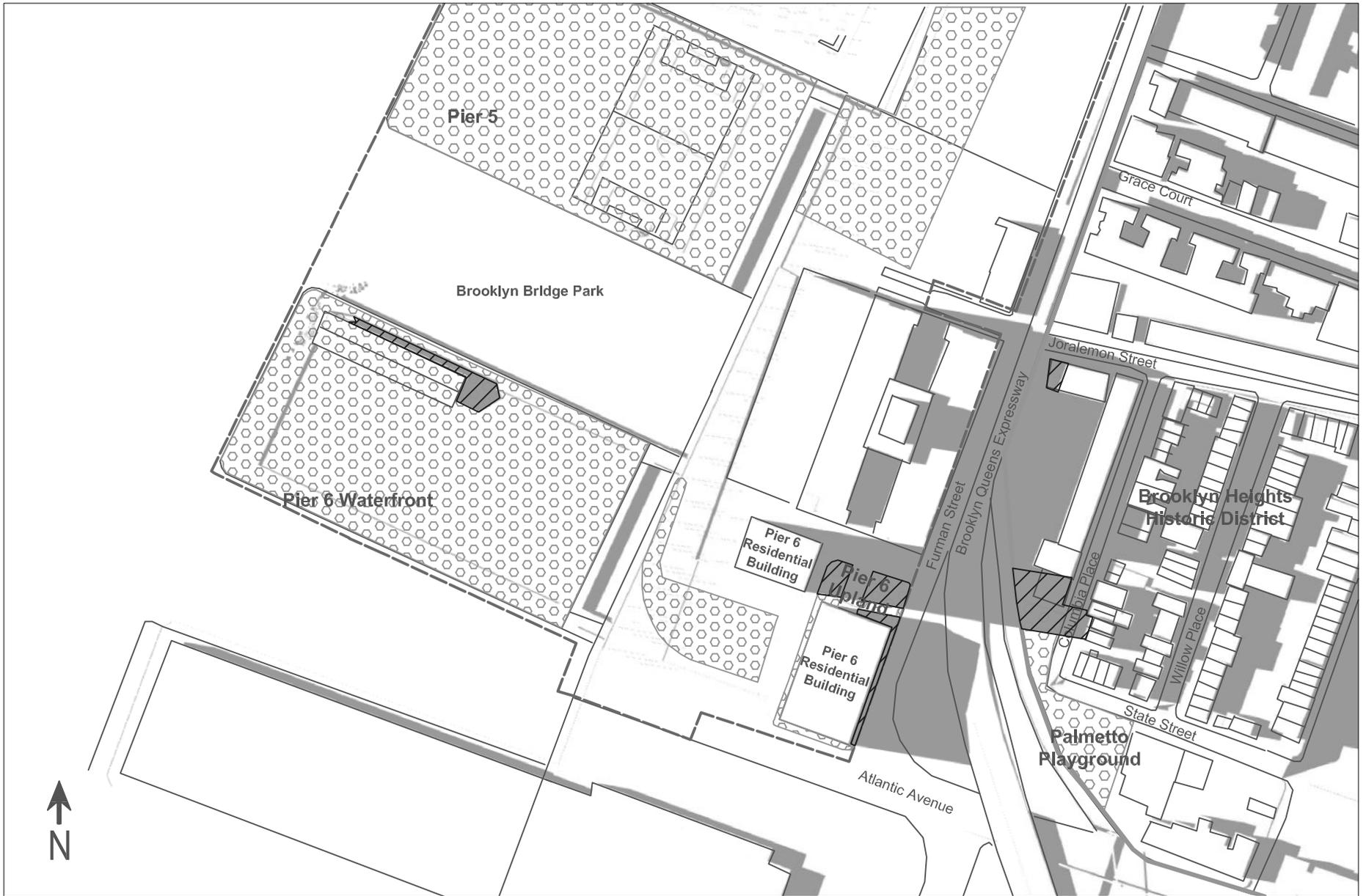
Pier 6 Area:Shadow Diagram
June 21 9:00 AM DST
Figure 6-7



-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

Brooklyn Bridge Park

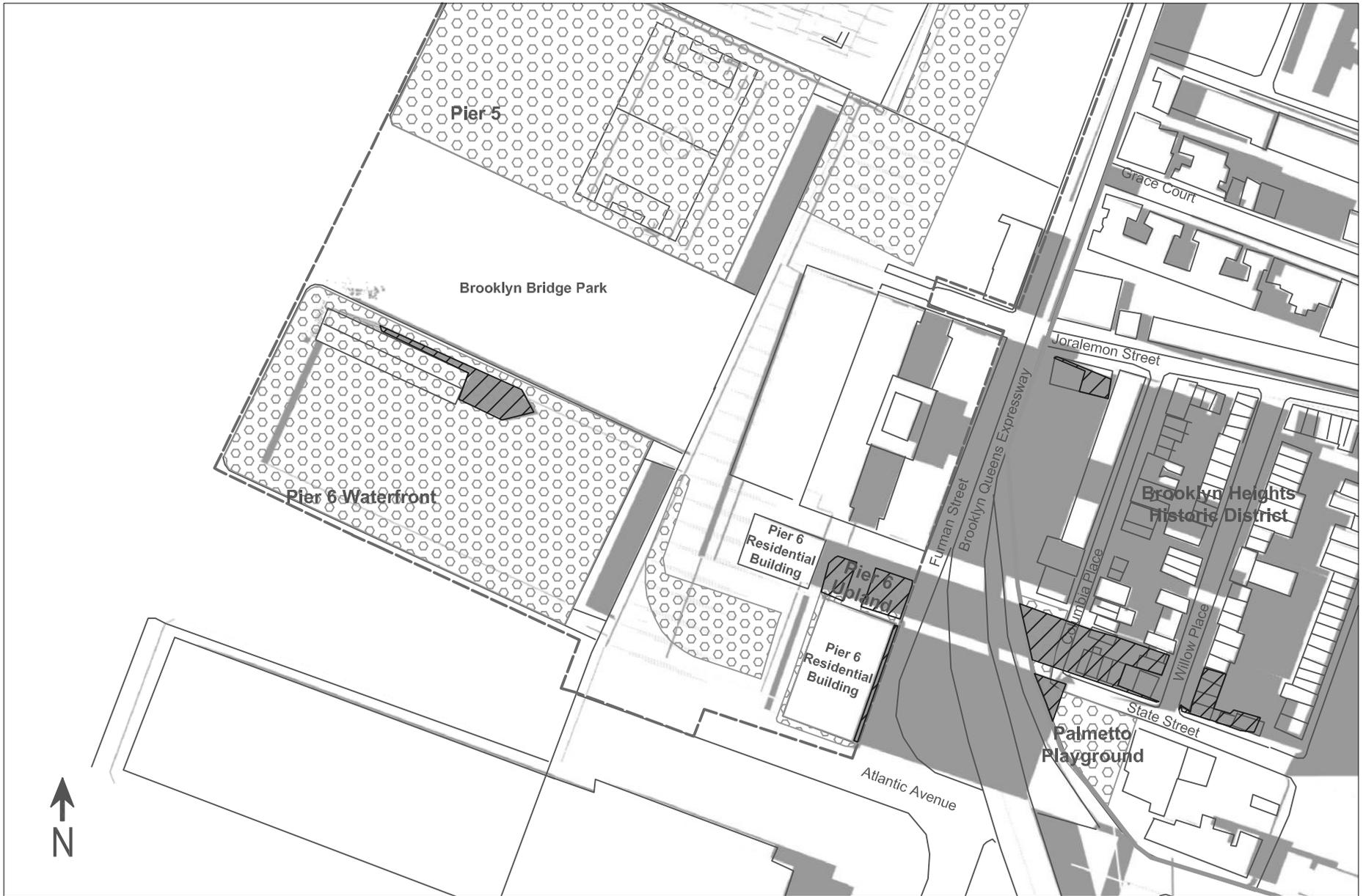
Pier 6 Area:Shadow Diagram
June 21 12:00 PM DST
Figure 6-8



-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

Brooklyn Bridge Park

Pier 6 Area:Shadow Diagram
 June 21 6:00 PM DST
 Figure 6-9



-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

Brooklyn Bridge Park

Pier 6 Area:Shadow Diagram
 June 21 7:01 PM DST
 Figure 6-10

DECEMBER 21—ANALYSIS PERIOD: 8:51 AM TO 2:53 PM EST

On December 21, when shadows are longest, shadows of the two buildings would fall northwest off Pier 6 at the beginning of the analysis period at 8:51 AM (see Figure 6-11). At this time, the shadow of the taller building would just touch the tip of Pier 5 to the north. The shadow from the addition to 360 Furman Street would fall on part of Pier 5. By 11 AM, the shadow would be off Pier 6 and would fall across the waterfront promenade onto a small portion of Pier 5 (see Figure 6-12). The shadow from addition to 360 Furman Street would fall on the waterfront open space and a small part of Pier 5. At 12:30 PM, the shadow would nearly be off Pier 5 but falling on the waterfront open space (see Figure 6-13). Even at the end of the analysis period, the shadows of the new buildings and the addition to 360 Furman Street would not fall into the Brooklyn Heights Historic District because of the sun's angle. More of the shadow from the shade structure would fall on the water in the winter when the sun is lower in the sky.

PIER 1 AREA

MARCH 21/SEPTEMBER 21—ANALYSIS PERIOD: 7:36 AM TO 4:29 PM EST

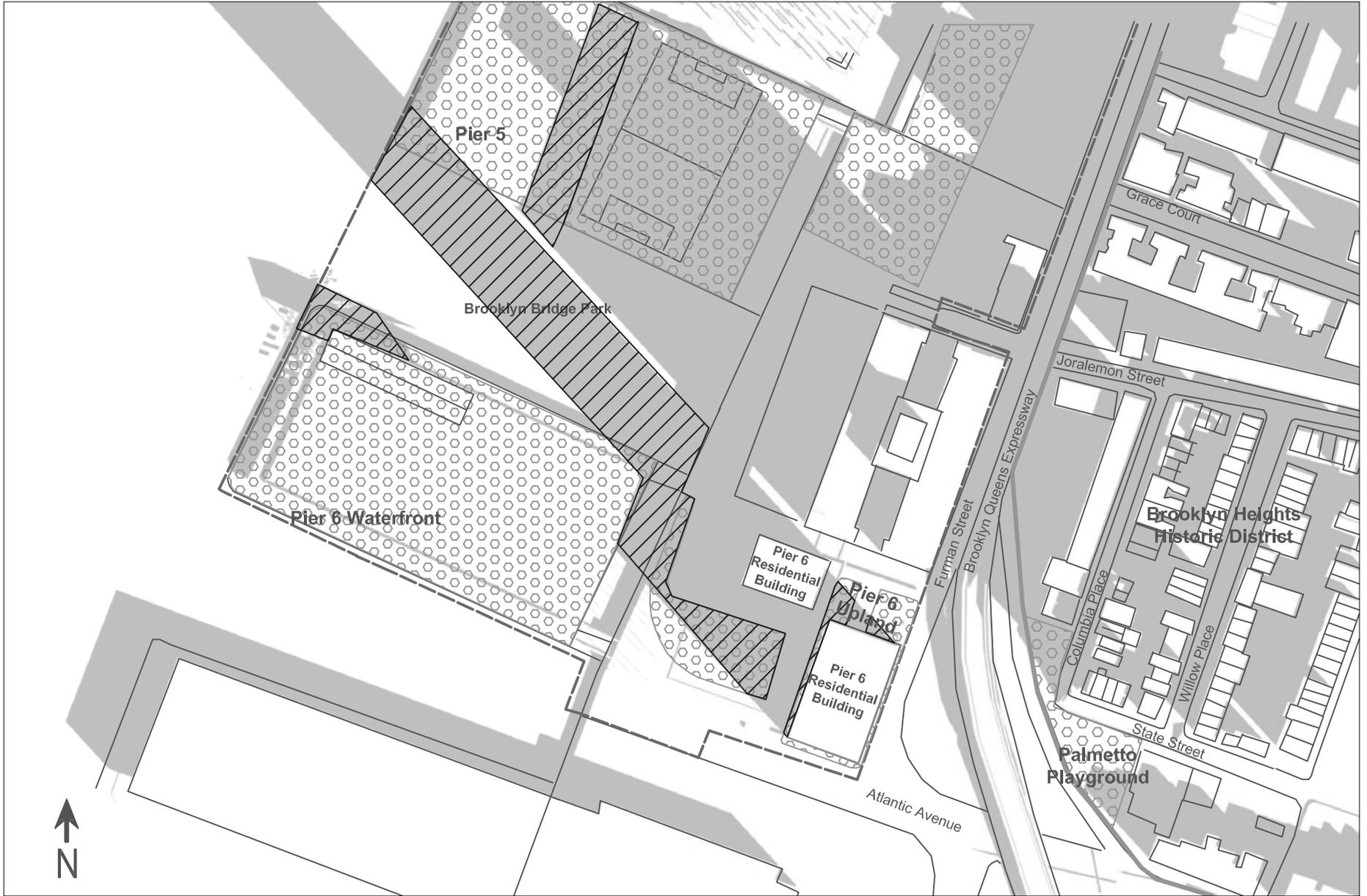
At 8:45 AM, near the beginning of the analysis period on March 21, the shadows of the two upland buildings would fall on small portions of the marsh area and the hill (see Figure 6-14). By 10 AM, their shadows would be much smaller (see Figure 6-15). At 4 PM, near the end of the analysis period, the building to the north would cast shadow one short block of Furman Street and the lower portions of the facades of buildings facing east on that street (see Figure 6-16). Furman Street and the buildings facing it are in the Fulton Ferry Historic District. The waterfront restaurant building would cast afternoon shadows on the open space to its north and east (see Figure 6-16); but earlier in the day, its very small shadow increment would fall on the water.

MAY 6/AUGUST 6--ANALYSIS PERIOD: 7:27 AM TO 6:18 PM DST

At 7:45 AM, the shadow of the south building would fall on a large portion of the marsh area, while there would be relatively little incremental shadow from the north building (see Figure 6-17). By 9 AM, the shadow of the south building would be greatly reduced, while the incremental shadow of the north building would cover a small portion of the hill (see Figure 6-18). At noon the Pier 1 open spaces would be in sunlight (see Figure 6-19). At 5:30 PM, late afternoon shadows from the north building would reach Furman Street and Doughty Street, and buildings on that corner in the Fulton Ferry Historic District (see Figure 6-20). The restaurant would cast afternoon shadows on the open space to its north and east (see Figure 6-20); however, earlier in the day its small shadow increment would fall on the open space to its south.

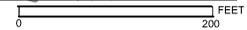
JUNE 21—ANALYSIS PERIOD: 6:57 AM TO 7:01 PM DST

On June 21, at 7:15 AM just after the beginning of the analysis period, the shadow of the south building would fall on much of the marsh area, and the shadow of the north building would mostly fall on the northern end of the hill (see Figure 6-21). By 9:45 AM, the shadows would be much shorter and fall only on the eastern edge of the hill (see Figure 6-22). At 2 PM, the Pier 1 open spaces would be in sunlight (see Figure 6-23). At 6:15 PM, near the end of the analysis period, the shadow from the north building would touch the corner of the Fulton Ferry Historic District, reaching buildings facing Doughty Street (see Figure 6-24). The restaurant would cast shadow on a very small portion of the open space at the north end of the hill.

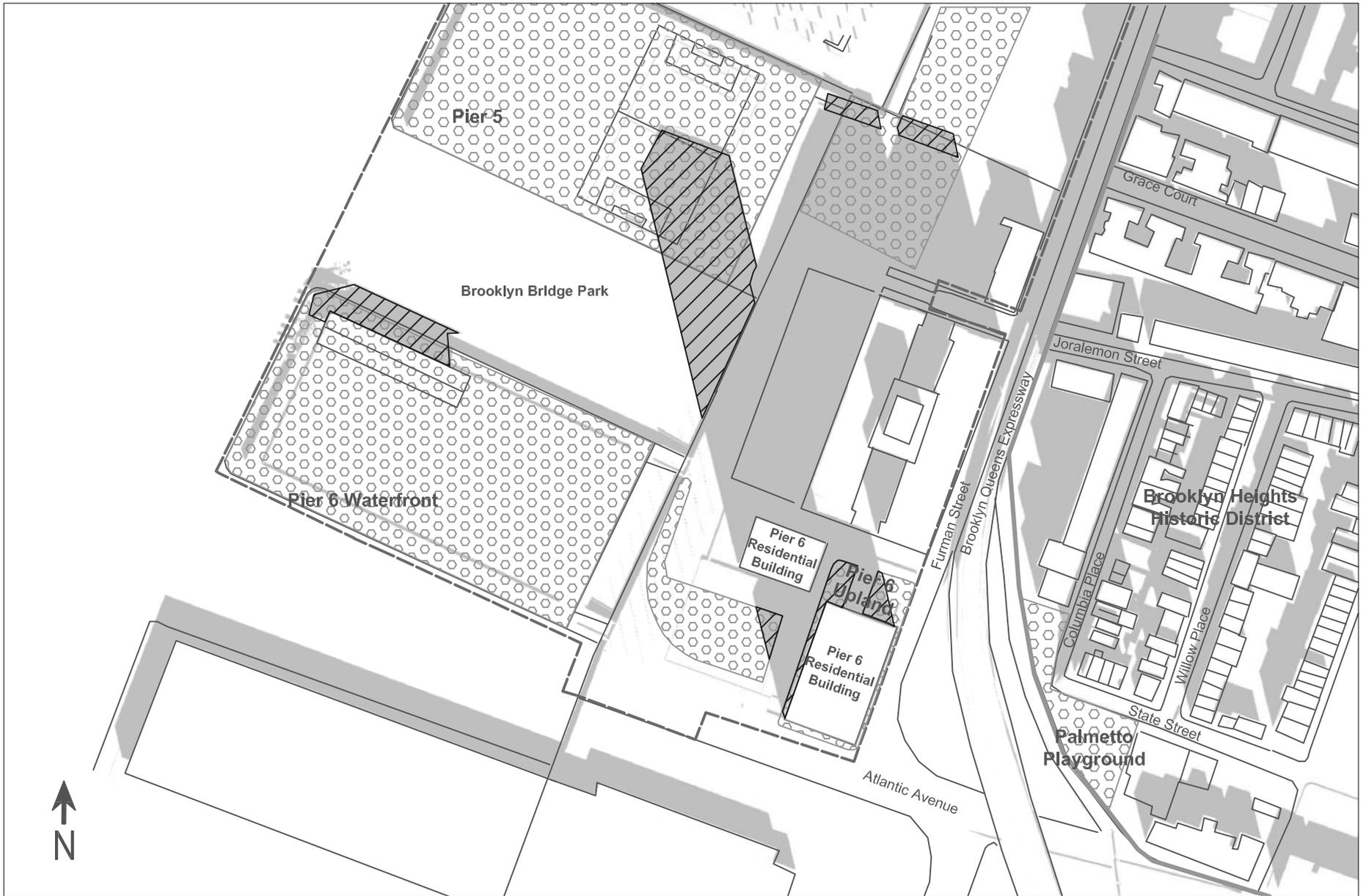


-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

Brooklyn Bridge Park



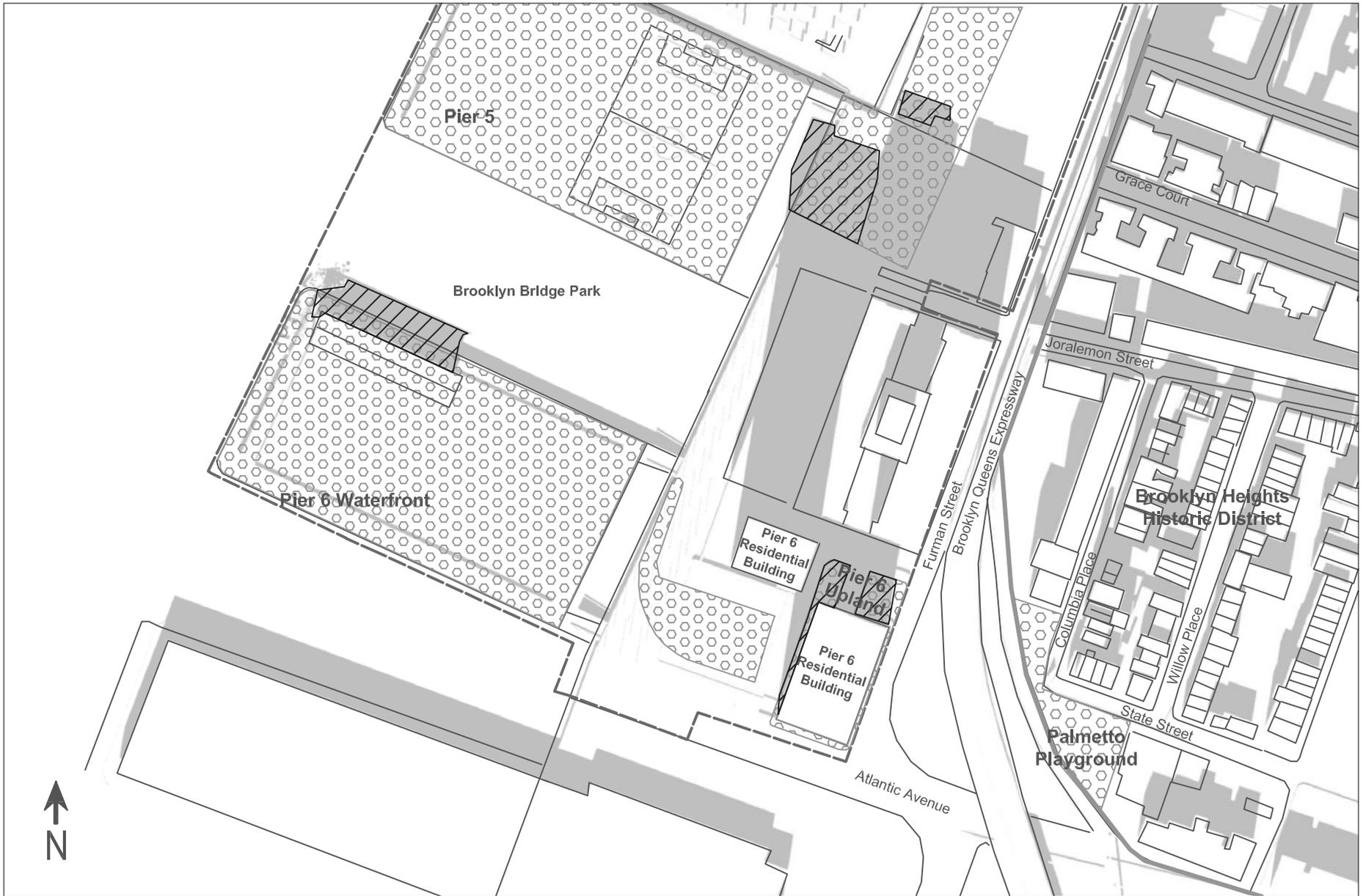
Pier 6 Area:Shadow Diagram
 December 21 8:51 AM EST
 Figure 6-11



-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

Brooklyn Bridge Park

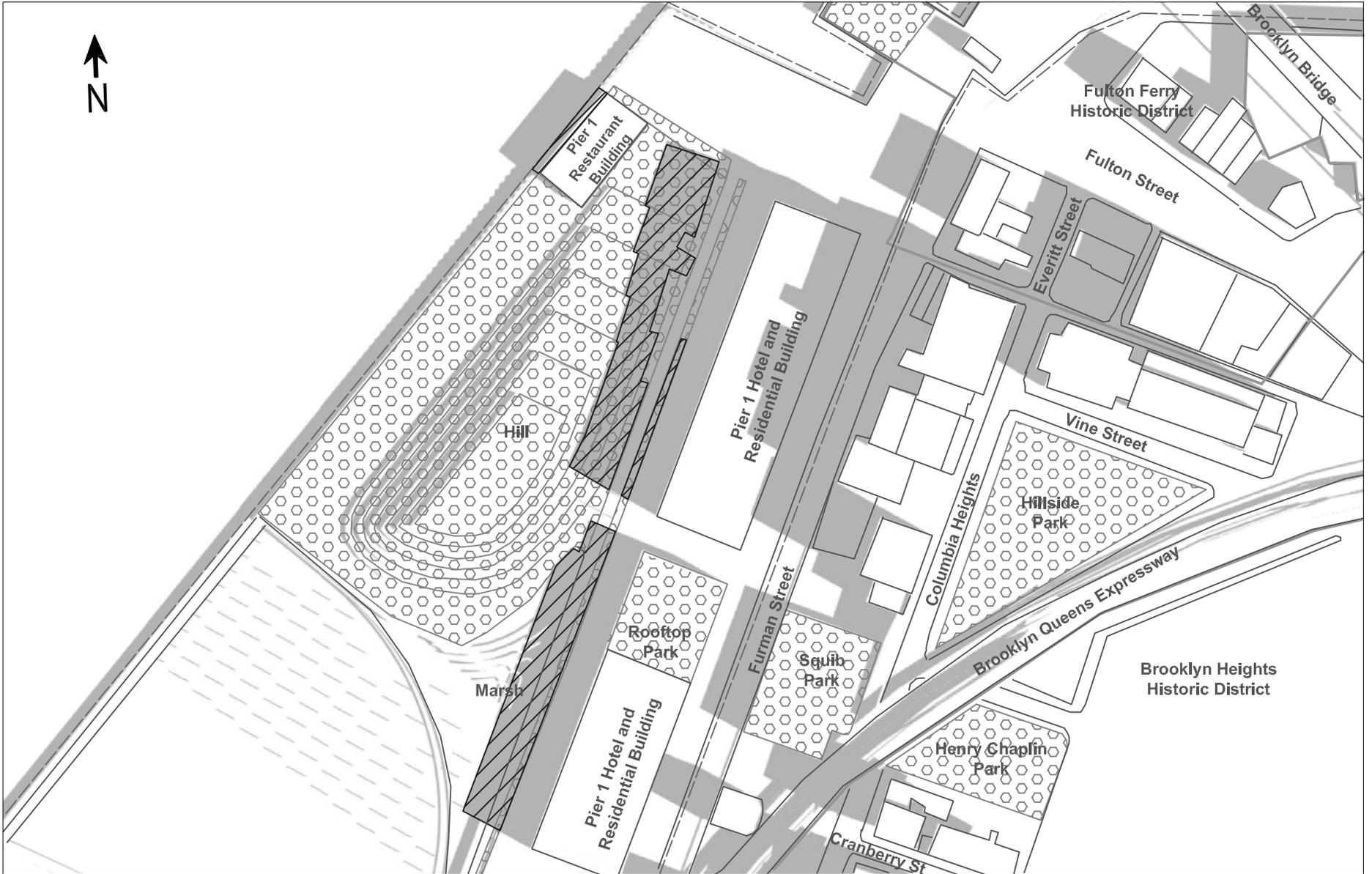
Pier 6 Area:Shadow Diagram
 December 21 11:00 AM EST
 Figure 6-12



-  Brooklyn Bridge Park Boundary
-  Brooklyn Heights Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

Brooklyn Bridge Park

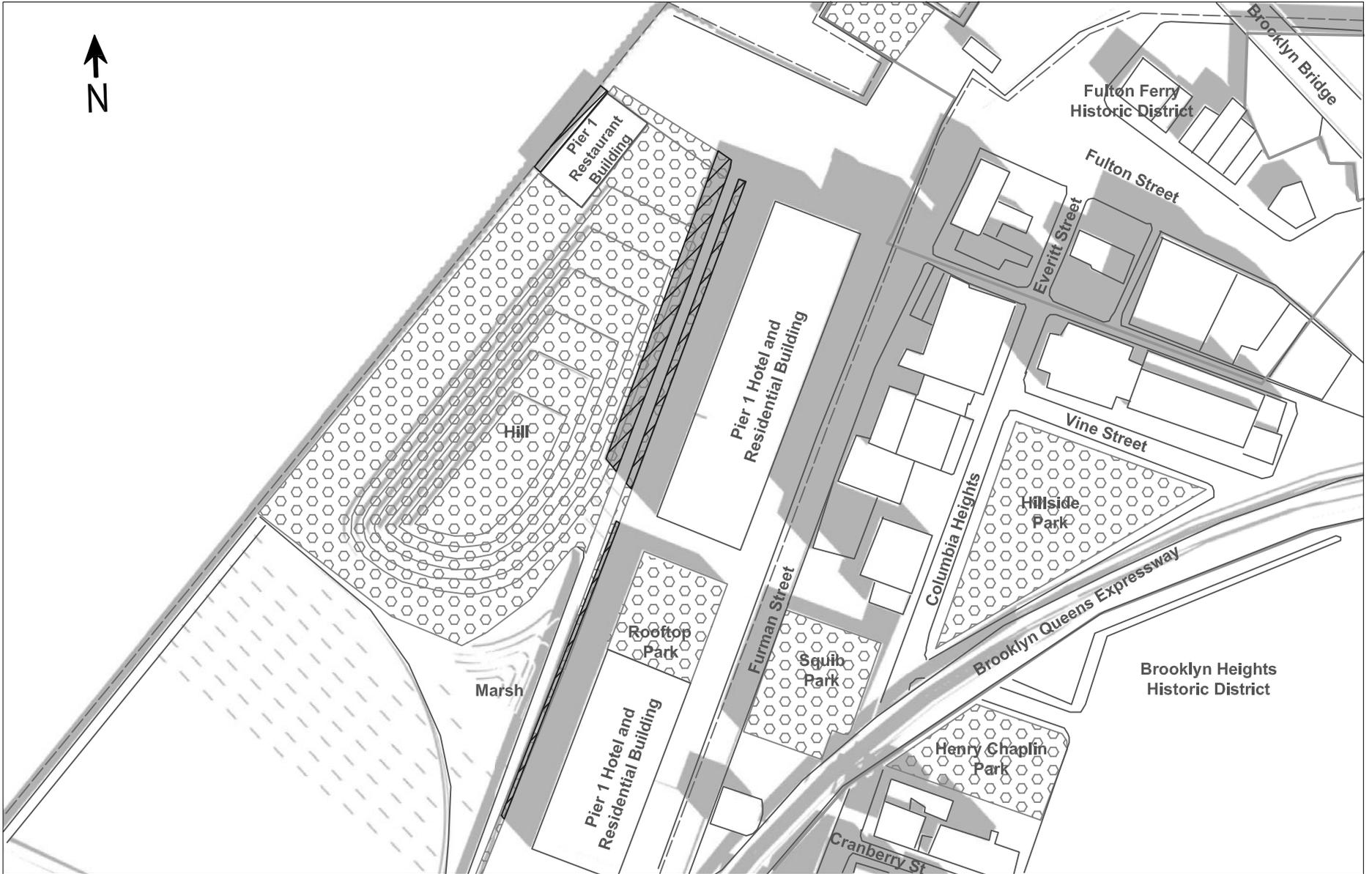
Pier 6 Area:Shadow Diagram
 December 21 12:30 PM EST
 Figure 6-13



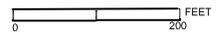
-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

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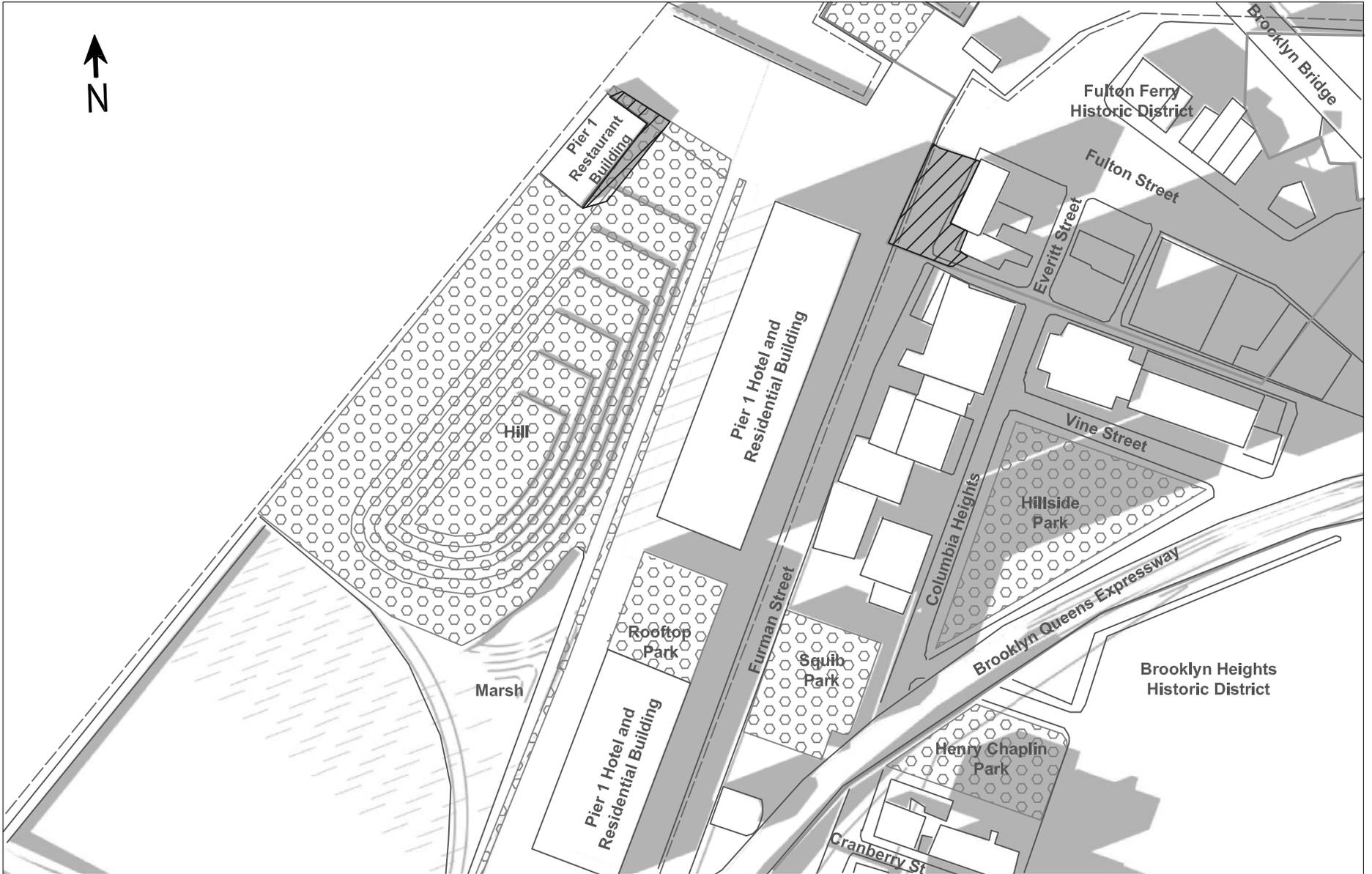
Pier 1 Area:Shadow Diagram
 March 21 8:45 AM EST
 Figure 6-14



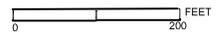
-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space



Pier 1 Area:Shadow Diagram
 March 21 10:00 AM EST
 Figure 6-15



- Brooklyn Bridge Park Boundary
- Historic District Boundary
- Shadow
- Open Space
- Incremental Shadow on Open Space



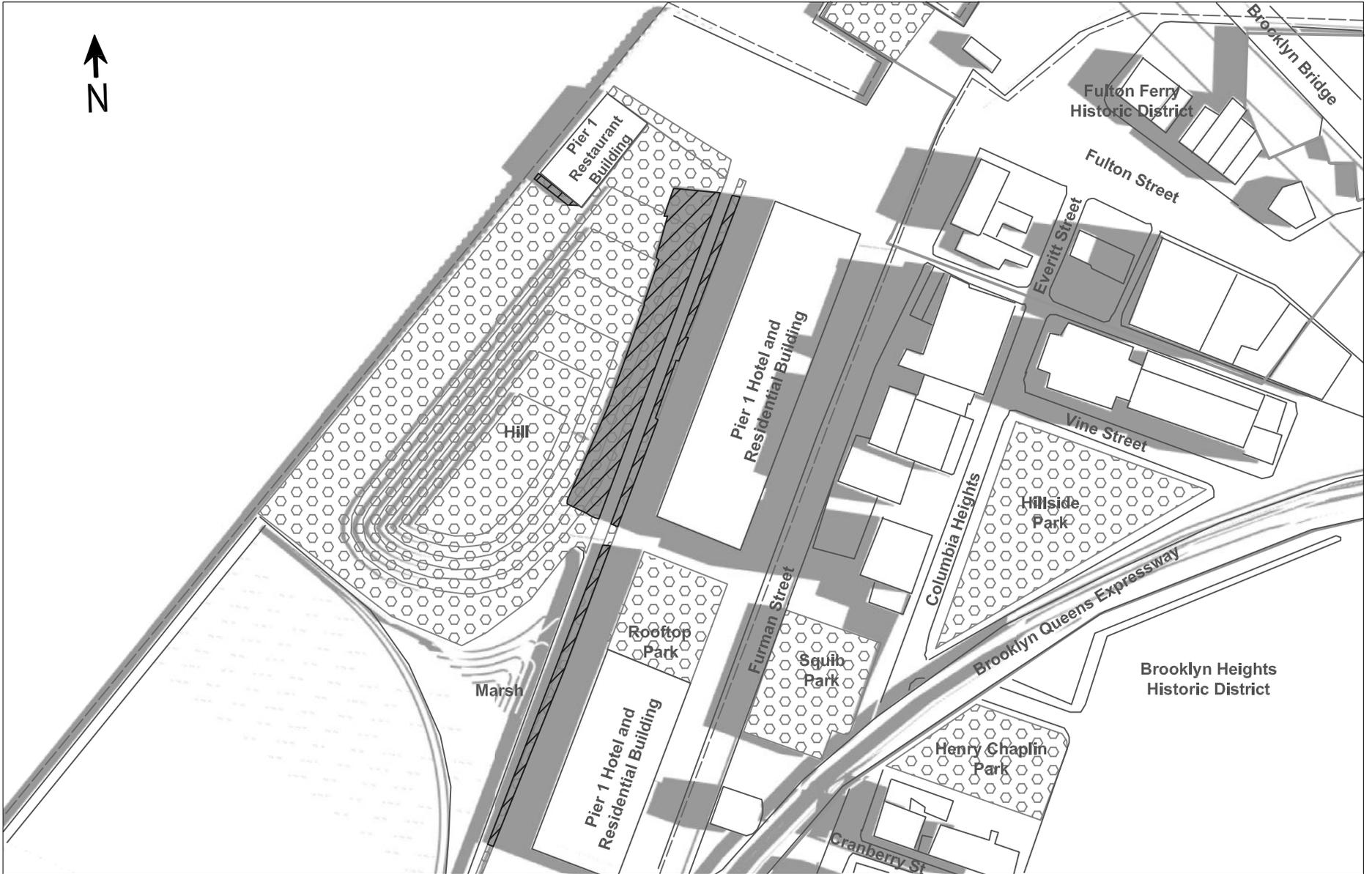
Pier 1 Area:Shadow Diagram
 March 21 4:00 PM EST
 Figure 6-16



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

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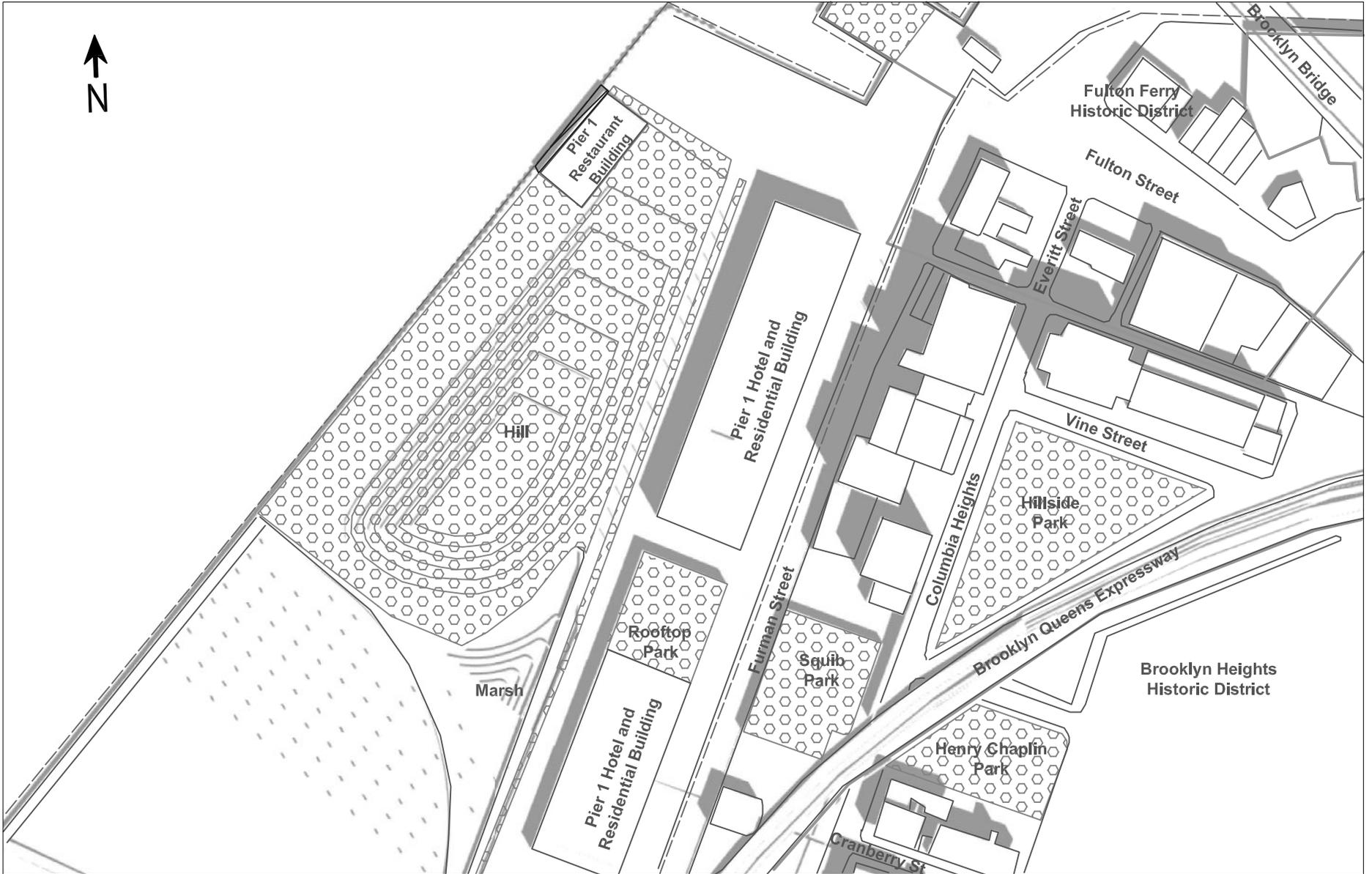
Pier 1 Area:Shadow Diagram
 May 6 7:45 AM DST
 Figure 6-17



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

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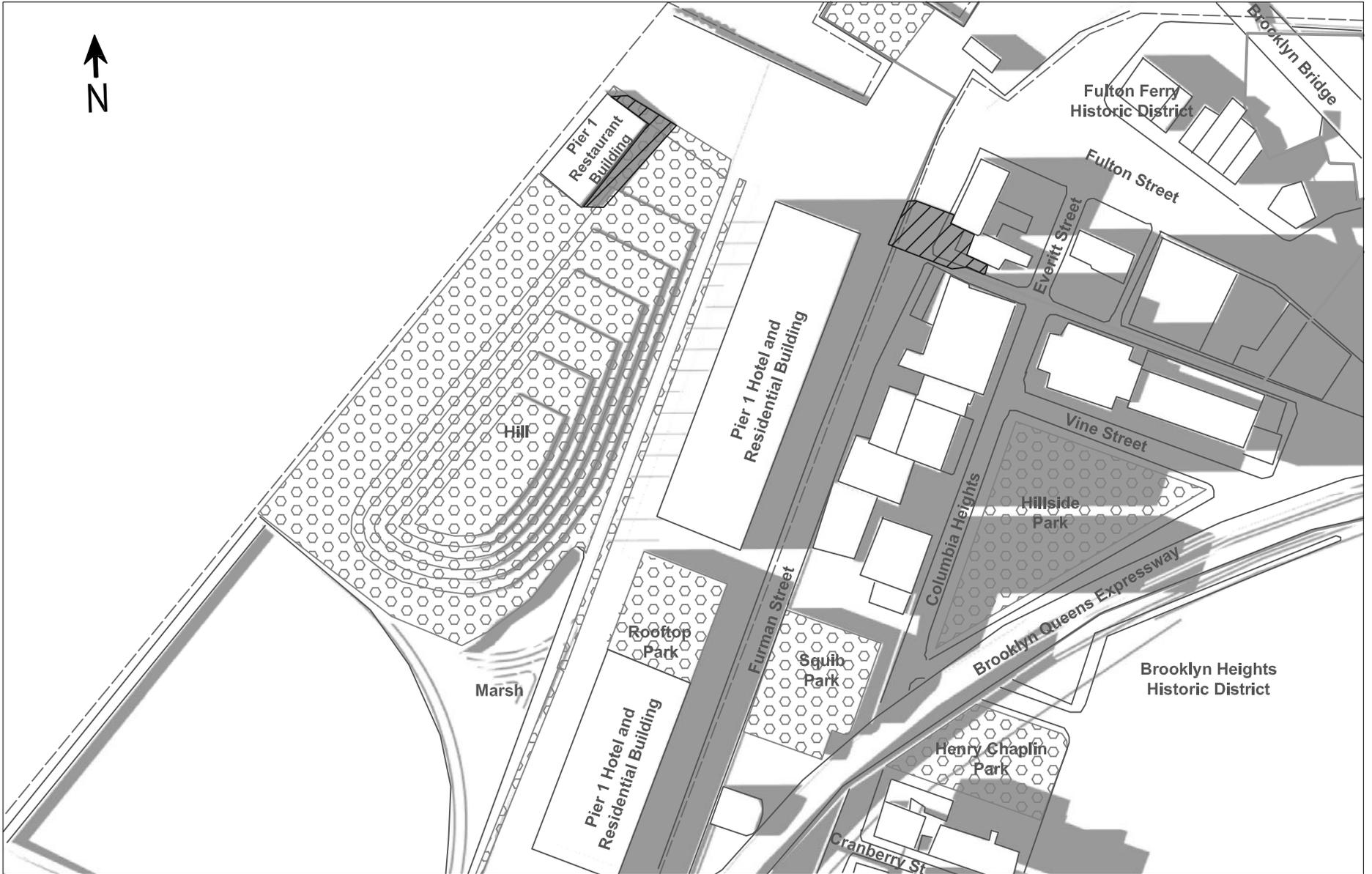
Pier 1 Area:Shadow Diagram
 May 6 9:00 AM DST
 Figure 6-18



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

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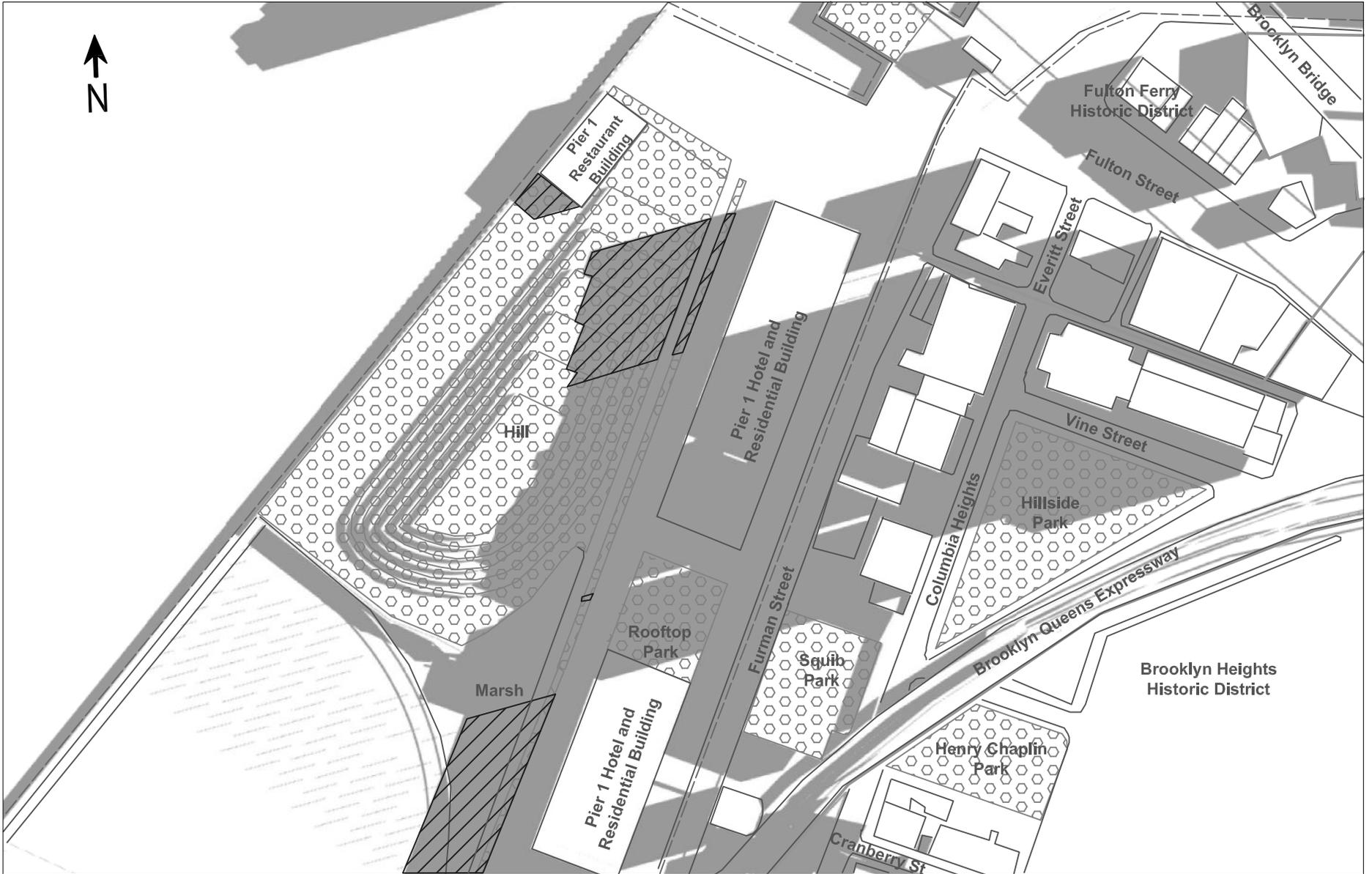
Pier 1 Area:Shadow Diagram
 May 6 12:00 PM DST
 Figure 6-19



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

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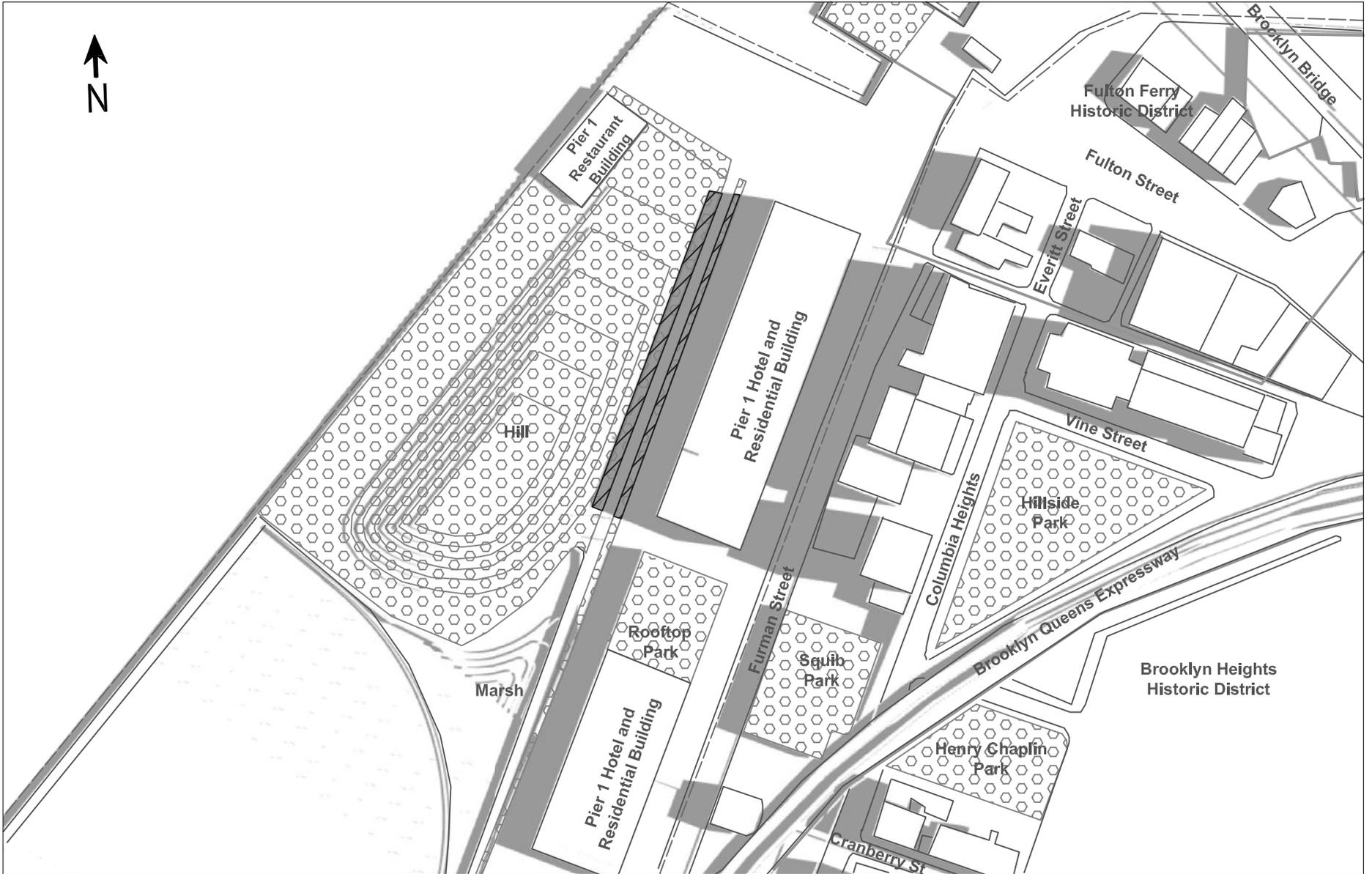
Pier 1 Area:Shadow Diagram
 May 6 5:30 PM DST
 Figure 6-20



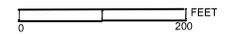
-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
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-  Incremental Shadow on Open Space

0 200 FEET

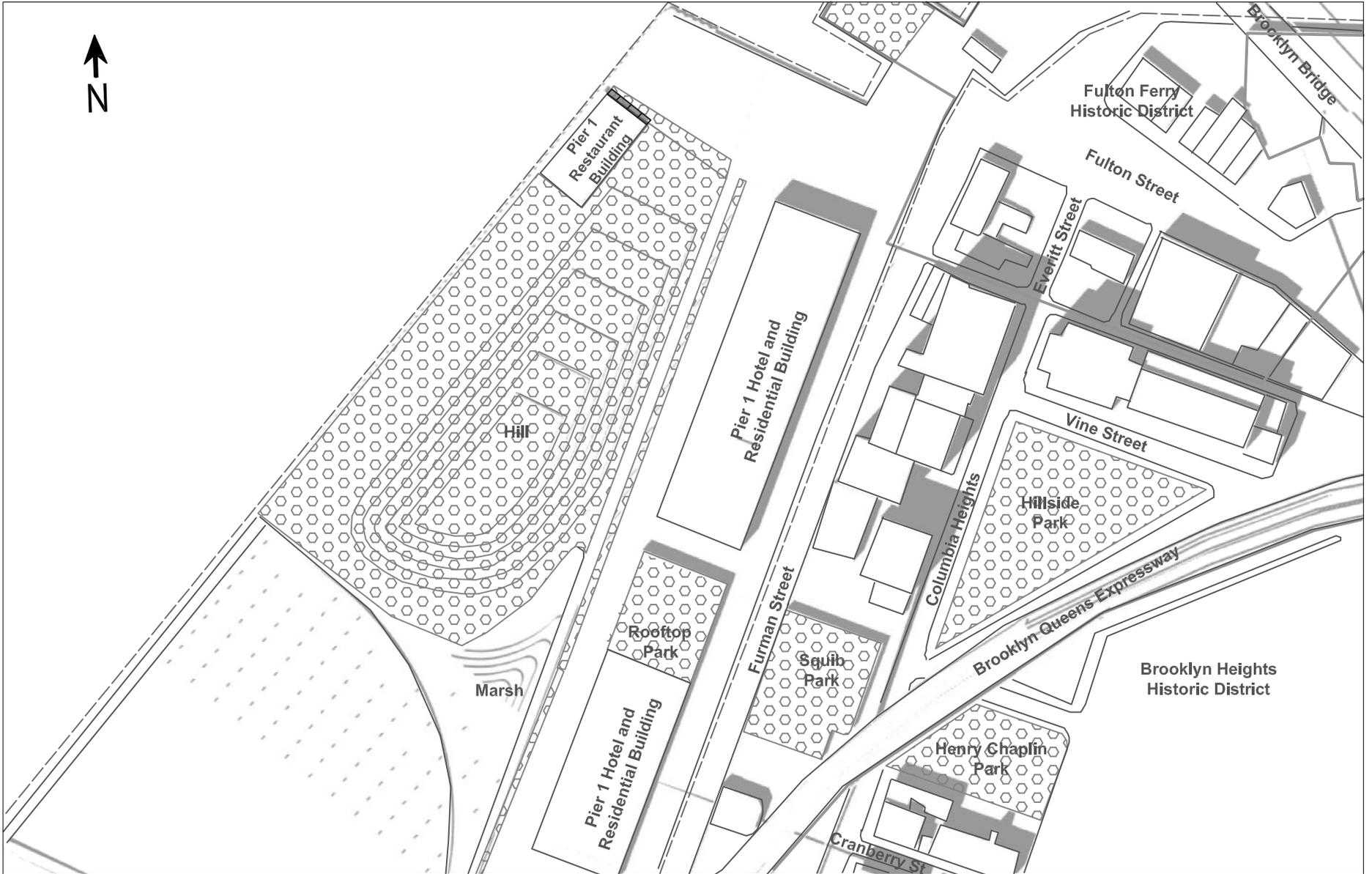
Pier 1 Area:Shadow Diagram
 June 21 7:15 AM DST
 Figure 6-21



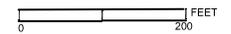
-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space



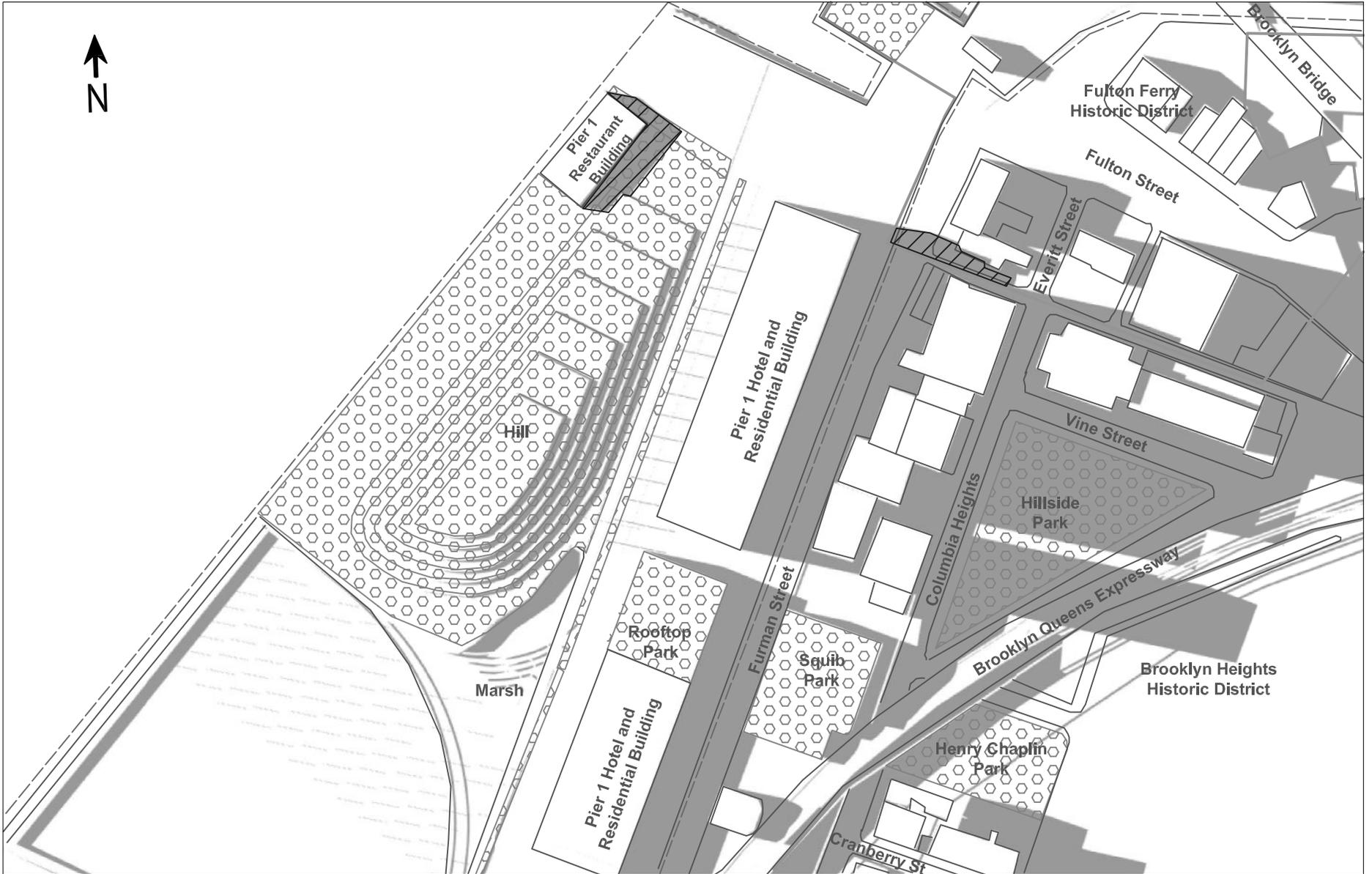
Pier 1 Area:Shadow Diagram
 June 21 9:45 AM DST
 Figure 6-22



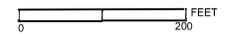
-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space



Pier 1 Area:Shadow Diagram
 June 21 2:00 PM DST
 Figure 6-23



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space



Pier 1 Area:Shadow Diagram
 June 21 6:15 PM DST
 Figure 6-24

DECEMBER 21—ANALYSIS PERIOD: 8:51 AM TO 2:53 PM EST

On December 21, the north building would cast a wide swath of shadow northwest across the hill to the waterfront at the beginning of the analysis period (see Figure 6-25). By 10 AM, the south building would cast shadow on part of the marsh, and the north building would cast shadow on a portion of the hill area (see Figure 6-26). At 11:30 AM, the shadow increment from the north building would be greatly reduced (see Figure 6-27). By 2:15 PM, the north building shadow would reach into the Fulton Ferry Historic District and onto the Fulton Ferry Pier (see Figure 6-28).

JOHN STREET SITE

MARCH 21/SEPTEMBER 21—ANALYSIS PERIOD: 7:36 AM TO 4:29 PM EST

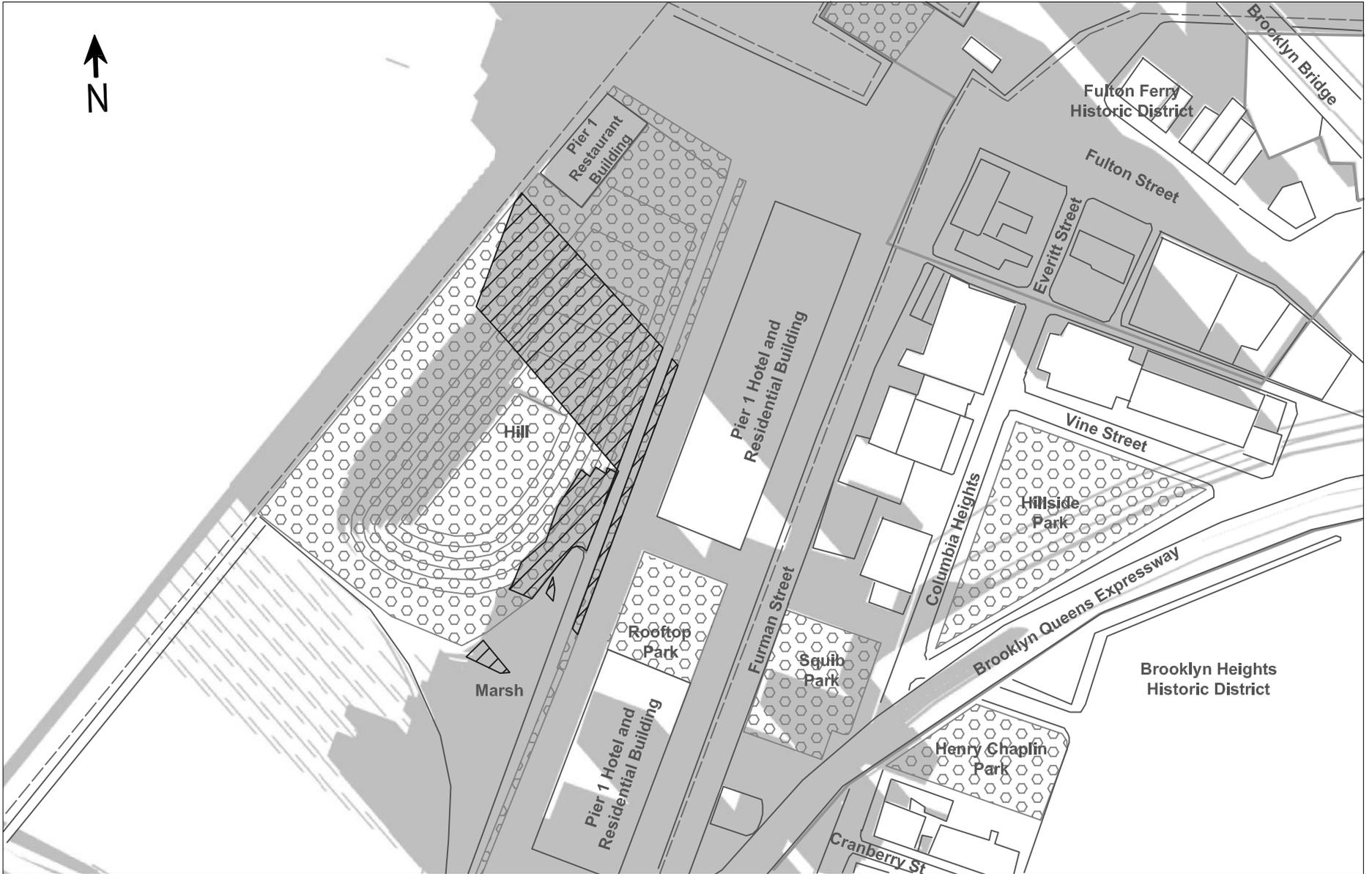
On March 21, at 8:30 AM, the shadow of the proposed building would fall northwest across a small portion of the waterfront open space and onto the adjacent water area of the park and the concrete foot bridge to the Main Street Playground (see Figure 6-29). By noon, the shadow would fall directly north and cover less than a fifth of the waterfront open space including the western end of the hill (see Figure 6-30). At 2 PM, the building would cast its shadow northeast, covering less than a quarter of the waterfront open space and much of the hill in this area (see Figure 6-31). This portion of the park is within the D.U.M.B.O. Historic District, and the shadow would fall on this small part of the much larger district for the entire analysis period. However, the features of the historic district in this area would not be considered sun-sensitive, because the park is not a historic landscape and no buildings except the industrial building at the corner of Pearl and John Streets would be in the path of the shadow. As shown in Figure 6-29, shadows would move off the area of the Manhattan Bridge by 8:30 AM; it would therefore not be affected by shadows.

MAY 6/AUGUST 6--ANALYSIS PERIOD: 7:27 AM TO 6:18 PM DST

At 8:15 AM on May 6, the shadow of the proposed building would stretch to the west across the water area and touch a small portion of the open space area under the Manhattan Bridge (see Figure 6-32). At 12 noon, the shadow would fall northwest on a small portion of the water area and on less than a quarter of the waterfront open space (see Figure 6-33). Later in the afternoon at 4 PM, the building shadow would fall northeast across the waterfront open space, covering about a tenth of the open space including a small portion of the hill (see Figure 6-34). While the shadows would fall on the D.U.M.B.O. Historic District through the analysis period, nothing in the shadow path is a historic landscape or a building with a sun-sensitive feature. Early morning shadows falling under the Manhattan Bridge and onto a very small portion of the overall Fulton Ferry Historic District would not be considered significant adverse impacts.

JUNE 21—ANALYSIS PERIOD: 6:57 AM TO 7:01 PM DST

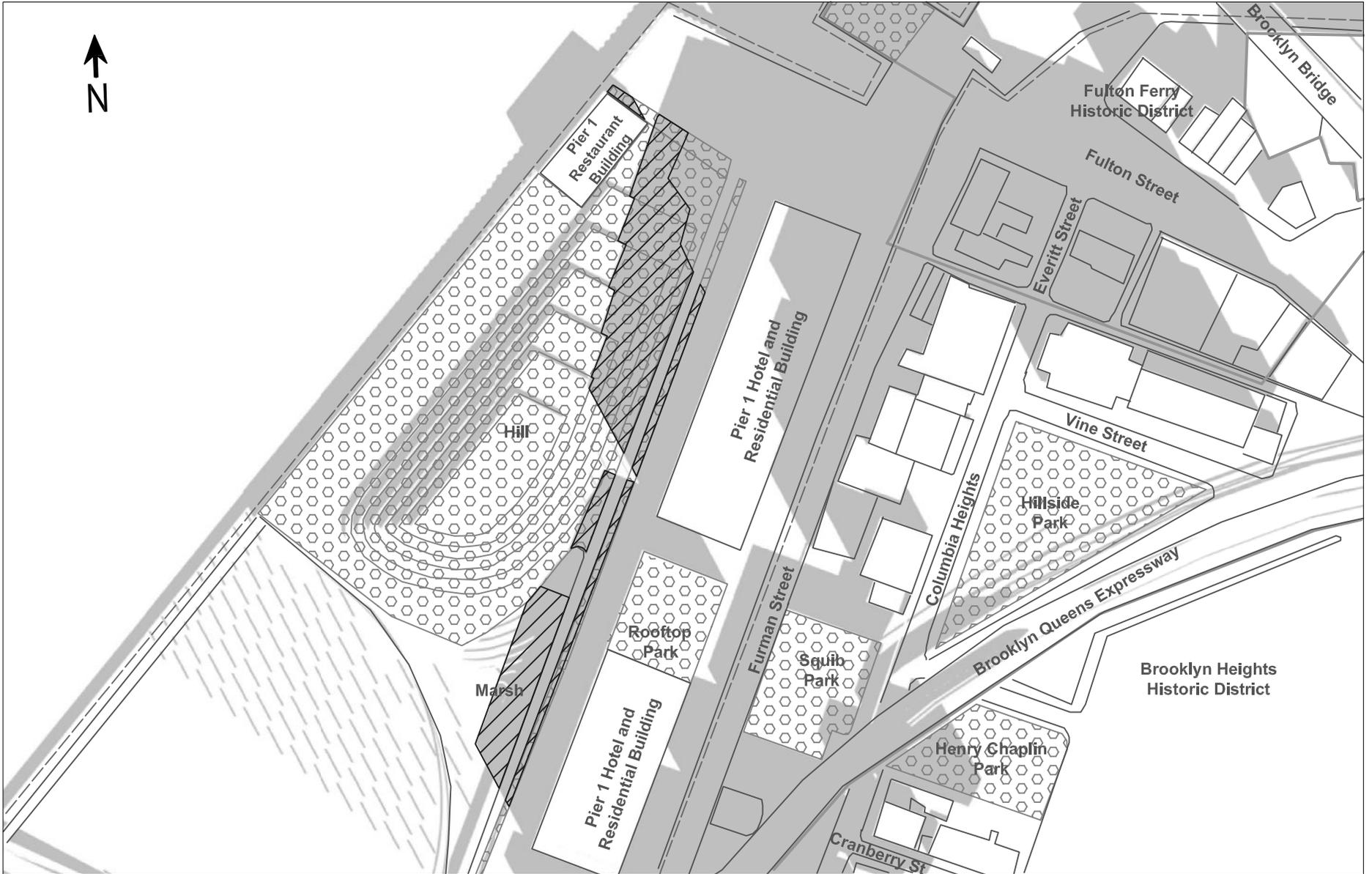
At 7:15 AM, not long after the beginning of the analysis period on June 21, shadows from the proposed building would fall west across the water area and on a portion of the open space area under the Manhattan Bridge, a small portion of the Main Street Playground, and a very small portion of the Fulton Ferry Historic District (see Figure 6-35). By 8:45 AM, the shadow would be shorter and would not extend beyond the Manhattan Bridge. It would fall on some of the water area of the park and a small portion of the waterfront open space adjacent to the Manhattan Bridge (see Figure 6-36). At 2 PM, the shadow would fall northeast on a small



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

0 200 FEET

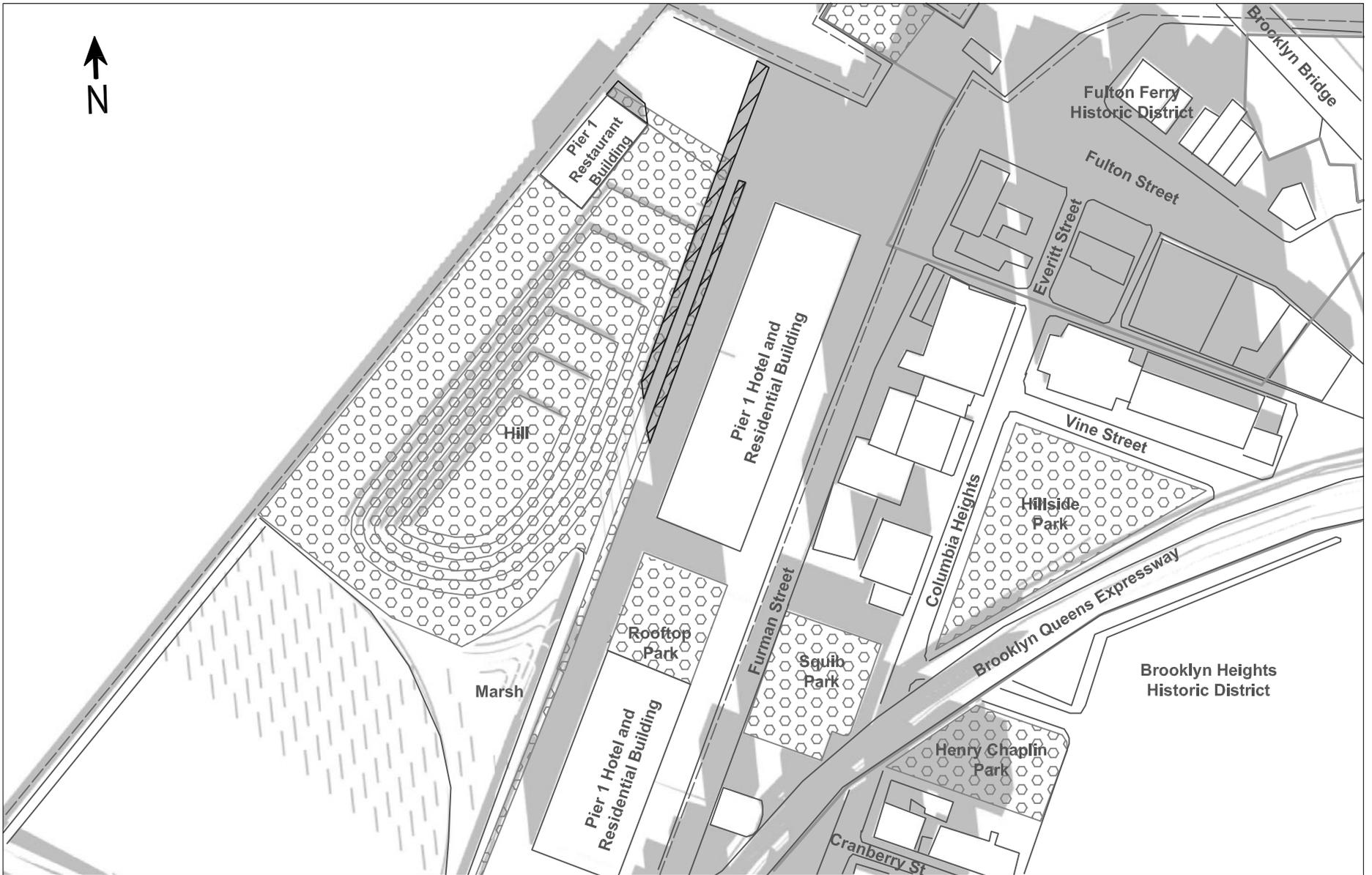
Pier 1 Area:Shadow Diagram
 December 21 9:00 AM EST
 Figure 6-25



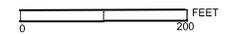
-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space

0 200 FEET

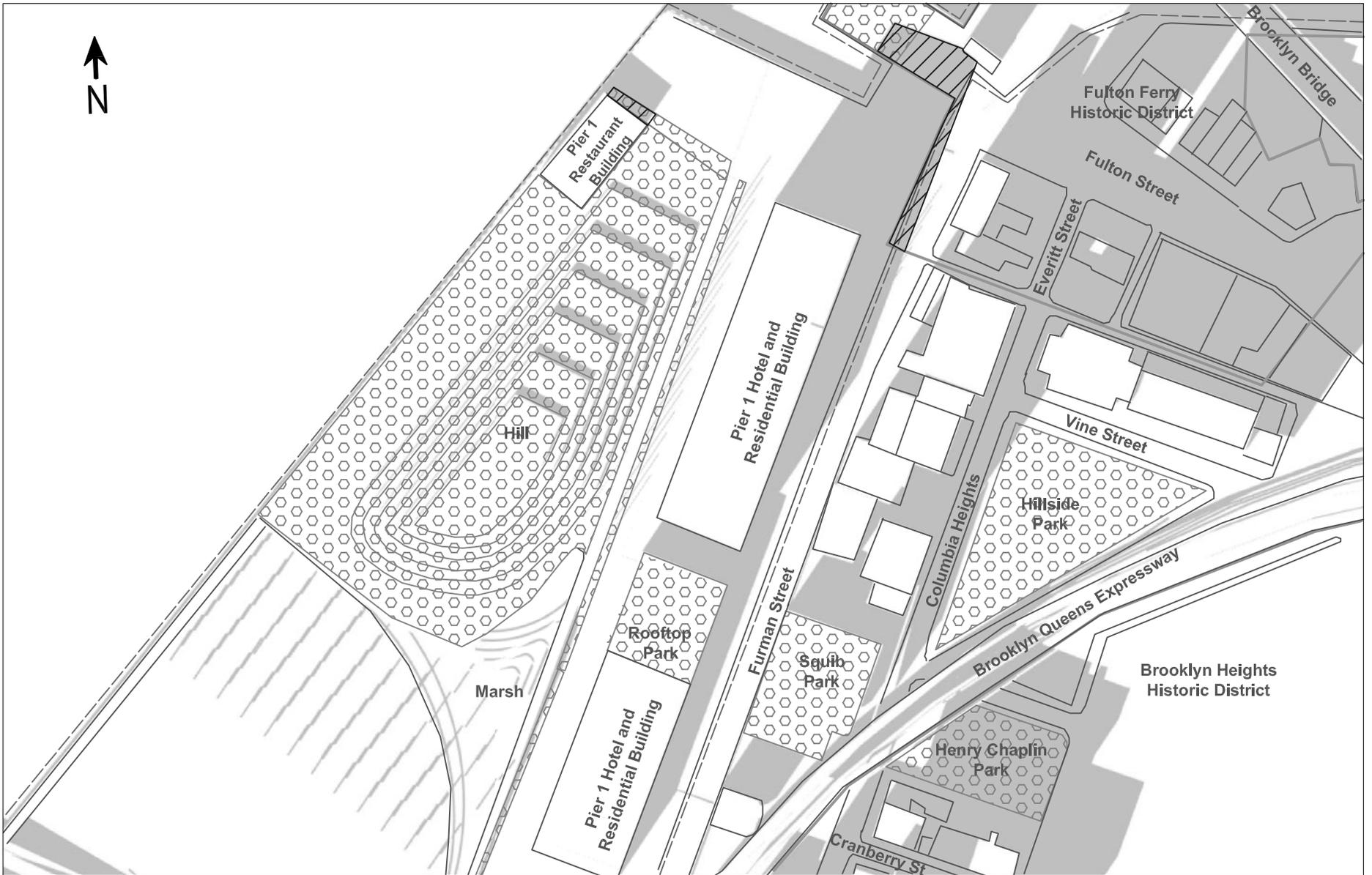
Pier 1 Area:Shadow Diagram
 December 21 10:00 AM EST



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space



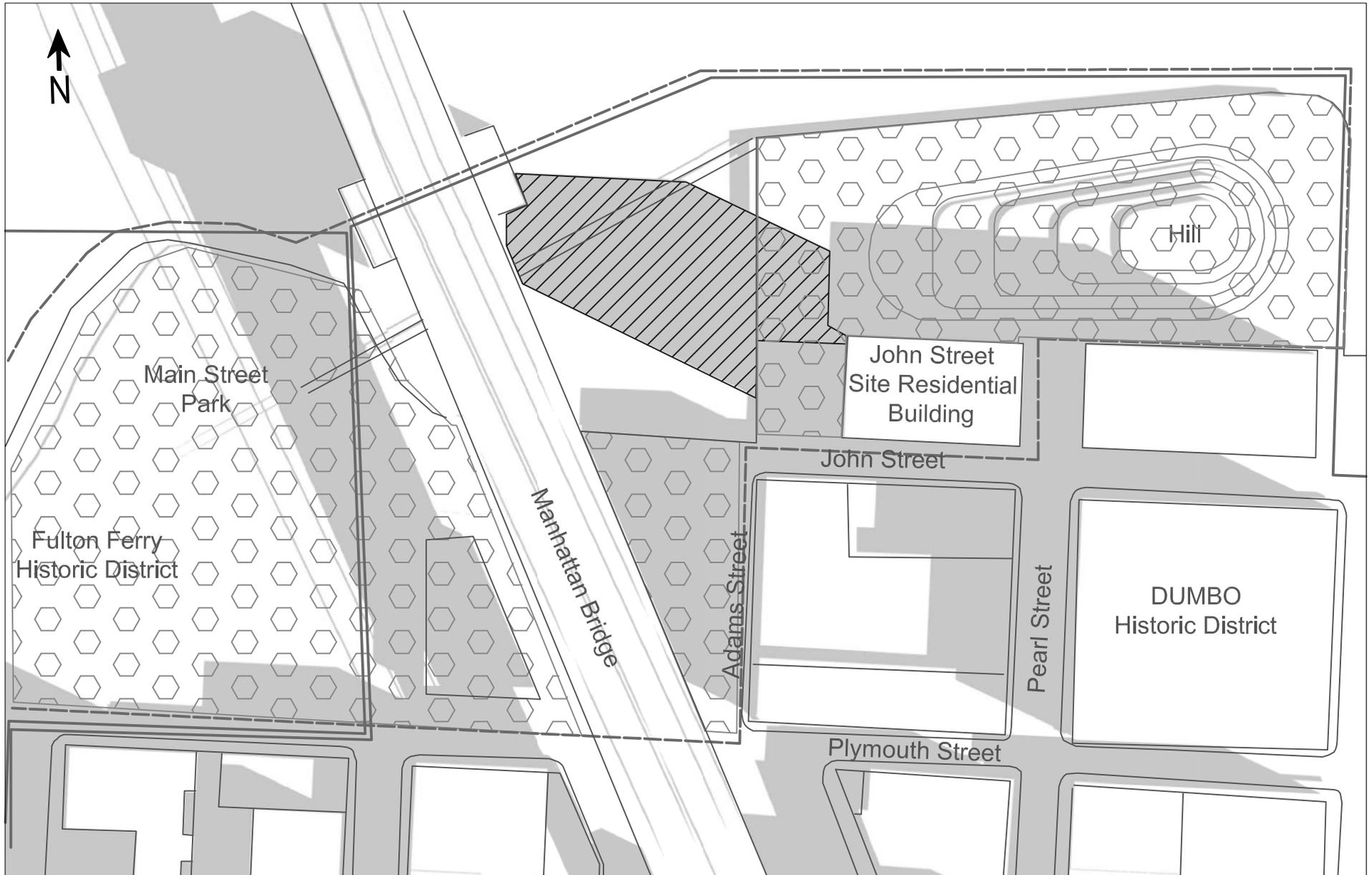
Pier 1 Area:Shadow Diagram
 December 21 11:30 AM EST
 Figure 6-27



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space



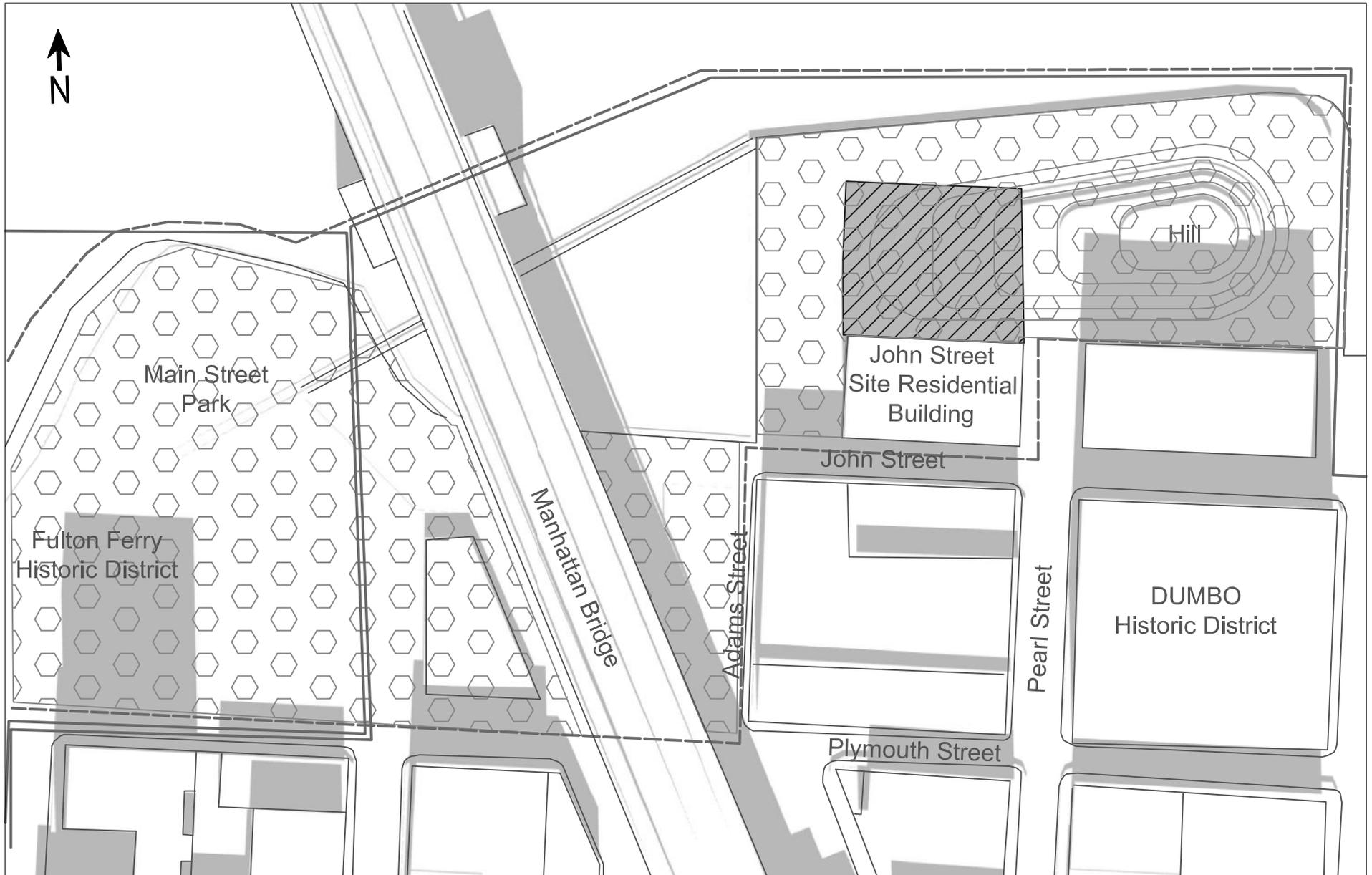
Pier 1 Area:Shadow Diagram
 December 21 2:15 PM EST
 Figure 6-28



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space/Historic District

Brooklyn Bridge Park

John Street Site:Shadow Diagram
March 21 8:30 AM EST
Figure 6-29

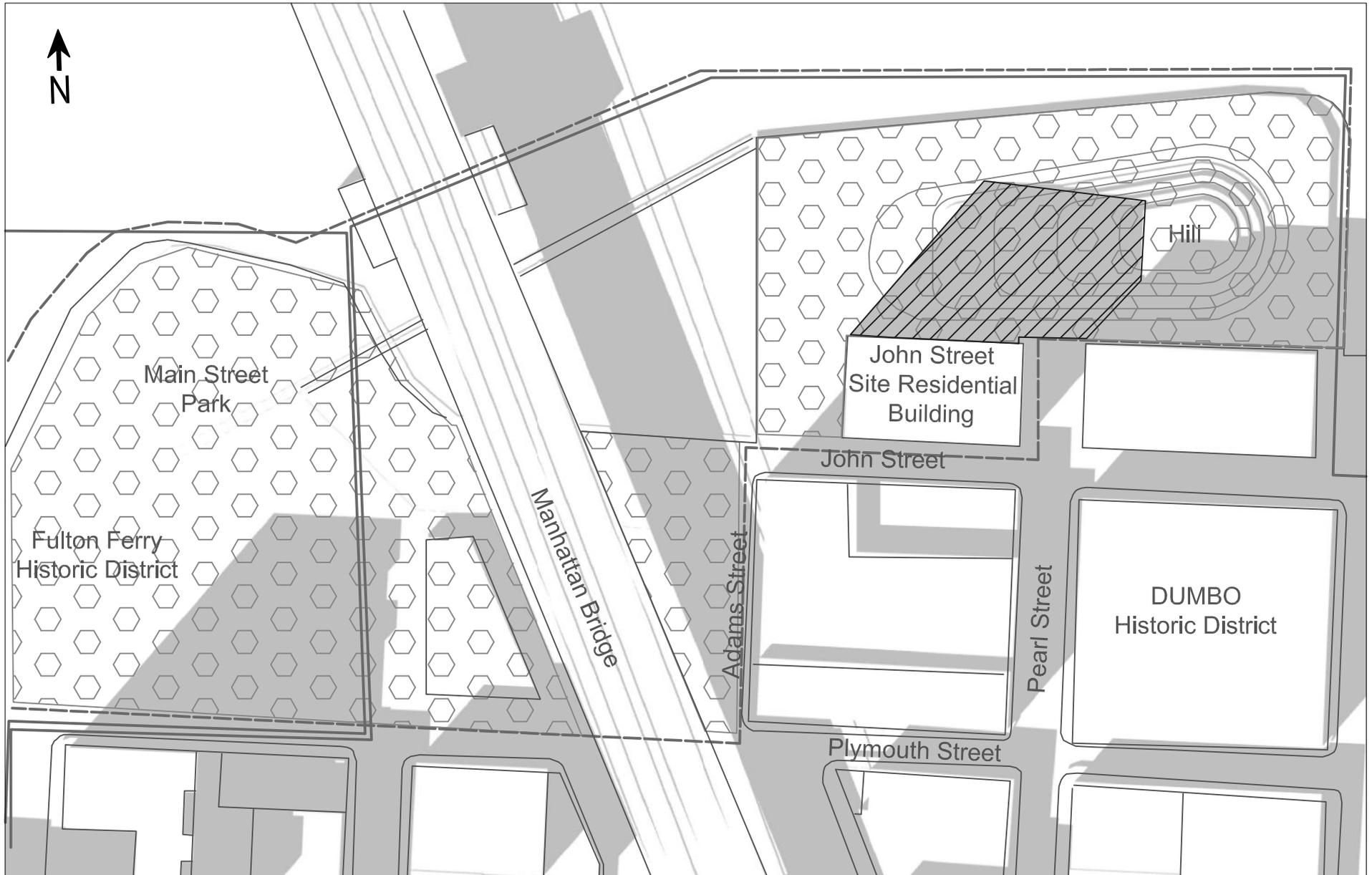


-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space/Historic District

0 100 FEET

John Street Site:Shadow Diagram
 March 21 12:00 PM EST
 Figure 6-30

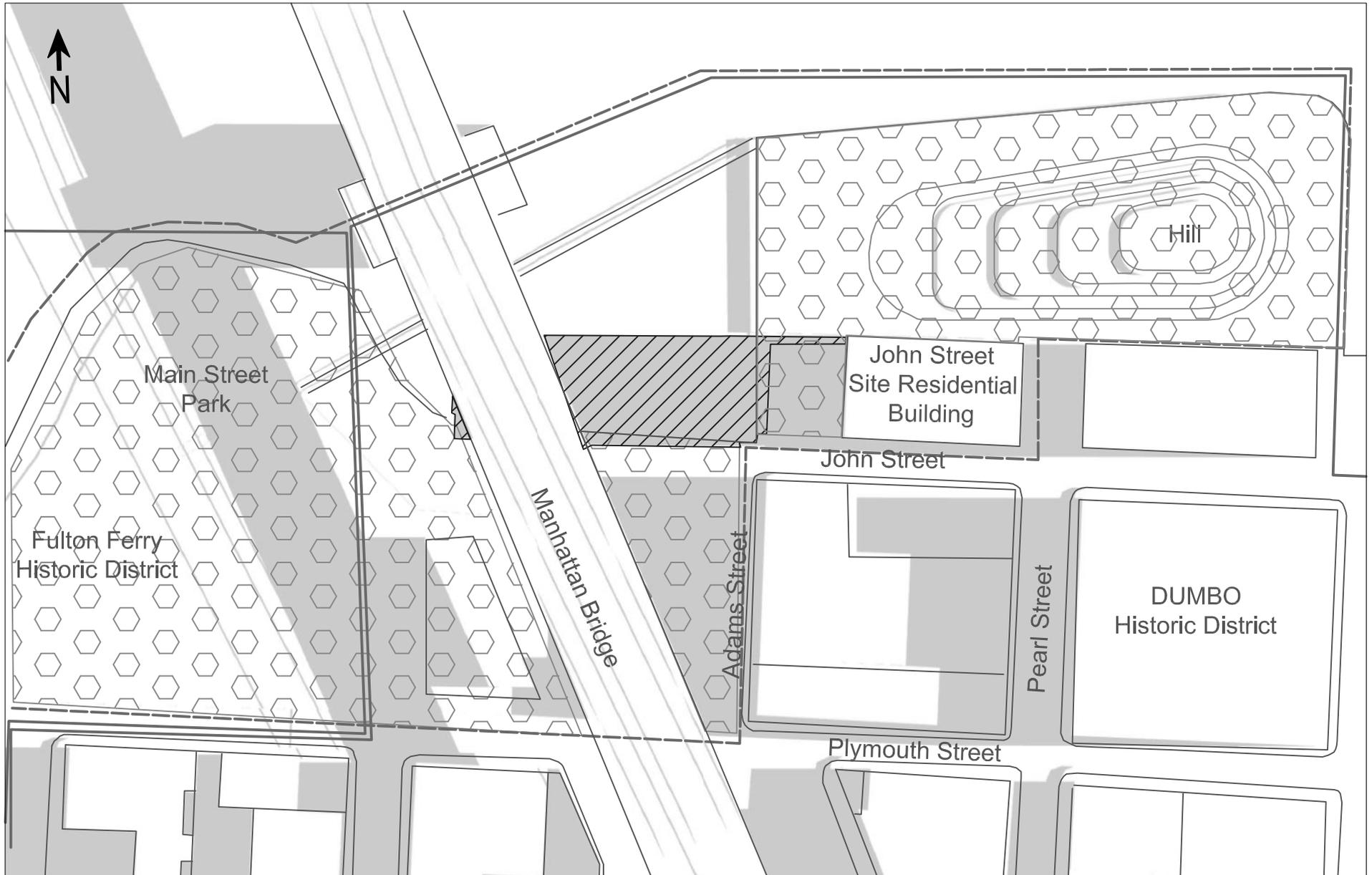
Brooklyn Bridge Park



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space/Historic District

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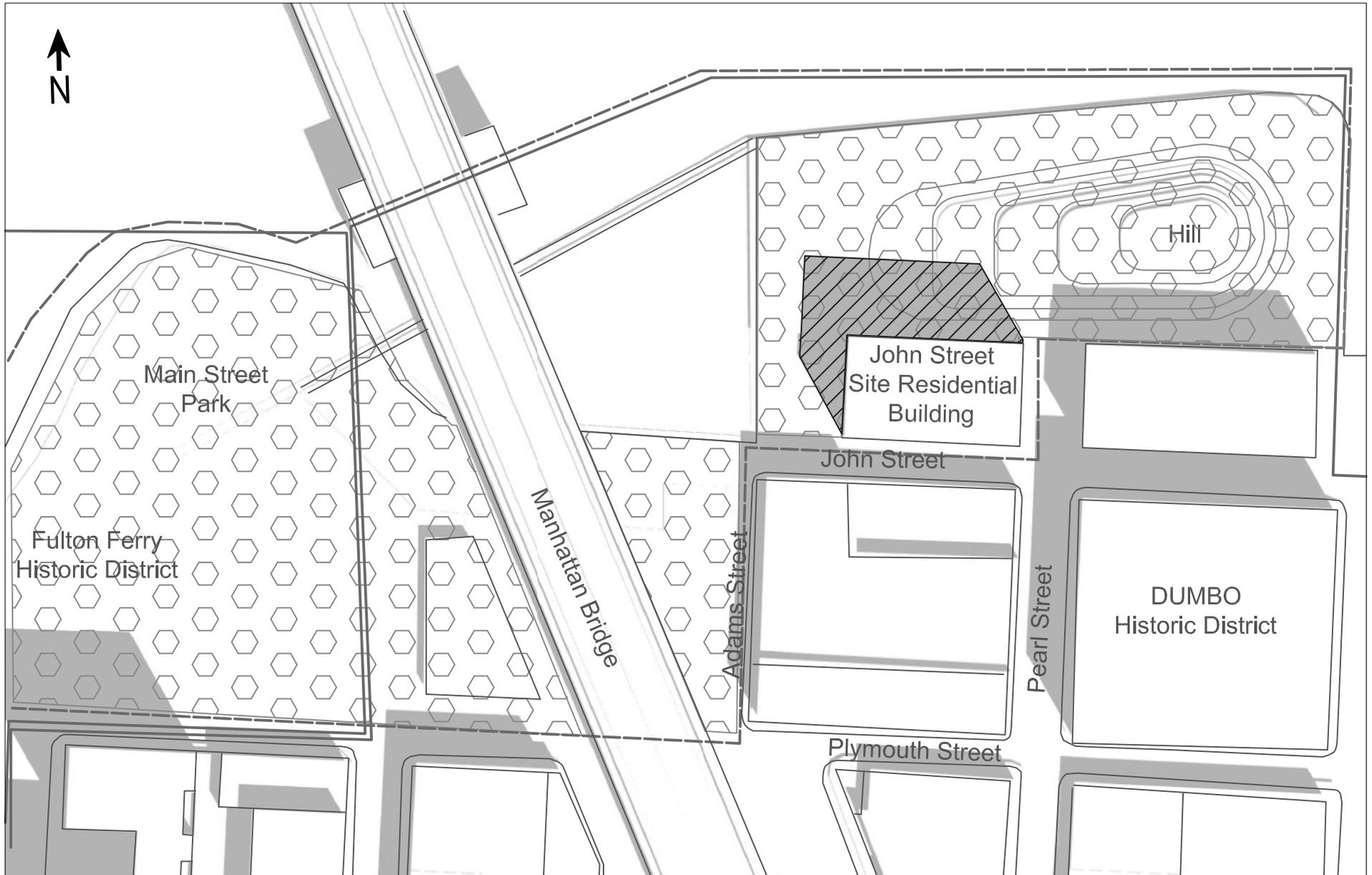
John Street Site:Shadow Diagram
 March 21 2:00 PM EST
 Figure 6-31



- Brooklyn Bridge Park Boundary
- Historic District Boundary
- Shadow
- Open Space
- Incremental Shadow on Open Space/Historic District

0 FEET 100

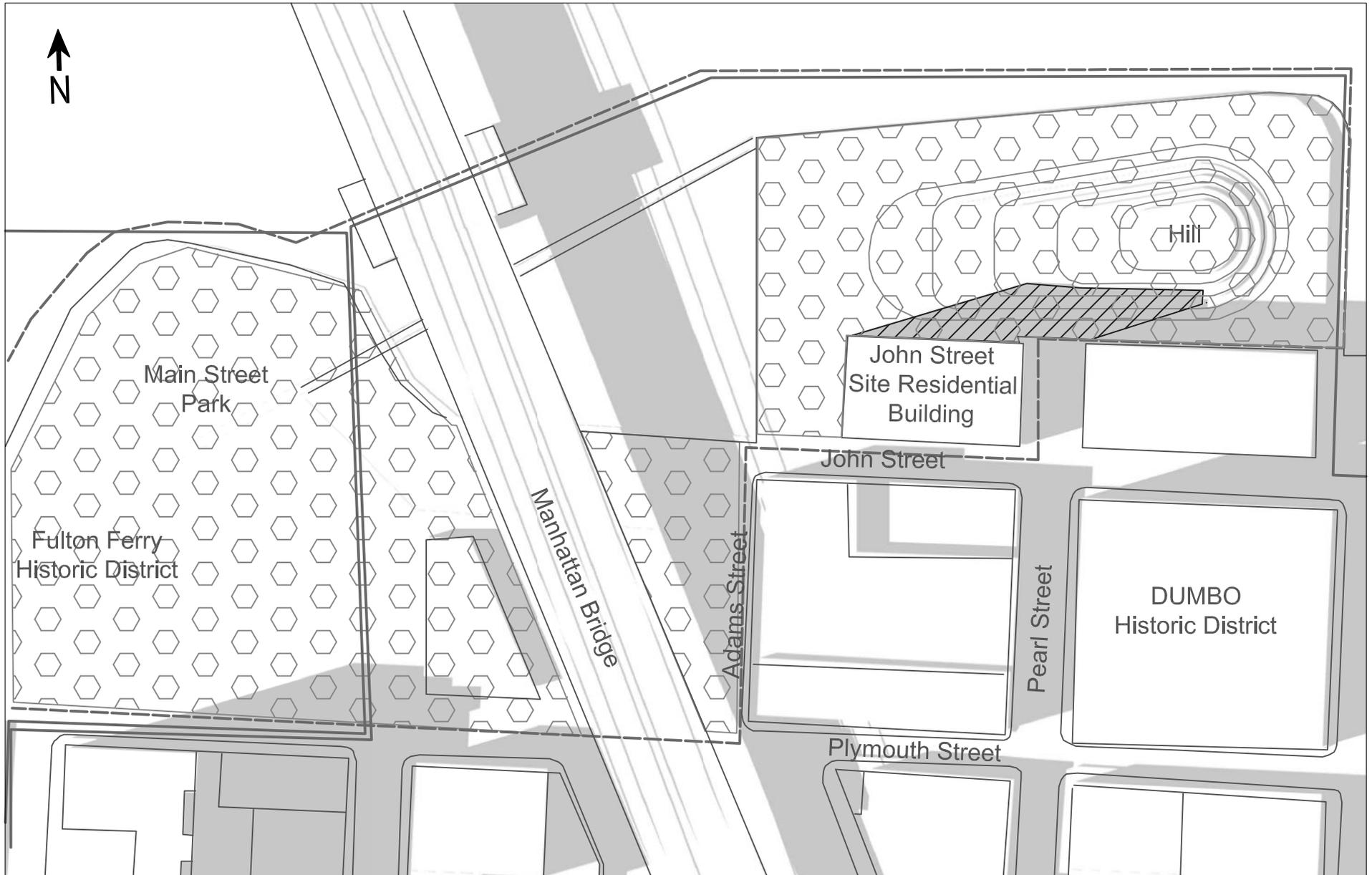
John Street Site:Shadow Diagram
 May 6 8:15 AM DST
 Figure 6-32



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space/Historic District



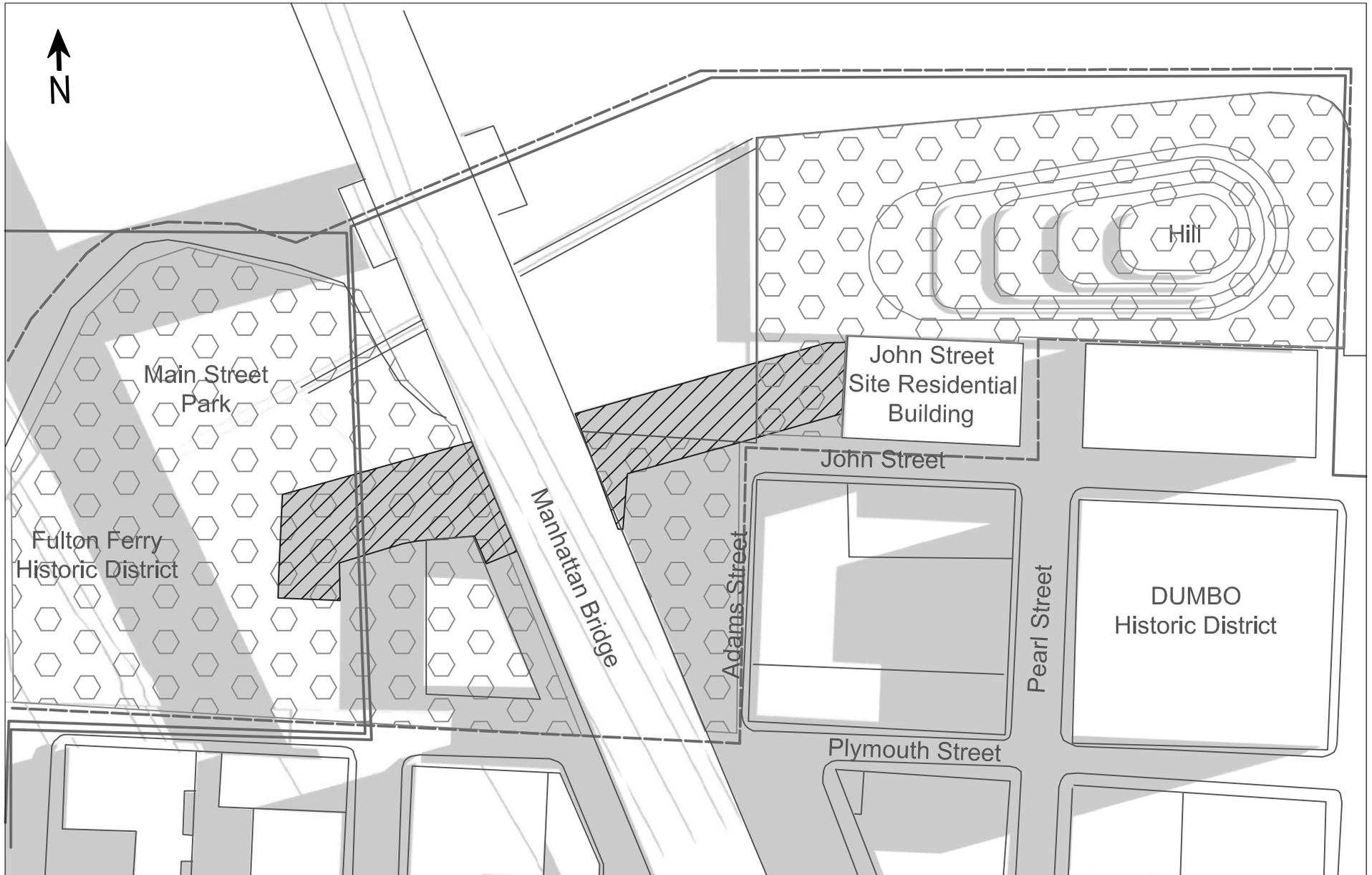
John Street Site:Shadow Diagram
 May 6 12:00 PM DST
 Figure 6-33



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space/Historic District

0 100 FEET

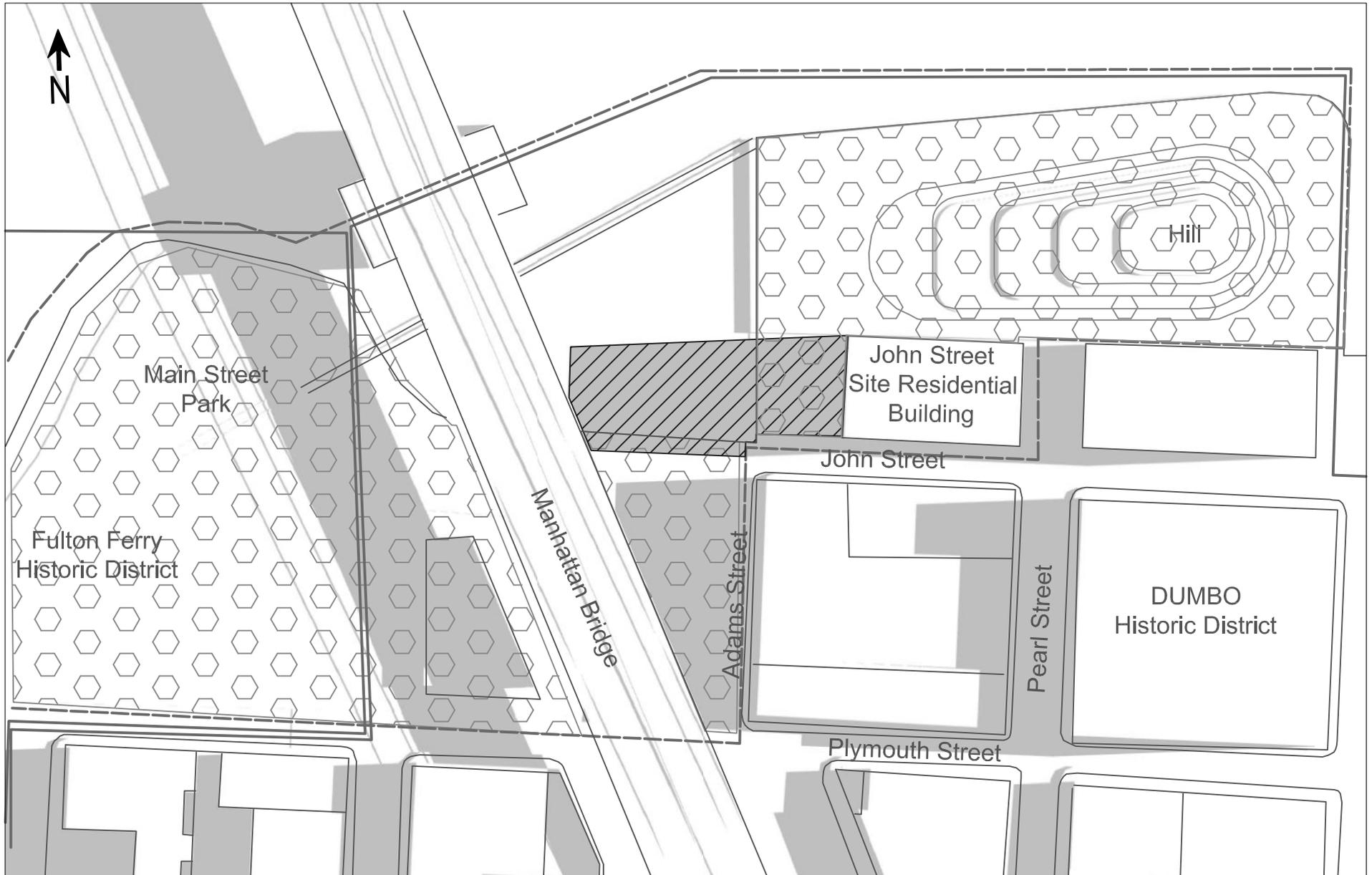
John Street Site:Shadow Diagram
 May 6 4:00 PM DST
 Figure 6-34



- Brooklyn Bridge Park Boundary
- Historic District Boundary
- Shadow
- Open Space
- Incremental Shadow on Open Space/Historic District

0 100 FEET

John Street Site:Shadow Diagram
 June 21 7:15 AM DST
 Figure 6-35



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space/Historic District

0 100 FEET

John Street Site:Shadow Diagram
 June 21 8:45 AM DST
 Figure 6-36

Brooklyn Bridge Park FEIS

portion of the waterfront open space (see Figure 6-37). The shadow would stretch further east, becoming narrower and smaller by 4 PM (see Figure 6-38).

DECEMBER 21—ANALYSIS PERIOD: 8:51 AM TO 2:53 PM EST

In December, the noon shadow (the shortest of the day) would cover the waterfront open space north of the proposed building (see Figure 6-39). At 2 PM, the shadow would move east, leaving a wedge of the waterfront in sun (see Figure 6-40).

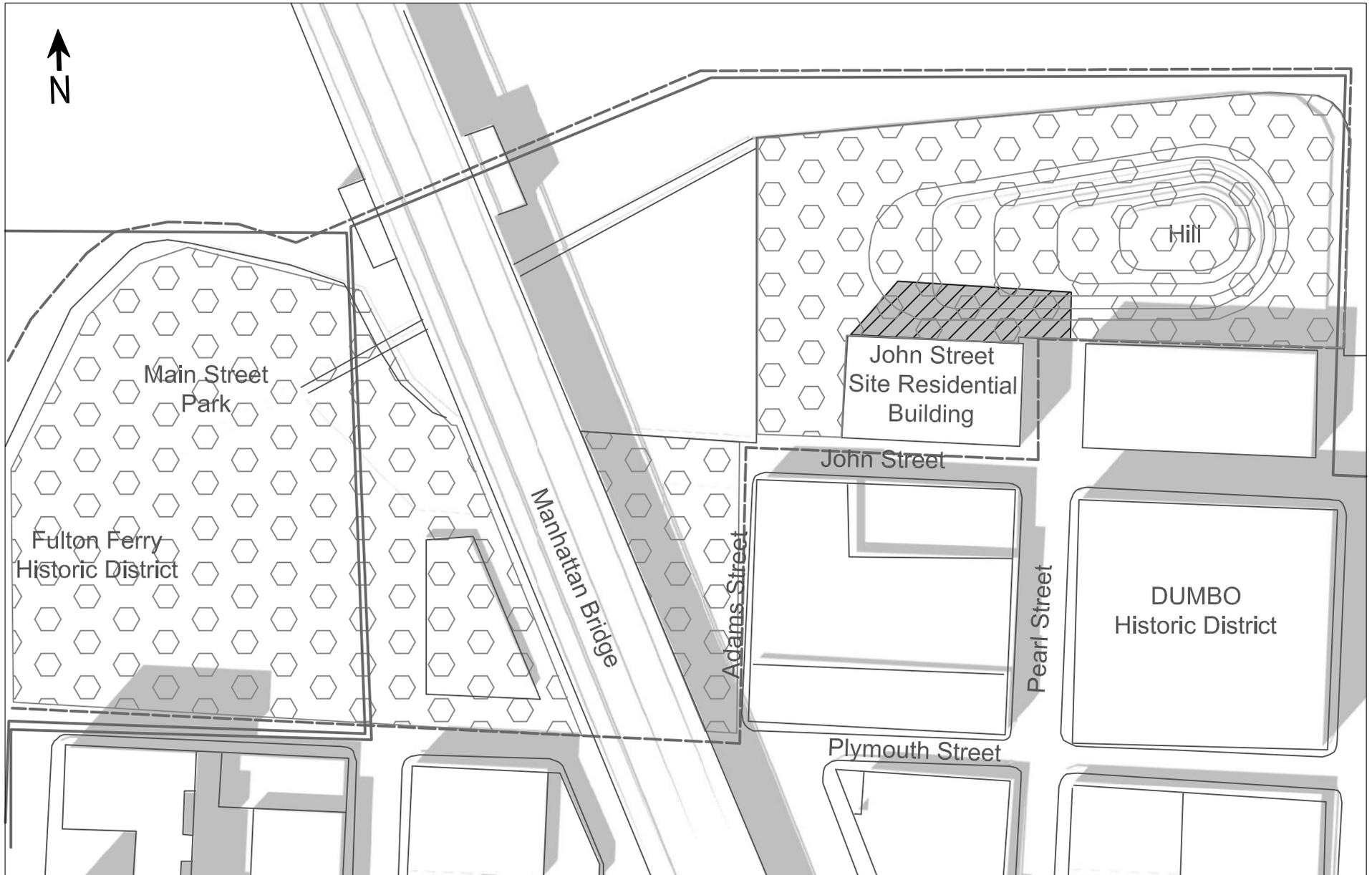
F. SHADOW EFFECTS BY RESOURCE

This section considers shadows by resource.

Table 6-1 shows the project shadow durations by open space and historic district.

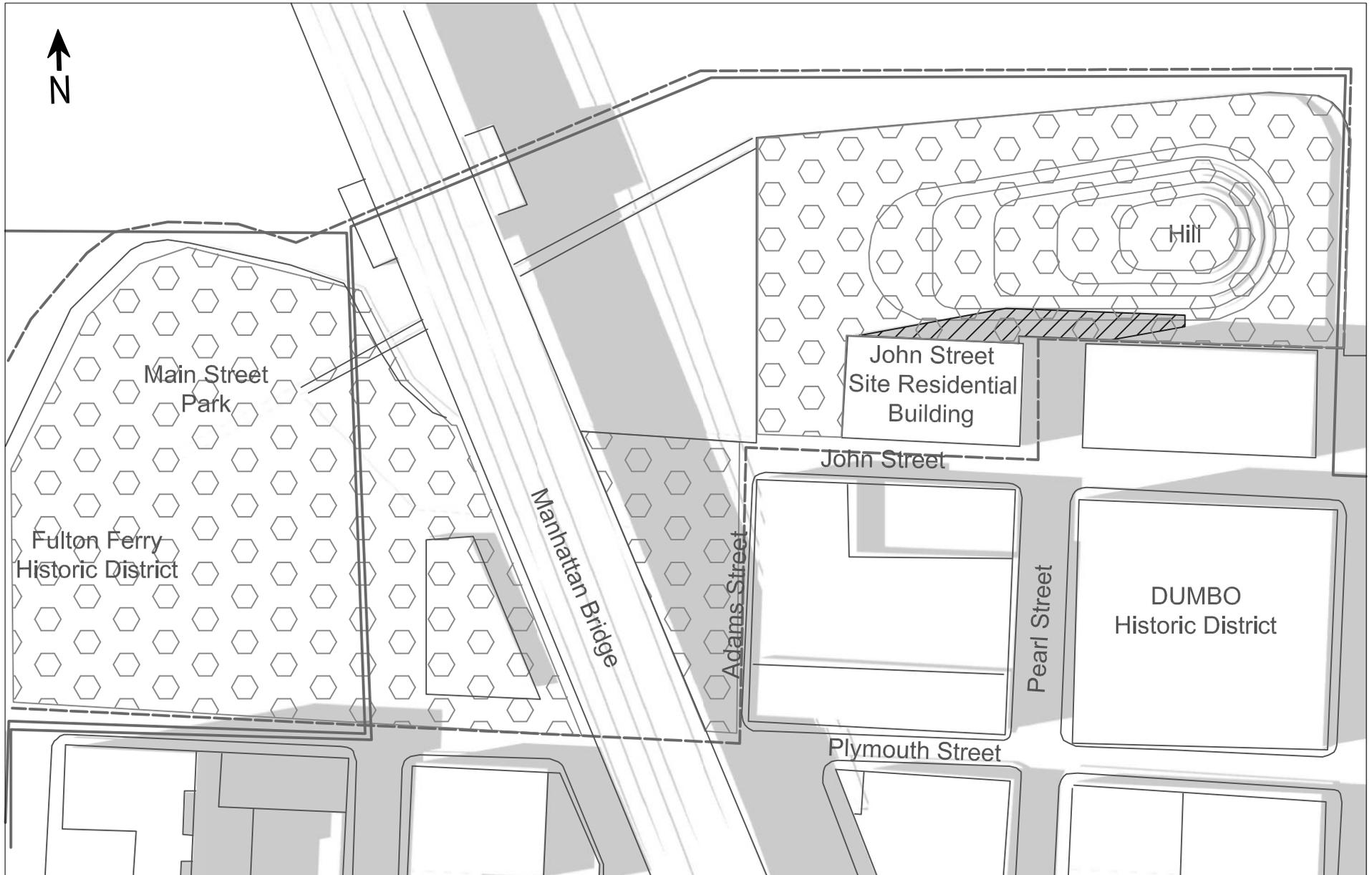
**Table 6-1
Shadow Increments on Open Spaces and Historic Districts**

Areas	Analysis Period 7:36 AM-4:29 PM March		Analysis Period 7:27 AM-6:18 PM May		Analysis Period 6:57 AM-7:01 PM June		Analysis Period 8:51 AM-2:53 PM December	
	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
Pier 6 Area								
Pier 6 Waterfront*	7:36 AM	11:15 PM	7:27 AM	12:00 PM	6:57 AM	12:00 PM	8:51 AM	12:45 PM
Pier 6 Waterfront**	7:36 AM	8:00 AM	7:27 AM	8:30 AM	6:57 AM	8:00 AM	—	—
Pier 6 Upland*	7:36 AM	4:29 PM	7:27 AM	6:18 PM	6:37 PM	7:01 PM	8:51 AM	2:53 PM
Pier 6 Upland**	9:45 AM	10:15 AM	8:30 AM	10:15 AM	8:45 AM	9:45 AM	10:15 AM	12:45 PM
Pier 5*	—	—	—	—	—	—	8:51 AM	12:45 PM
Pier 5**	7:45 AM	9:00 AM	—	—	—	—	8:51 AM	10:45 AM
Brooklyn Heights* Historic District	—	—	4:45 PM	6:18 PM	4:45 PM	7:01 PM	—	—
Brooklyn Heights** Historic District	3:45 PM	4:29 PM	4:30 PM	6:18 PM	4:45 PM	7:01 PM	—	—
Palmetto Playground	—	—	5:45 PM	6:18 PM	5:30 PM	7:01 PM	—	—
Pier 1 Area								
Marsh	7:36 AM	9:30 AM	7:27 AM	9:00 AM	6:57 AM	8:30 AM	8:51 AM	10:30 AM
Pier 1 Waterfront	7:36 AM	10:15 AM	7:27 AM	10:30 AM	6:57 AM	10:00 AM	8:51 AM	11:45 AM
Fulton Ferry Pier	—	—	—	—	—	—	1:45 PM	2:53 PM
Fulton Ferry Historic District	2:15 PM	4:29 PM	3:15 PM	6:18 PM	3:45 PM	7:01 PM	1:45 PM	2:53 PM
John Street Area								
Main Street Playground	7:36 AM	7:45 AM	7:27 AM	8:00 AM	6:57 AM	8:15 AM	—	—
Waterfront Open Space	8:15 AM	4:29 PM	9:15 AM	5:15 PM	10:00 AM	4:30 PM	8:51 AM	2:53 PM
Fulton Ferry Historic District	7:36 AM	7:45 AM	7:27 AM	7:45 AM	6:57 AM	7:30 AM	—	—
D.U.M.B.O. Historic District	7:36 AM	4:29 PM	7:27 AM	6:18 PM	6:57 AM	7:01 PM	8:51 AM	2:53 PM
Notes:								
* Shadow from new buildings.								
** Shadow from addition to 360 Furman Street.								
September 21 is the equivalent of March 21, but one hour later. April 6 is the equivalent of May 6.								



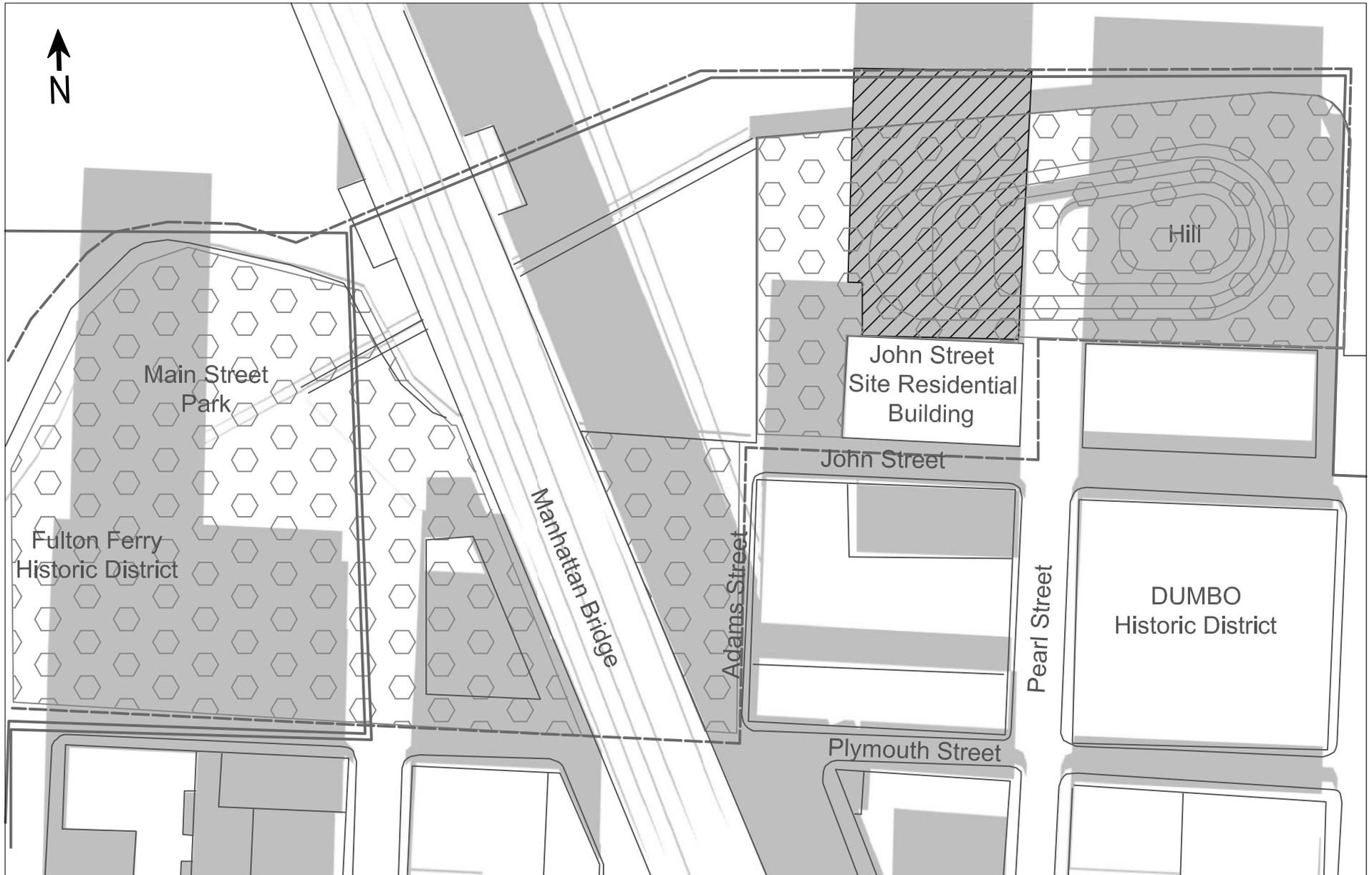
-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space/Historic District

John Street Site:Shadow Diagram
 June 21 2:00 PM DST
 Figure 6-37



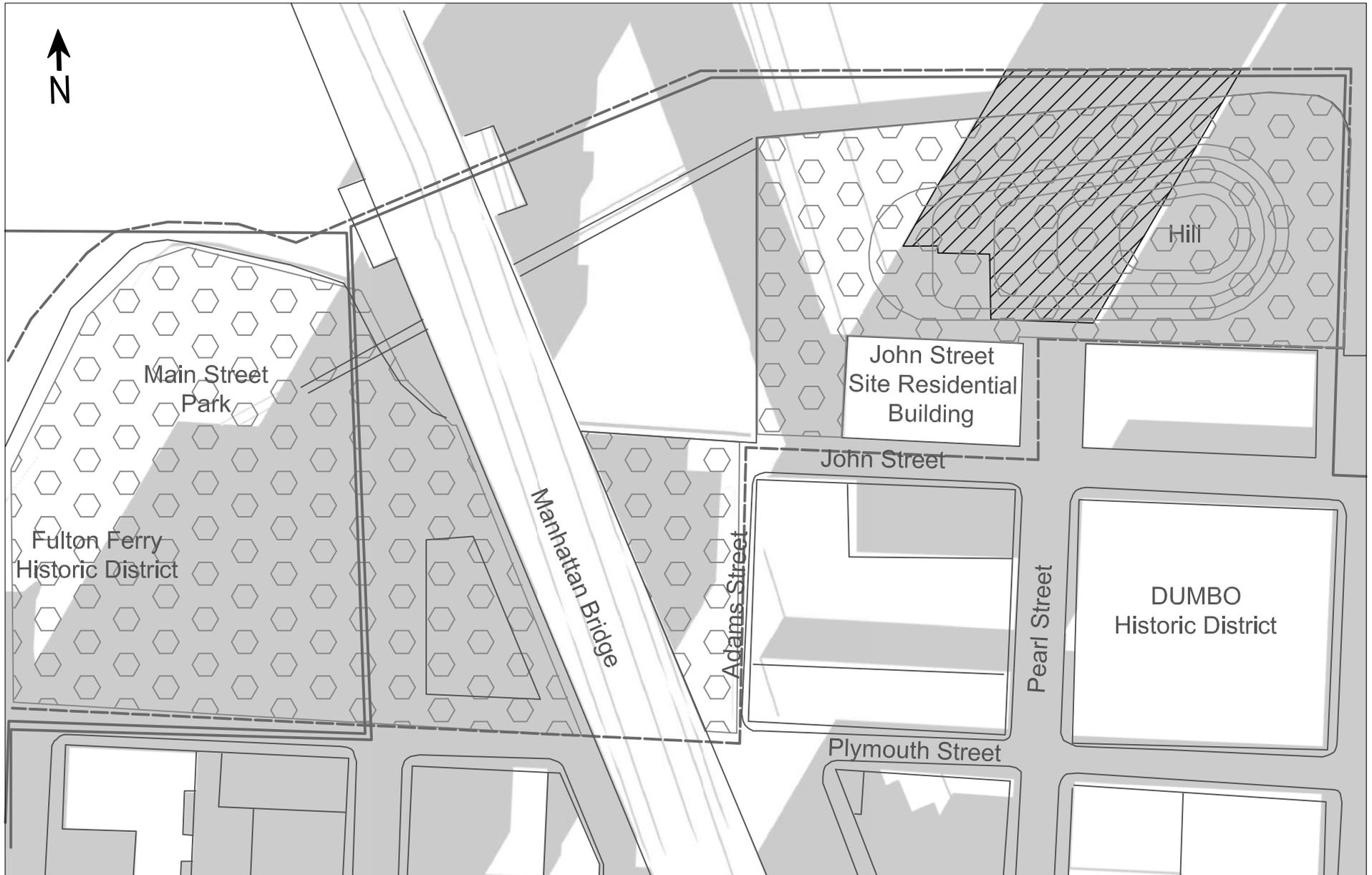
-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space/Historic District

John Street Site:Shadow Diagram
 June 21 4:00 PM DST
 Figure 6-38



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space/Historic District

John Street Site:Shadow Diagram
 December 21 12:00 PM EST
 Figure 6-39



-  Brooklyn Bridge Park Boundary
-  Historic District Boundary
-  Shadow
-  Open Space
-  Incremental Shadow on Open Space/Historic District

John Street Site:Shadow Diagram
 December 21 2:00 PM EST
 Figure 6-40

PALMETTO PLAYGROUND

Shadow from the taller of the two Pier 6 buildings would reach this open space at the very end of the analysis period (4:45 PM) on May 6/August 6 and near the end of the analysis period (4:45 PM) on June 21. However, given their short durations, neither shadow increment would be considered a significant adverse impact.

PIER 6

From March to September, the shadows from the taller Pier 6 building would stretch across varying sections of the pier during the morning. The addition to 360 Furman Street would also cast shadow on Pier 6 in the early morning and on the upland area later in the morning. These shadows would not affect active recreational pursuits, such as beach volleyball, but would, at times, diminish the attractiveness of the upland playground, particularly the water play area. The water play area would likely be used most intensively from May into September, when it would be in full sun from before noon through the end of the day. Similarly, the playground would be in full sun by noon and for the rest of the day. Given the amount of sun these open spaces receive throughout the day and especially in the afternoon, the morning shadow increments would not be considered a significant adverse impact.

Open spaces along Furman Street north and east of the two buildings would be in shadow much of the afternoon, and the northern one would receive shadow beginning in the morning. These areas are intended for landscaping around the buildings and would be planted with species that are tolerant of the anticipated level of sunlight. Furthermore, were it not for the buildings, these open spaces would not be created. Therefore, the shadows on these open spaces are not considered significant adverse impacts.

PIER 5

Shadow from the taller Pier 6 building would only reach Pier 5 in the winter. It would move quickly across the open space and be largely removed from it by 12:30 PM. Although sunlight is most appreciated in the colder months, the inclement winter weather itself would limit the use of the fields in winter. Shadows from the addition to 360 Furman Street would fall on Pier 5 in the morning from September to March for less than 2 hours. Given the limited occurrence and coverage, these shadows would not be considered a significant adverse impact.

MARSH AREA

Shadows from the south building in the Pier 1 upland area would fall on the marsh in the early morning in all seasons. However, they would be off this natural area by 10:30 AM, and consequently would not constitute a significant adverse impact because the marsh would enjoy full sunlight the rest of the day.

PIER 1 OPEN SPACES

Shadows from the north building on the Pier 1 upland area would fall on the hill and the landscaped areas in the morning in all seasons. The shadow would be off the hill and the landscaped area by around noon throughout the year, and even earlier in seasons other than winter. The small shadow that the waterfront restaurant building would cast on this open space would be insignificant. The size of the shadows would vary by season, and morning shadows would be smaller than afternoon shadows. Plantings in this open space area would take into

Brooklyn Bridge Park FEIS

account the amount of sunlight that could be expected. Overall, the shadows from the upland buildings and the restaurant would not have a significant adverse impact on the Pier 1 open spaces.

FULTON FERRY PIER

The shadow of the north building in the Pier 1 upland area would reach Fulton Ferry Pier only in the afternoon on the December analysis day. Even then it would only fall on a small part of the open space and would not be a significant adverse impact.

MAIN STREET PLAYGROUND

The proposed building on the John Street Site would cast shadow on the existing Main Street Playground area on the March, May, June, and August analysis days. However, this shadow would be off the open space by 7:45 in March/September, 8 AM in May/August, and 8:15 AM in June. Given the short duration in the early morning and its occurrence only in the warmer months, this shadow increment is not considered a significant adverse impact on the Main Street Playground.

JOHN STREET SITE WATERFRONT OPEN SPACE

Shadows from the proposed building on the John Street Site would fall on the water area to the east in the earlier part of the morning and move to cover more of the waterfront open space by noon. As the afternoon progresses, they would fall at a more easterly direction, and cover less of the open space area as they travel farther east. In December, however, the building shadows would cover much of the open space for most of the analysis period. The landscape design for this portion of the park would take these sunlight and shadow conditions into consideration. Since this open space is being created as part of the proposed Brooklyn Bridge Park Project which would also include construction of the new building on the John Street Site, the shadows on this open space are not considered a significant adverse impact.

BROOKLYN HEIGHTS HISTORIC DISTRICT

On the May and August analysis days shadows from the taller building on the Pier 6 upland would reach into the Brooklyn Heights Historic District from 4:15 PM until the end of the analysis period at 6:18 PM, but fall only on the roofs and backyards of houses along Columbia Place and Willow Place. On June 21, the 6 PM shadow of the taller building would reach into the Brooklyn Heights Historic District, but fall only on a small portion of Palmetto Playground. By the end of the analysis period at 7:01 PM, the shadow would cover somewhat more of the playground and reach the facades and roofs of buildings on Columbia Place and State Street. Shadows from the Pier 6 structures would not reach Brooklyn Heights Historic District on the December analysis day. Shadows from the addition to 360 Furman Street would also reach the Brooklyn Heights Historic District in the late afternoon except in December. Given their small size and brief duration, these incremental shadows are not considered a significant adverse impact on the Brooklyn Heights Historic District. Further, shadows from the Pier 1 structures would not fall on the Brooklyn Heights Historic District.

FULTON FERRY HISTORIC DISTRICT

Shadows from the north building in the upland area of Pier 1 would reach the southwest tip of the large Fulton Ferry Historic District late in the analysis period throughout the year. Shadows

from the building on the John Street Site would fall on the opposite end of the Fulton Ferry Historic District near the Manhattan Bridge in the early morning from March through September. Given the short durations of these increments and the extremely small portion of the historic district on which they would be falling, these shadows would not be considered significant adverse impacts.

D.U.M.B.O. HISTORIC DISTRICT

Shadows from the proposed building on the John Street Site would fall on the waterfront portions of the D.U.M.B.O. Historic District throughout the year and through the entire analysis period on each analysis day. Even with the long shadows in the winter time, these shadows would not be considered significant adverse impacts because they would fall on only an extremely small portion of the district and this area has no historic landscapes or buildings with sun-sensitive features. *