

A. INTRODUCTION

The proposed Atlantic Yards Arena and Redevelopment Project would result in the development of an arena, 16 buildings of varying heights, and a major new open space. This chapter examines the extent of incremental shadows (additional shadows beyond the baseline shadows) cast by the proposed project. The analysis focuses on sun-sensitive resources, which are defined in the 2001 *City Environmental Quality Review (CEQR) Technical Manual* as public open spaces, historic resources with significant sunlight-dependent features, and natural features (there are no natural features in the study area).

In accordance with CEQR criteria, an analysis of shadow increments is conducted to determine whether a proposed project would cause an impact on open spaces or sun-sensitive historic resources. According to the *CEQR Technical Manual*, a shadows analysis is required for any action that would result in new structures or additions to existing structures that would be located near sun-sensitive resources (particularly actions that propose buildings 50 feet in height or taller). The proposed 150-foot-tall arena and the proposed project's other buildings, which would range in maximum height from 184 to 650 feet (including mechanical), would result in an increase in shadow coverage on sun-sensitive resources (see Figure 9-1¹). The building shapes modeled to create this shadow sweep are shown in Figures 9-2 and 9-3. Therefore, a detailed shadows analysis, which included four representative days of the year, was conducted. These four representative days are discussed in further detail below.

This EIS analyzes the reasonable worst-case impacts on public open spaces and historic resources with sun-sensitive features that may occur as a result of the proposed project for both the 2010 and 2016 analysis years. As discussed in Chapter 2, "Procedural and Analytical Framework," the proposed project would allow for variation in the program to substitute commercial use for the hotel and some residential use on three of the project site buildings. The reasonable worst-case scenario for this analysis is assumed to be the commercial mixed-use variation because although both variations have the same building heights, the office buildings would be slightly bulkier than the residential buildings in order to incorporate the larger contiguous floorplates required for modern commercial office use. Therefore, the commercial mixed-use variation would cast slightly wider shadows.

PRINCIPAL CONCLUSIONS

These new buildings would cast new shadows at times throughout the year on some of the existing open spaces to the west, north, and east, as well as on the proposed new open space. However, this area of Brooklyn is already developed and the incremental shadows from the

¹ All figures can be found at the end of this chapter. Please also see the Shadow Diagram Locator key at the end of this chapter (precedes figures).

proposed project would have significant adverse impacts on only one public open space and one historic resource with sun-sensitive features. With the exception of the resources listed below, the existing open spaces and historic resources in the study area would not be significantly affected or affected at all.

Proposed mitigation for the shadow impacts on the public open space and historic resource is detailed in Chapter 19, "Mitigation."

OPEN SPACES

Of the 15 public open spaces that fall within the proposed project's shadow sweep, the shadows cast by the 2016 proposed project's buildings would result in a significant adverse impact on the open space resource of the Atlantic Terminal Houses, a New York City Housing Authority (NYCHA) development, located at the northeast corner of Atlantic and Carlton Avenues. This open space, divided into two separate areas by a one-story building, contains both passive and active use areas (see Figure 9-3a). With construction of Phase I (2010) these areas would both receive less than an hour of incremental shadow in the spring, late spring, late summer, and fall. These increases in shadows would not be considered to have a significant adverse impact on this open space due to their brief duration. However, with full development (2016), there would be additional shadow cast on this open space. Both parts of the open space would receive shadow all day in the winter. In the spring and fall, the Carlton Avenue side would receive shadow for most of the afternoon, and the Atlantic Avenue side would receive shadow for most of the analysis day. During late spring and late summer days, the Carlton Avenue side would receive shadow for a brief time at the end of the analysis period, but the Atlantic Avenue side would be in shadow for most of the afternoon. In summer, the project's incremental shadow would not reach the Carlton Avenue side, whereas the Atlantic Avenue side would be in shadow during the mid-afternoon hours. The Carlton Avenue side would receive less incremental shadow throughout the year than the Atlantic Avenue side. The project's incremental shadows would have a significant adverse impact on this open space when the weather is cooler and shadows are longer, in the spring, fall, and winter as they would diminish the attractiveness of this open space.

HISTORIC RESOURCES

Of the 14 designated and eligible historic resources that fall within the proposed project's shadow sweep, the shadows cast by the proposed buildings would result in a significant adverse impact on only one historic resource—the Church of the Redeemer (see Figure 9-3b). The other eligible or designated historic resources in the study area would not be significantly adversely affected by the proposed project. The proposed building on Site 5 would cast shadow to the west on the Church of the Redeemer (a State/National Register [S/NR]-eligible historic resource) at 24-32 4th Avenue, in the morning and during all seasons when this Phase I building is constructed. In the late spring, summer, and late summer, the durations would be the longest—just under four hours—lasting through most of the morning. The shadows would have a significant adverse impact because they would reduce light to the stained glass windows on the church's east façade when services are most likely to be taking place. However, morning services currently begin at 11:00 AM on Sundays.

B. METHODOLOGY

As described in the *CEQR Technical Manual*, a shadow assessment is required if the proposed project would contain new structures tall enough for the shadows to reach an open space or historic resource. Also, an assessment is required because the proposed project would result in new structures that would be 50 feet high or taller. For actions resulting in structures 50 feet high or taller, and for shorter structures adjacent to important features, a shadow assessment is required. The shadow screening analysis was used to identify the study area and those open spaces and historic resources that could be affected. The purpose of the shadow assessment was to define the extent and duration of additional or new shadows that the proposed project would cast on shadow-sensitive resources. The uses and vegetation in an open space determine its sensitivity to shadows. Uses that rely on sunlight include passive use, such as sitting or sunbathing, and such activities as gardening or children's wading 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.

Computer-generated simulations of the shadows caused by the proposed project during CEQR-defined representative times of the day during the year were prepared. 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 simulations were cast for the existing condition and the future with and without the proposed project. The 2010 and 2016 future with the proposed project simulations reflect shadows that would be cast by the proposed development and show the incremental difference in shadowing over the future without the proposed project.

The *CEQR Technical Manual* identifies the following situations when a proposed project 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 house of worship with stained glass windows) or where a comparatively large loss is not significant (for example, where vegetative species are not critical to the character of the open space and can be replaced with more shade-tolerant species). Although

these situations represent a general guideline for determining significant adverse impacts, each case is reviewed on its own merits.

The shadow diagrams and analysis presented in this chapter were developed using building envelope and topographical information supplied by Earthdata Solutions, LLC. The baseline condition includes building envelopes of projects expected to be complete in the future without the proposed project in both 2010 and 2016 as indicated in Chapter 2, “Procedural and Analytical Framework” (see Figures 9-4 through 9-23). The project sponsors provided the 3D model of the proposed project. Shadows were modeled using the solar rendering capabilities of MicroStation V8 software.

C. SHADOW SCREENING

For purposes of the shadow analysis, a maximum shadow study area (study area) was defined through the screening procedures as set forth in the *CEQR Technical Manual*. The screening procedure notes that the longest shadow that any structure could cast during the year is 4.3 times its height at the beginning and end of the December 21 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—Building 1—would be approximately 650 feet in height (including mechanical space on the roof), it would have a maximum shadow length of approximately 2,795 feet at the beginning and end of the December 21 analysis period, and a maximum shadow length of approximately 1,345 feet at 12:00 PM. 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; in June, shadows are cast up to 108 degrees southeast and 108 degrees southwest. Therefore, resources in the shadow sweep in June may be outside the shadow sweep in other months. The boundaries of the study area roughly extend to DeKalb Avenue to the north, Douglass and Bergen Streets to the south, Grand Avenue to the east, and Bond Street to the west (see Figure 9-1).

Because of the large number of open spaces and historic resources in the study area, a shadow screening analysis was performed to identify those open spaces or historic resources that could be affected by shadows from the buildings to be built as a result of the proposed project. Following the guidelines provided in the *CEQR Technical Manual*, a list of all sun-sensitive historic resources and open spaces was created within the area of the potential shadow sweep of the proposed buildings on the project site.

OPEN SPACES

Open spaces that would be out of shadow range of the proposed buildings, that would not be affected by project shadows due to intervening buildings, or that are in the area south of the project site (where no project shadow would fall) were eliminated from further analysis. Table 9-1 lists all of the existing public open spaces that fall within the maximum shadow length of the buildings on the project site and indicates which ones were eliminated from analysis for the reasons mentioned above.

Table 9-1
Shadows Screening: Open Spaces Considered for
Inclusion in the Shadows Analysis

Map Ref. ¹	Open Spaces Included in Analysis
A	Atlantic Terminal Plaza
B1	Atlantic Terminal Houses-Carlton Avenue Side
B2	Atlantic Terminal Houses-Atlantic Avenue Side
C	Dean Playground
D	Lowry Triangle
E	Cuyler Gore
F	Temple Square
G	Sixteen Sycamores Playground
H	P.S. 38/The Pacific School Playground
I	Wyckoff Gardens Open Space
J	Brooklyn Bear's Pacific Street Community Garden
K	Warren/St. Marks Community Garden
L	Baltic Street Community Garden at P.S. 133
M	Charles B. Wang Field/Brooklyn Technical High School
N	Gateway Triangle
O	South Oxford Park
Open Spaces Screened Out of Analysis	
P	Thomas Greene Playground
Q	Gowanus Houses Open Space
R	Brooklyn Bear's Rockwell Place Garden
S	Fowler Square at Fulton St. and Lafayette Avenue
T	Fort Greene Park
U	Greene Park/P.S. 11 Playground
V	Hollenbach Community Garden
W	Police Athletic League
X	North Pacific Playground and Greenthumb
Y	Edmunds/J.H.S. 294 Playground
Note:	
¹ See Figure 9-1.	

HISTORIC RESOURCES

Historic resources that fall within the maximum shadow length of the buildings on the project site were also identified. Based on the *CEQR Technical Manual*, historic resources with sunlight-dependent features (such as stained glass windows or historic landscapes) should be considered in shadow analyses. These resources included properties or districts listed on the S/NR (or found to be eligible for such listing), National Historic Landmarks (NHLs), and New York City Landmarks (NYCLs) and Historic Districts, and properties determined eligible for landmark status. These historic resources were also chosen based on their location within the study area, the likelihood of being affected by new shadows, and proximity to project site. As detailed in Chapter 7, "Cultural Resources," there are a number of designated or eligible historic resources within the study area (see also Table 9-2). Individual historic resources that lack sun-sensitive features are not considered further. Similarly, resources with sun-sensitive features facing away from the project site and not possibly affected by project shadows are also eliminated from further analysis. All historic districts within the shadow sweep are considered to the extent of determining where incremental shadows would be expected to fall. Determination of impact is made based on whether or not the area in shadow has sun-sensitive features and how much of the district is affected.

**Table 9-2
Shadows Screening: Historic Resources Considered
for Inclusion in the Shadows Analysis**

Map Ref. ¹	Historic Resources Included in Analysis
1	United Methodist Church ²
2	Church of the Redeemer
3	Atlantic Terminal Control House
4	Hanson Place Baptist Church
5	St. Joseph's Roman Catholic Church
6	Williamsburgh Savings Bank Building
7	Bergen/Dean Street historic district
8	Boerum Hill Historic District
9	Brooklyn Academy of Music (BAM) Historic District
10	Fort Greene Historic District
11	Clinton Hill Historic District
12	Clinton Avenue historic district
13	Swedish Baptist Church/Dean Street historic district
14	Prospect Heights Historic District
Historic Resources Screened Out of Analysis	
15	Proposed Park Slope Historic District Expansion
16	522-550 State Street
17	The Church of St. Luke and St. Matthew
18	Clinton Hill South Historic District
19	2-story frame house at 505 Clinton Avenue
20	2½-story frame house at 525-536 Clinton Avenue
21	Former Public School 15
22	Brooklyn Public Library, Pacific Branch
23	The Telephone Building at 547-555 Clinton Avenue
24	Four 4-story residential buildings at 548-560 Dean Street
25	Ten 4-story residential buildings at 531-549 Bergen Street
26	78th Precinct Police Station
27	Peter F. Reilly & Sons Furniture Storage
28	Twenty-six 3- and 4-story residential buildings adjacent to the proposed Park Slope Historic District Expansion)
29	2-story commercial building at 62-64 6th Avenue
30	One 3½-story frame rowhouse at 413 Dean Street
31	Two 3-story rowhouses at 529 and 531 Atlantic Avenue
32	Former Brooklyn Printing Plant of the New York Times
33	Brooklyn High School of the Arts
34	Former Federal Brewing Co.
35	Five 3-story residential buildings at 542-534 Bergen Street
Notes:	
¹ See Figure 9-1.	
² Located in the Bergen/Dean Street historic district.	

A number of historic resources were not considered further for a variety of reasons, including the nature of these resources and their location (distance and direction) in relation to the project site. Only a small portion of the proposed expansion of the Park Slope Historic District is located within the projected shadow sweep of the proposed project; further analysis revealed that shadows from the proposed project would not reach the Clinton Hill South Historic District.

The stained glass windows of the Church of St. Luke and St. Matthew and the two-and-a-half-story frame house at 525-536 Clinton Avenue face east and away from the project site and, therefore, would not be affected by the new shadows. Further, the frame house lacks significant sun-sensitive features. Similarly, the rowhouses at 522-550 State Street face north away from the project site. The former Brooklyn Printing Plant of the *New York Times* and the Brooklyn School

of the Arts face west and would not be affected. The remaining historic resources were excluded because of their lack of sun-sensitive features.

D. RESOURCES OF CONCERN FOR FURTHER ANALYSIS

OPEN SPACES

EXISTING OPEN SPACES

Open spaces included in the shadows analysis are briefly described below. They consist of playgrounds, community gardens, public plazas and seating areas, small parks, and open space associated with public housing developments.

Atlantic Terminal Plaza

This 0.5-acre triangular plaza is located on the northeast corner of Atlantic and Flatbush Avenues opposite the proposed location of Building 1. This plaza is paved and has landscaping and trees, as well as tables with umbrellas and chairs in the summer months and 12 benches located along its perimeter.

Atlantic Terminal Houses

The Atlantic Terminal Houses are located on the northeast corner of Atlantic and Carlton Avenues opposite proposed Building 8. The development is 31 stories tall and contains 300 residential units. It is surrounded by lawns, trees, walkways, benches, and playgrounds. The open space surrounding this development is physically divided into two parts by a one-story senior citizens center: the Carlton Avenue side, the northern half of the open space; and the Atlantic Avenue side, the southern half. The Carlton Avenue side is the portion of the open space along Carlton Avenue that is mostly paved and has play equipment and a seating area in the landscaped south end. The open space along Atlantic Avenue includes a seating area and a playground with new equipment to the east. The seating area is heavily shaded by mature trees. It is accessible to anyone on Atlantic Avenue, but there is no direct access from either the residential building or the senior center. There is also a basketball court on the northeast corner of the Atlantic Terminal Houses site; this location limits its use to residents only.

Dean Playground

Dean Playground, located on the south side of Dean Street between 6th and Carlton Avenues, is mostly paved and is predominantly used for active recreation. Amenities include playground equipment and basketball and handball courts.

Lowry Triangle

This small, passive open space on the south side of Atlantic Avenue, one full block to the east of the project site between Underhill and Washington Avenues, contains trees and a seating area.

Cuyler Gore

Cuyler Gore is an open space located one block to the north of the project site on a triangular block bordered by Fulton Street and Greene and Carlton Avenues. The 1.19-acre open space has trees, landscaped areas, benches and play areas with jungle gyms, and other play equipment.

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Temple Square

This small seating area is located northwest of the project site at the intersection of Flatbush and Lafayette Avenues.

Sixteen Sycamores Playground

This open space is located on the south side of Schermerhorn Street between Nevins Street and 3rd Avenue and contains facilities for active and passive uses and public restrooms.

P.S. 38/The Pacific School Playground

The new open space at P.S. 38 includes a turf field surrounded by running tracks, a basketball court, baseball diamond, and new jungle gym.

Wyckoff Gardens Open Space

The open space at the Wyckoff Gardens housing development includes lawns, benches, walkways, trees, playgrounds, and basketball and handball courts.

Brooklyn Bear's Pacific Street Community Garden

This community garden is located at the intersection of Flatbush Avenue and Pacific Street between Building 1 and the proposed building on Site 5.

Warren/St. Marks Community Garden

This community garden is located in the midblock south of St. Marks Place between 4th and 5th Avenues.

Baltic Street Community Garden at P.S. 133

This open space is located along 4th Avenue between Baltic and Butler Streets and includes a community garden and a playground.

Charles B. Wang Field/Brooklyn Technical High School

This open space, the athletic field for Brooklyn Technical High School, is located on the southwest corner of Fulton Street and Clermont Avenue. It includes a playing field surrounded by a large running track that is open to the public. There are also bleachers for spectator seating.

Gateway Triangle

The 0.07-acre Gateway Triangle is located at the intersection of Gates and Vanderbilt Avenues and Fulton Street. This open space, which is locked and inaccessible at most times, has been developed into a garden with a wide variety of trees, plants, flowers, and other landscaping.

South Oxford Park

This new park is located at South Oxford Street and Atlantic Commons, north of Building 6 across Atlantic Avenue and beyond a townhouse development. The 0.6-acre park consists of active and passive open space and features asphalt tennis courts, playground equipment, spray showers, a synthetic turf oval, a casual play area, and a community garden.

PROPOSED PROJECT'S PUBLICLY ACCESSIBLE OPEN SPACE

By 2016, Phase II of the proposed project would result in the creation of at least seven acres of publicly accessible open space on the eastern portion of the project site (east of 6th Avenue). This open space would be an integral part of the proposed project and a substantial amenity for the surrounding communities. This open space would include areas for passive recreation use (plazas, seating, fountains, gardens, and lawn areas) and active recreational use (volleyball, bocce, children's playgrounds, a half basketball court and a bicycle path). In addition, the proposed project would provide a private open space on portions of the roof of the arena by the 2010 analysis year. See Chapter 1, "Project Description," and Chapter 6, "Open Space and Recreational Facilities," for more details.

HISTORIC RESOURCES

The Brooklyn Academy of Music (BAM), Bergen/Dean Street, Swedish Baptist Church/Dean Street, and Clinton Avenue historic districts are in the shadow sweep. Portions of the larger Boerum Hill, Fort Greene, Clinton Hill, and Prospect Heights Historic Districts are also in the shadow sweep. The BAM Historic District, as well as the S/NR Fort Greene Historic District, include the Williamsburgh Savings Bank Building described below under individual resources.

The Bergen/Dean Street historic district contains the United Methodist Church, which is described below as an individual resource. In the Swedish Baptist Church/Dean Street historic district, the Swedish Baptist Church is actually south of the project and faces south away from the project. The portion of the Prospect Heights Historic District opposite Building 14 is composed of three- and four-story rowhouses.

There are also several individual historic resources with sun-sensitive features in the shadow sweep. The Williamsburgh Savings Bank Building north of the arena block and Site 5, has large windows that allow light into the six-story-high banking hall and are considered important sun-sensitive features. The Atlantic Terminal Control House is immediately north of Site 5. Although its historic function was not sun-related, it has been renovated and currently serves as a skylight to the station below. The Hanson Place Baptist Church, located at 88 Hanson Place to the north of the project site, has stained glass windows along both its long sides, one of which faces west along South Portland Avenue. St. Joseph's Roman Catholic Church, an ornate Italian Renaissance Revival structure, is located southeast of the project site. Its main façade, which faces north to Dean Street, contains a large, stained glass window at the upper level. Its east and west façades also have stained glass windows, and a garden area surrounds it. There are two more churches that are potential historic resources with sun-sensitive features. The United Methodist Church on the south side of Dean Street west of the proposed project has stained glass windows on its principal façade facing northeast toward Building 1. The façade of the Church of the Redeemer facing east to 4th Avenue also contains stained glass windows.

E. ASSESSMENT OF SHADOW IMPACTS

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

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the northeast and east. At the end of the day, just before the sun sets in the west, shadows are very slightly shorter than just after sunrise.

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 those seen in other seasons, and its late sunset and early sunrise creates shadows earlier in the morning and later in the evening than in other seasons.

Tables 9-3 and 9-4 show the extent and duration of the proposed project’s shadows. This is illustrated in Figures 9-2 and 9-3 and 9-24 through 9-63. A shadow diagram locator table is located at the end of this chapter.

Table 9-3
Duration of Incremental Shadow on Open Spaces in Phase I—2010

Map Ref. ¹	Open Space Resource	March 21 (Analysis Period: 7:36 AM - 4:29 PM)	May 6 (Analysis Period: 7:27 AM - 6:18 PM DST)	June 21 (Analysis Period: 6:57 AM - 7:01 PM DST)	December 21 (Analysis Period: 8:51 AM - 2:53 PM)
A	Atlantic Terminal Plaza	8:30 AM - 4:29 PM	11:15 AM - 3:00 PM 4:00 PM - 6:18 PM	12:00 PM - 1:45 PM 4:00 PM - 6:15 PM	8:51 AM - 2:53 PM
B1	Atlantic Terminal Houses- Carlton Avenue Side	4:15 PM - 4:29 PM	6:00 PM - 6:15 PM	-	-
B2	Atlantic Terminal Houses-Atlantic Avenue Side	4:15 PM - 4:29 PM	5:30 PM - 6:18 PM	-	-
C	Dean Playground	-	-	-	-
D	Lowry Triangle	-	-	-	-
E	Cuyler Gore	-	-	-	1:15 PM - 2:53 PM
F	Temple Square	-	-	-	9:15 AM - 9:30 AM
G	Sixteen Sycamores Playground	-	-	-	8:51 AM - 9:15 AM
H	P.S. 38/The Pacific School Playground	7:36 AM - 7:45 AM	-	-	-
I	Wyckoff Gardens Open Space	-	7:27 AM - 7:45 AM	6:57 AM - 7:15 AM	-
J	Brooklyn Bear’s Pacific Street Community Garden	7:36 AM - 9:45 AM	7:27 AM - 11:00 AM	7:15 AM - 11:30 AM 6:15 PM - 7:01 PM	8:51 AM - 9:15 AM
K	Warren/St. Marks Community Garden	-	-	6:57 AM - 7:30 AM	-
L	Baltic Street Community Garden	-	-	6:57 AM - 7:15 AM	-
M	Charles B. Wang/Brooklyn Technical High School	3:15 PM - 4:29 PM	-	-	-
N	Gateway Triangle	-	-	-	-
O	South Oxford Park	1:45 PM - 4:29 PM	3:15 PM - 3:30 PM 5:00 PM - 5:15 PM	-	1:45 PM - 2:53 PM

Note: ¹ See Figure 9-1.

PHASE I—2010

Tables 9-3 and 9-4 indicate the duration of the incremental shadows of the proposed project on the open spaces and sun-sensitive historic resources from Phase I of the proposed project.

Table 9-4
Duration of Incremental Shadow on Historic Resources in Phase I—2010

Map Ref. ¹	Historic Resource	March 21 (Analysis Period: 7:36 AM - 4:29 PM)	May 6 (Analysis Period: 7:27 AM - 6:18 PM DST)	June 21 (Analysis Period: 6:57 AM - 7:01 PM DST)	December 21 (Analysis Period: 8:51 AM - 2:53 PM)
1	United Methodist Church	7:36 AM - 7:45 AM	7:27 AM - 9:15 AM	6:57 AM - 8:45 AM	-
2	Church of the Redeemer ²	7:36 AM - 9:45 AM	7:27 AM - 11:15 AM	7:30 AM - 11:15 AM	8:51 AM - 9:15 AM
3	Atlantic Terminal Control House	9:15 AM - 10:00 AM 11:00 AM - 1:30 PM	12:30 PM - 1:30 PM	-	8:51 AM - 2:30 PM
4	Hanson Place Baptist Church	-	-	-	11:45 AM - 12:30 PM
5	St. Joseph's Roman Catholic Church	-	-	-	-
6	Williamsburgh Savings Bank Building	-	-	-	11:30 AM - 1:15 PM
7	Bergen/Dean Street historic district	7:36 AM - 8:00 AM	7:25 AM - 9:15 AM	6:57 AM - 9:00 AM	-
8	Boerum Hill Historic District	7:36 AM - 7:45 AM	-	-	-
9	BAM Historic District	-	-	-	11:30 AM - 2:15 PM
10	Fort Greene Historic District	2:30 PM - 4:00 PM	-	-	11:45 AM - 2:53 PM
11	Clinton Hill Historic District	-	-	-	-
12	Clinton Avenue historic district	-	-	-	-
13	Swedish Baptist Church/Dean Street historic district	-	4:45 PM - 6:18 PM	4:15 PM - 7:01 PM	-
14	Prospect Heights Historic District	-	6:00 PM - 6:18 PM	6:00 PM - 7:01 PM	-

Notes:
¹ See Figure 9-1.
² Resource with significant adverse impact.

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

Open Spaces

At the beginning of the analysis period, Building 1 and the building on Site 5 would cast shadow on P.S. 38/The Pacific School Playground (see Figure 9-24). The incremental shadow would move quickly (see Figure 9-25) and be off the open space by 7:45 AM. The shadow of Building 1 would completely cover the Brooklyn Bear's Pacific Street Community Garden at the beginning of the analysis period, but it would move north and exit the garden by 9:45 AM. The garden would be in sunlight for most of the day until the end of the analysis period when existing shadows would begin to fall on the garden.

Building 4 would begin to cast shadow on Atlantic Terminal Plaza at 8:30 AM. This incremental shadow would move east across this open space, and by 9:30 AM, the incremental shadow from Building 1 would begin to fall on the Atlantic Terminal Plaza (see Figures 9-24 through 9-28). Shortly before 12:00 PM, the incremental shadow of Building 1 would cover all of Atlantic Terminal Plaza. The incremental shadow would then move east and south, which would mean sun light would begin to reach the northwest corner of the open space (see Figure 9-26). By 2:30 PM, the Building 1 shadow would cover less than half of the open space (see Figure 9-27). The building on Site 5 would cast shadow on Atlantic Terminal Plaza from just after 2:30 PM until the end of the analysis period, when shadow from Building 1 and Site 5 would cover most of this open space (see Figure 9-28).

Incremental shadow from Building 4 would begin to reach South Oxford Park by 1:45 PM. From the northwest corner of the open space, it would move southeast, covering as much as half the open space at one time (see Figure 9-27). Building 1 would also cast incremental shadow on the park by 3:45 PM. Both of the buildings would cast shadow on the open space until the end of the analysis period at 4:29 PM (see Figure 9-28). South Oxford Park would be free of shadows

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from the proposed project until mid-afternoon, and intermittently thereafter as the shadows from Buildings 1 and 4 move eastward as the day progresses.

From 4:15 to the end of the analysis period at 4:29 PM, shadow from Building 3 would reach both parts of the Atlantic Terminal Houses open space (see Figure 9-28). Shadow from Building 4 would reach a small part of the Charles B. Wang Field/Brooklyn Technical High School at the end of the analysis period.

Historic Resources

Building 2 would cast shadow on the United Methodist Church for less than 15 minutes at the beginning of the analysis period (see Figure 9-24). At the same time, Building 1 and the building on Site 5 would cast shadow on the Boerum Hill Historic District. Bergen/Dean Street historic district would receive incremental shadow until 8:00 AM (less than 30 minutes). Shadow would fall on the Church of the Redeemer just west of Site 5 for a little more than two hours, but would be off this church by 9:45 AM and would then fall on Atlantic Terminal Control House until 10:00 AM. Building 1 would cast shadow on the Atlantic Terminal Control House from 9:15 AM to 10:00 AM and the Site 5 building shadow would follow from 11:00 AM to 1:30 PM (see Figures 9-25 and 9-26). From 2:30 PM until 4:00 PM, Fort Greene Historic District would receive shadow from Building 1.

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

Open Spaces

At the beginning of the analysis period, Building 1 would cast shadow on the Wyckoff Gardens open space and the Brooklyn Bear's Pacific Street Community Garden (see Figure 9-29). While the Building 1 shadow would fall on the Wyckoff Gardens open space for only a little over 15 minutes, it would fall on the Brooklyn Bear's Pacific Street Community Garden until approximately 11:00 AM (see Figure 9-30).

At 11:15 AM, Building 1's shadow would reach Atlantic Terminal Plaza's northwest corner and move east along the open space, covering much of it after 12:00 PM (see Figures 9-30 and 9-31). Building 1's shadow would fall on Atlantic Terminal Plaza until 3:00 PM. After then, the open space would be in full sun until the Site 5 building's incremental shadow would begin to fall on it at 4:00 PM (see Figure 9-32).

South Oxford Park would receive incremental shadow for two 15-minute periods in the afternoon. Building 4's shadow would reach the park at 3:15 PM and Building 1 would cast shadow on the park at 5 PM. Shadow from Building 4 would reach east to both of the Atlantic Terminal Houses open spaces from 5:30 PM for nearly one hour until the end of the analysis period. The incremental shadow would cover about a quarter of the open space at 6:00 PM (see Figure 9-33).

Historic Resources

Building 4 would cast shadow on the United Methodist Church for less than two hours at the beginning of the analysis period. Shadows from the building on Site 5 would fall on the Church of the Redeemer from 7:27 AM until 11:15 AM (see Figures 9-29 and 9-30). Buildings 2 and 3 would cast shadow on Bergen/Dean Street historic district for just less than 2 hours from 7:25 AM to 9:15 AM. Site 5 would cast shadow on the Atlantic Terminal Control House for an hour beginning at 12:30 PM (see Figure 9-31). Building 3 would cast shadow on Swedish Baptist

Church/Dean Street historic district from 4:45 PM until the end of the analysis period. A very small portion of the northern tip of the Prospect Heights Historic District would receive shadow for a short period starting at 6:00 PM.

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

Open Spaces

Wyckoff Gardens open space, Baltic Street Community Garden at P.S. 133, and Warren/St. Marks Community Garden would receive incremental shadow from Buildings 1 and 2 briefly at the beginning of the analysis period. The incremental shadow would fall on very small portions of Baltic Street Community Garden and Wyckoff Gardens open space (see Figure 9-33); by 7:15 AM, the project's incremental shadow would be gone from both open spaces. The incremental shadow would leave Warren/St. Marks Community Garden by 7:30 AM.

Building 1 would begin to cast shadow on Brooklyn Bear's Pacific Street Community Garden at 7:15 AM. The incremental shadow would increase, covering the entire open space for a short period until it begins to move off it after 11:00 AM (see Figure 9-35). The incremental shadow from Building 1 would continue to move east, crossing the Atlantic Terminal Plaza at 12:00 PM. The incremental shadow from Building 1 would be off Atlantic Terminal Plaza by 1:45 PM. The plaza would be in full sunlight until incremental shadow from the building on Site 5 would fall on it at 4:00 PM (see Figure 9-37).

Atlantic Terminal Plaza would remain in shadow cast by the building on Site 5 until 6:15 PM. Incremental shadow from the Site 5 building would fall on Brooklyn Bear's Pacific Street Community Garden beginning at 6:15 PM and remain there until the end of the analysis period less than one hour later (see Figure 9-38).

Historic Resources

Shadow from Building 4 would be cast on the United Methodist Church from 6:57 AM to 8:45 AM, and shadow from Site 5 would fall on the Church of the Redeemer from 7:30 AM to 11:15 AM (see Figures 9-34 and 9-35). Bergen/Dean Street historic district would receive incremental shadow from the beginning of the analysis period until 9:00 AM. Building 3 shadow would reach the Swedish Baptist Church/Dean Street historic district from 4:15 PM. The incremental shadow would stretch east to reach a very small portion of the Prospect Heights Historic District for one hour beginning at 6:00 PM.

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

Open Spaces

At the beginning of the analysis period, Buildings 1 through 4 and the building on Site 5 would cast incremental shadow on Atlantic Terminal Plaza, Sixteen Sycamores Playground, and Brooklyn Bear's Pacific Street Community Garden (see Figure 9-39). The incremental shadow would move quickly off Sixteen Sycamores Playground and Brooklyn Bear's Pacific Street Community Garden. The incremental shadows on Atlantic Terminal Plaza would move east across this open space, covering most if not all of this open space until the end of the analysis period (see Figures 9-40 through 9-42).

Building 4 would cast incremental shadow on Cuyler Gore from 1:15 PM until the end of the analysis period less than two hours later. However, most of this open space would remain in

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sunlight (see Figures 9-42 and 9-43). The proposed project would cast shadow on South Oxford Park for just over one hour at the end of the analysis period (see Figure 9-43).

Historic Resources

Long shadows in December would reach a number of historic resources. The building on Site 5 would cast shadow on the Church of the Redeemer for less than a half hour at the beginning of the analysis period. Building 1 and the building on Site 5 would cast shadow on the Atlantic Terminal Control House from the beginning of the analysis period at 8:51 AM until 2:30 PM, which is almost the end of the analysis period (see Figures 9-39 through 9-43). Shadow from Building 4 would fall on the Hanson Place Baptist Church for less than one hour—from 11:45 AM to 12:30 PM. Shadow from the building on Site 5 would fall on the BAM Historic District from 11:30 AM to 2:15 PM. From 11:30 AM to 1:15 PM, shadow would fall on the south and east façades of the Williamsburgh Savings Bank Building and the large arched windows that illuminate the main banking hall (see Figure 9-41). Building 4 would cast shadow that would reach the corner of the Fort Greene Historic District at the intersection of Cumberland Street and Greene Avenue at 11:45 AM and leave the district at 2:53 PM. Building 1 would cast shadow on small portions of the Fort Greene Historic District from 1:00 PM until the end of analysis period.

PHASE II—2016

With the full development of the proposed project assumed to be complete by 2016, Phase II Buildings (Buildings 5 through 15) would cast new shadows in addition to those cast by the first four buildings and the arena. In this group of buildings, the ones on the north along Atlantic Avenue are taller than those to the south (see Figures 9-22 and 9-23, above). In addition to the new buildings, full development of the proposed project would bring a new publicly accessible open space resource to the blocks of the project site east of 6th Avenue. Tables 9-5 and 9-6 show the shadow durations at full development of Phase II of the proposed project.

Table 9-5
Durations of Incremental Shadows on Open Spaces at Development of Phase II—2016

Map Ref. ¹	Open Space Resource	March 21 (Analysis Period: 7:36 AM - 4:29 PM)	May 6 (Analysis Period: 7:27 AM - 6:18 PM DST)	June 21 (Analysis Period: 6:57 AM - 7:01 PM DST)	December 21 (Analysis Period: 8:51 AM - 2:53 PM)
A	Atlantic Terminal Plaza	8:30 AM - 4:29 PM	11:15 AM - 3:00 PM 4:00 PM - 6:18 PM	12:00 PM - 1:45 PM 4:00 PM - 6:15 PM	8:51 AM - 2:53 PM
B1	Atlantic Terminal Houses- Carlton Avenue Side ²	1:00 PM - 4:29 PM	6:00 PM - 6:18 PM	-	8:51 AM - 2:53 PM
B2	Atlantic Terminal Houses- Atlantic Avenue Side ²	9:00 AM - 4:29 PM	2:00 PM - 6:18 PM	2:15 PM - 4:45 PM	8:51 AM - 2:53 PM
C	Dean Playground	-	7:27 AM - 7:45 AM	6:57 AM - 7:45 AM	-
D	Lowry Triangle	-	-	6:45 PM - 7:01 PM	-
E	Cuyler Grove	-	-	-	1:15 PM - 2:53 PM
F	Temple Square	-	-	-	9:15 AM - 9:30 AM
G	Sixteen Sycamores Playground	-	-	-	8:51 AM - 9:15 AM
H	PS 38/The Pacific School Playground	7:36 AM - 7:45 AM	-	-	-
I	Wyckoff Gardens Open Space	-	7:27 AM - 7:45 AM	6:57 AM - 7:15 AM	-
J	Brooklyn Bear's Pacific Street Community Garden	7:36 AM - 9:45 AM	7:27 AM - 11:00 AM	7:15 AM - 11:30 AM 6:15 PM - 7:01 PM	8:51 AM - 9:15 AM
K	Warren/St. Marks Community Garden	-	-	6:57 AM - 7:30 AM	-
L	Baltic Street Community Garden	-	-	6:57 AM - 7:15 AM	-
M	Charles B. Wang Field/Brooklyn Technical High School	3:15 PM - 4:29 PM	-	-	8:51 AM - 2:53 PM
N	Gateway Triangle	-	-	-	12:30 PM - 1:30 PM
O	South Oxford Park	10:00 AM - 10:30 AM 1:00 PM - 4:29 PM	3:15 PM - 3:30 PM 5:00 PM - 5:15 PM	-	8:51 AM - 2:53 PM

Notes:
¹ See Figure 9-1.
² Resource with significant adverse impact.

Table 9-6
Durations of Incremental Shadows on Historic Resources at Development of Phase II—2016

Map Ref. ¹	Historic Resource	March 21 (Analysis Period: 7:36 AM-4:29 PM)	May 6 (Analysis Period: 7:27 AM-6:18 PM DST)	June 21 (Analysis Period: 6:57 AM-7:01 PM DST)	December 21 (Analysis Period: 8:51 AM-2:53 PM)
1	United Methodist Church	7:36 AM - 7:45 AM	7:27 AM - 9:15 AM	6:57 AM - 8:45 AM	-
2	Church of the Redeemer ²	7:36 AM - 9:45 AM	7:27 AM - 11:15 AM	7:30 AM - 11:15 AM	8:51 AM - 9:15 AM
3	Atlantic Terminal Control House	9:15 AM - 10:00 AM 11:00 AM - 1:30 PM	12:30 PM - 1:30 PM	-	8:51 AM - 2:30 PM
4	Hanson Place Baptist Church	-	-	-	11:45 AM - 12:30 PM
5	St. Joseph Roman Catholic Church	-	5:30 PM - 6:18 PM	6:00 PM - 7:01 PM	-
6	Williamsburgh Savings Bank Building	-	-	-	11:30 AM - 1:15 PM
7	Bergen/Dean Street historic district	7:36 AM - 8:00 AM	7:27 AM - 9:15 AM	6:57 AM - 9:00 AM	-
8	Boerum Hill Historic District	7:36 AM - 7:45 AM	-	-	-
9	Brooklyn Academy of Music Historic District	-	-	-	8:51 AM - 2:15 PM
10	Fort Greene Historic District	2:30 PM - 4:00 PM	-	-	8:51 AM - 2:53 PM
11	Clinton Hill Historic District	-	-	-	2:30 PM - 2:53 PM
12	Clinton Avenue historic district	2:00 PM - 4:29 PM	-	-	12:00 PM - 2:53 PM
13	Swedish Baptist Church/Dean Street historic district	7:36 AM - 7:45 AM	7:27 AM - 8:00 AM 4:00 PM - 6:18 PM	6:57 AM - 7:45 AM 4:15 AM - 7:01 PM	12:00 PM - 2:53 PM
14	Prospect Heights Historic District	7:36 AM - 11:45 AM	7:27 AM - 12:15 PM 6:00 PM - 6:18 PM	6:57 AM - 12:30 PM 6:00 PM - 7:01 PM	8:51 AM - 12:15 PM

Notes:
¹ See Figure 9-1.
² Resource with significant adverse impact.

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

Open Spaces

Building 9 would cast shadow on the Atlantic Terminal Houses-Atlantic Avenue side from 9:00 to 11:15 AM (see Figure 9-45). Shadow from Building 8 would fall on a small portion of this open space from around 12:00 PM to 3:45 PM and the Carlton Avenue side from 1:00 PM (see Figures 9-46 and 9-47). By afternoon, Building 7 would also cast shadow on both sides of this open space (see Figure 9-47). South Oxford Park would receive shadow from Building 7 in the morning and from Building 5 in the afternoon, when shadow from Building 4 would already be on this open space (see Figures 9-45 and 9-47).

Project Open Space

At the beginning of the analysis period, almost all of the proposed project's open space would be in shadow cast from Buildings 5 through 15 (see Figure 9-44). Throughout the day, these buildings would cast shadow on the new, adjacent open spaces. However, from 9:00 AM to 3:00 PM, large portions of the open spaces would be in full sun (see Figures 9-45 through 9-47). These open spaces would be covered in shadow again at the end of the analysis period (see Figure 9-48).

Historic Resources

On the March/September analysis day, Buildings 13 and 14 would cast shadow on the Prospect Heights Historic District all morning from 7:36 AM until 11:45 AM. The Swedish Baptist Church/Dean Street historic district would receive shadow for less than 15 minutes at the beginning of the analysis period. Building 10 would cast shadow on the Clinton Avenue historic district for 2½ hours beginning at 2:00 PM. The Church of the Redeemer would continue to be in morning shadow from the building on Site 5 from 7:36 AM to 9:45 AM.

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

Open Space

At the beginning of the analysis period, the northern edge of Dean Playground would receive incremental shadow for 15 minutes from Buildings 8 and 14 (see Figure 9-49). In the afternoon, Buildings 6 and 7 would cast shadow on the Atlantic Terminal Houses-Atlantic Avenue side from 2:00 to 6:18 PM and on the easternmost portion of the Carlton Avenue side from 6:00 PM to 6:18 PM (see Figure 9-52).

Project Open Space

At the beginning of the analysis period, almost all of the project-created publicly accessible open space would be in shadow cast by Buildings 5 through 15 (see Figure 9-49). Throughout the day, these buildings would cast shadow on the new, adjacent open spaces. However, from 10:00 AM to 4:45 PM, large portions of the open spaces would be in full sun (see Figures 9-50 through 9-52). At the end of the analysis period, the open spaces would be covered in shadow again (see Figure 9-53).

Historic Resources

On the May/August analysis day, the Swedish Baptist Church/Dean Street historic district would receive incremental shadow for 30 minutes at the beginning of the analysis period and for more than 2 hours at the end of the analysis period. Buildings 8 through 14 would cast shadow on the Prospect Heights Historic District from 7:27 AM until 12:15 PM. Building 11 would cast shadow reaching the west façade of St. Joseph’s Roman Catholic Church for less than one hour at the end of the analysis period, 5:30 to 6:18 PM. The church has stained glass windows along its east and west façades. The Church of the Redeemer would continue to be in shadow from the building on Site 5 from 7:27 AM to 11:15 AM.

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

Open Spaces

At the beginning of the analysis period, the incremental shadow from Buildings 8 and 14 would cast full shadow over the Dean Playground (see Figure 9-54). However, this shadow would be off the playground by 7:45 AM. In the afternoon, Building 7 would cast shadow on the Atlantic Terminal Houses-Atlantic Avenue side. The shadow would fall on the open space for more than two hours, and would move off the open space by 4:45 PM. The Carlton Avenue side of this open space would receive no shadow during this analysis period.

At the end of the analysis period, shadow from Building 10 would stretch east to reach Lowry Triangle, covering a small portion of the open space for a brief, 16-minute period.

Project Open Space

Buildings 5 through 14 would cast almost all of the project-created publicly accessible open space in shadow at the beginning of the analysis period (see Figure 9-54). The adjacent open space would receive shadow throughout the day from these buildings. However, from 10:00 AM to 5:00 PM large portions of the open space would be in full sun (see Figures 9-55 through 9-57). When the analysis period ends the open spaces would be covered in shadow again (see Figure 9-58).

Historic Resources

Building 7 would cast shadow on the Swedish Baptist Church/Dean Street historic district for 45 minutes at the beginning of the analysis period. Buildings 8 and 14 would cast shadow on small parts of the Prospect Heights Historic District from 6:57 AM until 12:30 PM. On June 21, Building 11 would cast shadow reaching the west façade of St. Joseph’s Roman Catholic Church for about an hour at the end of the analysis period, 6:00 PM to 7:01 PM.

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

Open Spaces

Buildings 5 through 15 would cast shadow on South Oxford Park throughout the analysis period. Building 4 would also cast a shadow on South Oxford Park at the end of the analysis period; there would be areas of the park that receive sun in the midday (see Figures 9-59 through 9-63). Buildings 7 and 8 would cast shadow on both sides of the Atlantic Terminal Houses throughout the entire analysis period. The entire open space would be in shadow until shortly before 12:00 PM, when all but small slivers of the open space would remain in shadow until the end of the analysis period.

Project Open Space

Early in the analysis period, almost all of the project-created publicly accessible open space would be in shadow cast mainly by Buildings 5 through 14 (see Figures 9-59 and 9-60). Throughout the day, these buildings would cast shadow on the adjacent, new open spaces, but there would be some areas of sun in the midday (see Figures 9-61 through 9-62). At the end of the analysis period, these open spaces would again be covered in shadow (see Figure 9-63).

Historic Resources

Shadows from Building 7 would reach a very small portion of the BAM Historic District along Hanson Place in the early morning (see Figure 9-59) and very small portions of the Clinton Hill Historic Districts at the end of the analysis period (see Figure 9-63). Buildings 5 through 15 would cast shadow on relatively small portions of the Fort Greene Historic District throughout the analysis period. The Clinton Avenue historic district would receive shadow from Building 10 at 12:00 PM. Building 9 would also cast shadow on that historic district at the end of the analysis period.

F. SHADOW EFFECTS BY RESOURCE

This section considers the potential effects of the full development of the proposed project on public open spaces and historic resources with sun-sensitive features. Although many sensitive receptors are located within the shadow sweep, the shadow diagrams demonstrate that the proposed project would not affect the sunlight reaching a number of them. This is due to existing shadows already cast by intervening buildings in this densely developed urban area. Similarly, the proposed project’s shadows would reach some resources for only limited amounts of time during the year and during the analysis days. Resources identified in the sweep but not reached by the incremental shadows of the proposed project include Thomas Greene Playground, the Gowanus Houses open space, Brooklyn Bear’s Rockwell Place Garden, Fowler Square at Fulton and Lafayette Avenue, Fort Greene Park, Edmunds/J.H.S. 294 Playground, Police Athletic League, North Pacific Playground and Greenthumb, Greene Park/P.S. 11 Playground, and

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Hollenbach Community Garden. The proposed project would not have any effect on these resources.

Further, some historic districts identified do not have sun-sensitive features in the areas where the proposed project would cast shadows.

PUBLIC OPEN SPACES

Atlantic Terminal Plaza

The Atlantic Terminal Plaza open space is a largely passive use area that includes lawns, trees, walkways, benches, and playgrounds. Shadow from Buildings 1 and 4 and the building on Site 5 would cover more than three quarters of Atlantic Terminal Plaza for the whole day in the spring, fall, and winter. From May to August when shadows are shorter, the project's shadows would not reach the plaza until 11:15 AM or 12:00 PM, and would be off the plaza for a period before returning later in the day. During those periods, less than half of the open space would receive incremental shadow at any given time.

An urban amenity on a busy street, this large, landscaped plaza features tables with shade-umbrellas, chairs, and benches. Loss of the sunlight would make this open space less attractive and could adversely affect users of this passive open space, especially in the cooler seasons when warm sunshine might be more appreciated. The trees and vegetation have been selected for their shade tolerance. The shadow coverage and duration, even in the colder months, would not have a significant adverse impact on the usability of this outdoor plaza, since the space is heavily used by shoppers and waiting commuters and is not destination open space.

Atlantic Terminal Houses

Shadows from Buildings 1 through 4 and the arena would reach this open space on the March/September and May/August analysis days. The shadow durations would be short: less than 15 minutes on the March/September 21 analysis day, and less than one hour on the May/August 6 analysis day. This increase in shadows would not be considered a significant adverse impact.

However, with the development of Buildings 5 through 15 during Phase II, there would be much more shadow on this open space. The additional shadow would reach the Atlantic Avenue side of the open space from early in the morning to the end of the March/September analysis period, and would cover part of the Carlton Avenue side from 1:00 PM until the end of the same period. The Atlantic Avenue side would experience shadow for approximately four and two and a half hours beginning around 2:00 PM in May/August and June, respectively; and for the whole analysis period in December. The Carlton Avenue side would experience shadow for about 15 minutes before the end of the May/August analysis period, and for the entire December analysis day. For most of the day during the March/September, May/August, and June analysis periods, less than a quarter of the open space as a whole would receive incremental shadow. During the December analysis period, more than three quarters of the open space would receive incremental shadow.

During December, the shadow from Building 9 would cover the eastern portion of both sides of the open space early in the morning until 10:45 AM. Building 8 would start casting shadow on the western portion of the open space and stay on the open space for the entire duration of the analysis period as the shadow would move east. The incremental shadow from Building 7 would start at the northwest corner of the Carlton Avenue side at 12:30 PM and move east. Playground

equipment and a landscaped seating area are located in the northern portion of this open space. The Atlantic Avenue side that would receive incremental shadow throughout the December analysis period has a seating area at the corner of Carlton Avenue and play equipment to the east. The seating area is heavily shaded by mature trees, but the shadows continue into the fall/winter when sun would be appreciated. There is a basketball court northeast of the senior center that separates the Atlantic Terminal Houses open space. Due to the intervening building, shadows would not reach the basketball court.

Even though this open space, as a whole, is only moderately used, the duration and extent of the shadow coverage would adversely affect users of the park. The incremental shadows from the full development would have a significant adverse impact on the open space on the cooler analysis days when shadows are longer (March/September and December), since they might diminish the attraction to use this open space resource.

Potential mitigation for this shadow impact on open space is discussed in Chapter 19, "Mitigation."

Dean Playground

Development of Buildings 1 through 4, the arena, and the building on Site 5 would not cast shadow on this open space. Development east of 6th Avenue, specifically Building 14, would cast shadow on Dean Playground in the morning on the May 6/August 6 and June 21 analysis days. However, the shadow increments would be off this playground by 7:45 AM. Consequently, they would not be considered to have a significant adverse impact due to their short duration and their occurrence before most users would be in the open space.

Lowry Triangle

Phase I development would not cast shadow on this open space. In Phase II, Building 10 would cast shadow on the open space for a short period at the end of the June analysis period. Given the small size and brief duration, this incremental shadow is not considered a significant adverse impact.

Cuyler Gore

Building 4 would cast shadow on Cuyler Gore on the December analysis day. Although sunlight is most appreciated in the colder months, the inclement winter weather itself would limit the use of the open space in winter. Given the limited occurrence and limited coverage, this shadow increment would not be considered a significant adverse impact.

Temple Square

Building 1 would cast incremental shadow on this open space for 15 minutes in the morning on the December analysis day. The shadow would only fall on a small part of this open space. It would not be considered a significant adverse impact.

Sixteen Sycamores Playground

This playground would receive incremental shadow from the proposed building on Site 5 early in the morning in December for less than 30 minutes. Given the short duration in the early morning, this shadow increment would not be considered a significant adverse impact.

P.S. 38/The Pacific School Playground

Shadows from Building 1 and the building on Site 5 would reach P.S. 38/The Pacific School Playground at the beginning of the analysis period for a little more than 15 minutes on the March/September analysis day. It would only fall on a small part of the open space, and would not be considered a significant adverse impact.

Wyckoff Gardens Open Space

Shadows from Building 1 and the Site 5 building would reach Wyckoff Gardens open space during early morning on the May/August and June analysis days. The incremental shadow would last for a little over 15 minutes on both analysis days. Given the small size and brief duration of these incremental shadows, they would not be considered a significant adverse impact.

Brooklyn Bear's Pacific Street Community Garden

Building 1 would cast shadow on the Brooklyn Bear's Pacific Street Community Garden in the morning throughout the year. However, this shadow would be off the open space by 9:45 AM in March/September, 11:00 AM in May/August, 11:30 AM in June, and 9:15 AM in December. The shadow from the proposed building on Site 5 would also cast an incremental shadow for 45 minutes at the end of the day in June. The garden would be in full sun during the most of the day. Given the amount of sun this open space receives throughout the day, especially in the afternoon, the morning and evening shadow increments would not be considered a significant adverse impact.

Warren/St. Marks Community Garden

On the June analysis day, Building 2 would cast a small sliver of incremental shadow on Warren/St. Marks Community Garden for 30 minutes. Given the short duration of this increment and the extremely small portion of the open space it would fall on, this shadow would not be considered a significant adverse impact.

Baltic Street Community Garden

During the morning of the June analysis day, Building 3 would cast a small incremental shadow on this open space. The shadow would last 15 minutes and would not be considered a significant adverse impact.

Charles B. Wang Field/Brooklyn Technical High School

In Phase I, Building 4 would cast shadow on the open space for nearly an hour and 15 minutes starting at 3:15 PM. This small increase in shadows would not be considered an adverse impact. With the Phase II addition of Buildings 5 through 15, the open space would receive shadow throughout the December analysis period. The incremental shadow would cast no more than a third of the open space into shadow.

The open space is an active use open space which includes a playing field surrounded by a large running track. Shadow is not generally expected to result in significant adverse impacts on the active uses. Further, there are generally fewer days of good weather on which to use the field during this time of year. Therefore, the shadows on this open space would not be considered significant adverse impact.

Gateway Triangle

During the December analysis period, the open space would receive small incremental shadow from Building 9 for an hour starting at 12:30 PM. Given the small size and brief duration, this incremental shadow is not considered a significant adverse impact.

South Oxford Park

Portions of this new open space would receive shadow from Buildings 1 and 4 during the afternoon on the March/September, May/August, and December analysis days. On the May/August analysis days, the duration would be brief. Completion of Buildings 5 through 15 would add morning shadows during the March/September and December analysis days. The duration would be brief in March/September, and these shadows would not have a significant adverse impact. However, in December the shadows would fall on this open space virtually the entire day and cover much of the open space.

Active uses, such as the tennis courts, playground equipment, a synthetic turf oval, and a casual play area are not generally considered to be adversely affected by shadows. However, the sprinkler area (which would not be used during winter months) and the seating are considered sun-sensitive. Given the typically cold weather on the December analysis day, this open space would be less attractive to users if it were largely in shadow most of the day. However, at the same time, inclement December weather would limit park use and users. Given the amount of sun that the planned active recreation area and the planned community garden would receive throughout the day in the other seasons, the shadow increment in December would not have a significant adverse impact on this open space.

PROPOSED PUBLICLY ACCESSIBLE OPEN SPACE

The proposed project's publicly accessible open space is designed to take into account the location and heights of the proposed buildings and the shadows they would create. Major landscape elements, such as the oval lawn, primary pathways, and water features, would be located to receive the maximum exposure to midday sun throughout the year. The location of other landscape elements, such as the north-south pathways and smaller passive use areas, would be sited and oriented to receive sunlight when other areas of this open space are in shade so that sizable portions of the entire open space would have access to sunlight during the late morning through early afternoon hours.

The proposed project's publicly accessible open space would receive shadow from Buildings 3 through 15 throughout the day in each analysis period. The incremental shadow would be greatest in the early mornings, when the shadows would stretch east and late afternoons, when the shadows would stretch west along the open space. During those times, most of the open space would be in shadow. Shadow is not generally expected to adversely affect active recreational uses such as volleyball, bocce, and the half basketball courts. The shadow would diminish the attractiveness of the passive recreation areas to their potential users. Were it not for the development of these buildings, this publicly accessible space would not be created. Therefore, the shadows on this public space would not be considered significant adverse impacts. See Chapter 1, "Project Description," and Chapter 6, "Open Space and Recreational Facilities," for details on the proposed project's open space component.

HISTORIC RESOURCES WITH SUN-SENSITIVE FEATURES

United Methodist Church

The proposed development of the arena block would cast shadow on the north and east façades of this church. On the March/September analysis day, the duration would be negligible, less than 15 minutes at the beginning of the analysis period. On the May/August and June analysis days the duration would be less than two hours with the shadow leaving the church by 9:15 AM and 8:45 AM, respectively. These early morning shadows would not have a significant adverse impact on the church.

Church of the Redeemer

Shadow from the proposed building on Site 5 would fall on the nearby east (main) façade of the S/NR-eligible Church of the Redeemer in all seasons. On the March/September and December analysis days, the durations would be a little over two hours and less than 30 minutes, respectively, and would occur at the beginning of the analysis period in the early morning. On the May/August and June analysis days, the shadow would fall on the church for just under four hours beginning at or near the beginning of the analysis period. Lasting until 11:15 AM, the incremental shadow would reduce the light through the stained glass windows on the main façade (see Figure 9-3b). These shadows would have a significant adverse impact on the church because they would reduce light to the stained glass windows on the church's east façade when services are most likely to be taking place. Morning services currently begin at 11:00 AM on Sundays.

Proposed mitigation for this historic resource is detailed in Chapter 19, "Mitigation."

Atlantic Terminal Control House

Shadow from Building 1 would fall on the Atlantic Terminal Control House briefly; later, shadow from the building on Site 5 would fall on the Atlantic Terminal Control House for 2½ hours on the March/September analysis day. On the May/August analysis day, the building on Site 5 would cast shadow on the Atlantic Terminal Control House for an hour in the midday. While there would be no project-generated shadow on the resource in June, the proposed project would cast shadow on the Atlantic Terminal Control House for nearly the entire analysis period in December. While this structure now functions as a skylight to the transit corridor below, even the day-long shadows in December would not have a significant adverse impact because the corridor is artificially lighted.

Hanson Place Baptist Church

Shadow from Building 4 would reach the Hanson Place Baptist Church for less than an hour in the midday in December. Shadow from the proposed project would not reach the church in any other season. This brief shadow occurring in only one season would not have a significant adverse effect on the church.

St. Joseph's Roman Catholic Church

Building 11 would cast shadow on this church for about an hour or less at the end of the analysis period on the June and May/August analysis days, respectively. Given their brief duration late in the day and their occurrence only from approximately May to August, these shadow increments would not have significant adverse impacts on the church.

Williamsburgh Savings Bank Building

The Williamsburgh Savings Bank Building is part of both the BAM Historic District and the S/NR Fort Greene Historic District. In Phase I, project shadows would only reach the Williamsburgh Savings Bank for less than two hours in the midday in December. These shadows would be the same in Phase II, and they would not be considered a significant adverse impact.

Boerum Hill Historic District

Shadow from Building 1 would fall on the Boerum Hill Historic District in the beginning of the March/September analysis period. Given the short durations of these increments and the extremely small portion of the historic district on which they would fall, these shadows would not be considered significant adverse impacts.

Brooklyn Academy of Music (BAM) Historic District

On the December analysis day the building on Site 5 would cast shadow on the BAM Historic District from the beginning of the analysis period until 2:15 PM. The shadows would fall mostly on backyards and sidewalks. Given their small size, these incremental shadows would not be considered a significant adverse impact on the BAM Historic District.

Fort Greene Historic District

Shadows from Building 4 would fall on the Fort Greene Historic District for the whole December analysis period. Buildings 1 through 14 would cast shadows for almost 1½ hours in the March/September analysis period. The shadows would fall mostly on the streets of the historic district and would, therefore, not be considered a significant adverse impact.

Clinton Hill Historic District

Building 7 would cast shadow on the Clinton Hill Historic District. The shadows would reach the district late on the December analysis day for less than 30 minutes. These shadows would not have significant adverse impacts because they would fall on only an extremely small portion of the district for a short duration.

Clinton Avenue Historic District

Shadows from Building 10 would fall on the Clinton Avenue historic district from 2:00 PM to 4:29 PM during March and from 12:00 PM to the end of the analysis day (2:53 PM) during December. Given the short duration and small size of these shadow increments, these shadows would not be considered significantly adverse.

Prospect Heights Historic District

Shadows from Buildings 8 through 14 would fall on the Prospect Heights Historic District throughout the morning in each analysis period. Buildings 3 and 15 would cast shadow on the district on May/August and June analysis days starting at 6:00 PM. These shadows would fall on a small portion of the historic district which contains no sun-sensitive resources and, therefore, would not be considered a significant adverse impact.

Bergen/Dean Street Historic District

Buildings 1 through 4 would cast shadow on Bergen/Dean Street historic district in the beginning of March/September, May/August, and June analysis periods. The district would

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receive less than two hours of incremental shadow. Given the short duration of these increments, these shadows would not be considered a significant adverse impact.

Swedish Baptist Church/Dean Street Historic District

This historic district would receive early morning shadows from Buildings 6, 7, 8, and 14 in the beginning of the analysis period on the March/September, May/August, and June analysis days. The shadow would last less than 45 minutes. On the May/August and June analysis days, Buildings 15 and 3 cast shadow on the district beginning at 4:00 PM and 4:15 PM, respectively. In December, Building 15 would cast a shadow on a small portion of this resource from 12:00 PM to the end of the analysis period at 2:53 PM. The shadows would fall mostly on the rooftops of the buildings and are of short duration and, therefore, would not be considered a significant adverse impact.

Figure Number Locator for Shadow Diagrams

Analysis Day and Time	Figure Nos.		
	Baseline	2010	2016
March 21—7:36 AM ¹	9-4	9-24	9-44
March 21—9:30 AM ¹	9-5	9-25	9-45
March 21—12:00 PM ¹	9-6	9-26	9-46
March 21—2:30 PM ¹	9-7	9-27	9-47
March 21—4:15 PM ¹	9-8	9-28	9-48
May 6—7:27 AM ²	9-9	9-29	9-49
May 6—11:15 AM ²	9-10	9-30	9-50
May 6—12:45 PM ²	9-11	9-31	9-51
May 6—4:15 PM ²	9-12	9-32	9-52
May 6—6:00 PM ²	9-13	9-33	9-53
June 21—6:57 AM ²	9-14	9-34	9-54
June 21—11:00 AM ²	9-15	9-35	9-55
June 21—1:30 PM ²	9-16	9-36	9-56
June 21—4:15 PM ²	9-17	9-37	9-57
June 21—6:45 PM ²	9-18	9-38	9-58
December 21—9:00 AM ¹	9-19	9-39	9-59
December 21—10:30 AM ¹	9-20	9-40	9-60
December 21—12:00 PM ¹	9-21	9-41	9-61
December 21—1:30 PM ¹	9-22	9-42	9-62
December 21—2:45 PM ¹	9-23	9-43	9-63
Notes:			
¹ Eastern Standard Time			
² Daylight Savings Time			

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