A. INTRODUCTION

This chapter assesses the potential for the Proposed Actions to result in incremental shadows long enough to reach any nearby publicly accessible open spaces or other sunlight-sensitive resources. According to the *City Environmental Quality Review* (CEQR) *Technical Manual*, a shadows assessment is required if a proposed action would result in structures (or additions to existing structures) of 50 feet in height or greater, or those that would be located adjacent to, or across the street from, a sunlight sensitive resource. As discussed in **Chapter 1, "Project Description,"** the Proposed Actions would facilitate the development of buildings that would be greater than 50 feet, located adjacent to several sunlight-sensitive resources. As such, a detailed shadows analysis was prepared in accordance with *CEQR Technical Manual* guidance to determine the potential for the Proposed Actions to result in significant adverse impacts on sunlight-sensitive resources.

B. PRINCIPAL CONCLUSIONS

The Proposed Actions would result in incremental shadow coverage (i.e. additional, or new, shadow coverage) on one open space resource, Whitey Ford Field, and one natural resource, the East River. Project-generated shadows would not affect the utilization, enjoyment, or character of these sunlight-sensitive resources and all vegetation would continue to receive a minimum of four to six hours of direct sunlight throughout the growing season. Additionally, project-generated shadows would not have any adverse impacts on the aquatic biota in the East River.

C. METHODOLOGY

According to the *CEQR Technical Manual*, the longest shadow a structure will cast in New York City, except for periods close to dawn or dusk, is 4.3 times its height. For projects or actions resulting in structures less than 50 feet tall, a shadow assessment is generally not necessary, unless the site is adjacent to a park, historic resource, or important natural feature (if the feature that makes the structure significant depends on sunlight).

First, a preliminary screening assessment must be conducted to ascertain whether shadows resulting from a project could reach any sunlight-sensitive resource at any time of year. The *CEQR Technical Manual* defines sunlight-sensitive resources as those resources that depend on sunlight or for which direct sunlight is necessary to maintain the resource's usability or architectural integrity. The following are considered to be sunlight-sensitive resources:

- *Public open space* (e.g., parks, playgrounds, plazas, schoolyards, greenways, and landscaped medians with seating). Planted areas within unused portions or roadbeds that are part of the Greenstreets program are also considered sunlight-sensitive resources. The use of vegetation in an open space establishes its sensitivity to shadows. This sensitivity is assessed for both (1) warm-weather

dependent features, like wading pools and sandboxes, or vegetation that could be affected by loss of sunlight during the growing season (i.e., March through October); and (2) features, such as benches, that could be affected by a loss of winter sunlight. Uses that rely on sunlight include: passive use, such as sitting or sunning; active use, such as playfields or paved courts; and such activities as gardening, or children's wading pools and sprinklers. Where lawns are actively used, the turf requires extensive sunlight. Vegetation requiring direct sunlight includes the tree canopy, flowering plants, and plots in community gardens. Generally, four to six hours a day of sunlight, particularly in the growing season, is a minimum requirement.

- *Features of historic architectural resources that depend on sunlight for their enjoyment by the public.* Only the sunlight-sensitive features are considered, as opposed to the entire architectural resource. Sunlight-sensitive features include the following: design elements that are part of a recognized architectural style that depends on the contrast between light and dark (e.g., deep recesses or voids, such as open galleries, arcades, recessed balconies, deep window reveals, and prominent rustication); elaborate, highly carved ornamentation; stained glass windows; exterior building materials and color that depend on direct sunlight for visual character (e.g., the polychromy [multicolored] features found on Victorian Gothic Revival or Art Deco façades); historic landscapes, such as scenic landmarks, including vegetation recognized as an historic feature of the landscape; and structural features for which the effect of direct sunlight is described as playing a significant role in the structure's importance as an historic landmark.

- *Natural resources where the introduction of shadows could alter the resource's condition or microclimate.* Such resources could include surface water bodies, wetlands, or designated resources, such as coastal fish and wildlife habitats.

The preliminary screening assessment consists of three tiers of analysis. The first tier determines a simple radius around the proposed building(s) representing the longest shadow that could be cast. If there are sunlight-sensitive resources within the radius, the analysis proceeds to the second tier, which reduces the area that could be affected by project-generated shadows by accounting for a specific range of angles that can never receive shade in New York City due to the path of the sun in the northern hemisphere. If the second tier of analysis does not eliminate the possibility of new shadows on sunlight-sensitive resources, a third tier of screening analysis further refines the area that could be reached by new shadows by looking at specific representative days of the year and determining the maximum extent of shadow over the course of each representative day. If the third tier of analysis does not eliminate the possibility of new shadows on sunlight-sensitive resources, a detailed shadow analysis is required to determine the extent and duration of the incremental shadow resulting from the project.

In accordance with the *CEQR Technical Manual*, shadows on sunlight-sensitive resources of concern are modeled for four representative days of the year. For the New York City area, the months of interest for an open space resource encompass the growing season (i.e., March through October) and one month between November and February representing a cold-weather month (usually December). Representative days for the growing season are generally the March 21st vernal equinox (or the September 21st autumnal equinox, which is approximately the same), the June 21st summer solstice, and a spring or summer day halfway between the summer solstice and equinoxes, such as May 6th or August 6th (which are approximately the same). For the cold-weather months, the December 21st winter solstice is included to demonstrate conditions when open space users rely most heavily on available sunlight warmth. As these months and days are representative of the full range of possible shadows, they are also used for assessing shadows on sunlight-sensitive historic and natural resources.

The *CEQR Technical Manual* defines the temporal limits of a shadow analysis period to fall from an hour and a half after sunrise to an hour and a half before sunset.

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

- *Vegetation:* a substantial reduction in sunlight available to sunlight-sensitive features of the resource to less than the minimum time necessary for its survival (when there would be sufficient sunlight in the future without the project), or a reduction in direct sunlight exposure where the sensitive feature of the resource is already subject to substandard sunlight (i.e., less than the minimum time necessary for its survival).

- *Historic and cultural resources:* a substantial reduction in sunlight available for the enjoyment or appreciation of the sunlight-sensitive features of an historic or cultural resource.

- *Open space utilization:* a substantial reduction in the usability of open space as a result of increased shadow, including information regarding anticipated new users and the open space's utilization rates throughout the affected time periods.

- *For any sunlight-sensitive feature of a resource:* complete elimination of all direct sunlight on the sunlight-sensitive feature of the resource, when the complete elimination results in substantial effects on the survival, enjoyment, or, in the case of open space or natural resources, the use of the resource.

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

D. PRELIMINARY SCREENING

Tier 1 Screening Assessment

According to the *CEQR Technical Manual*, the longest shadow that a structure will cast in New York City, except for periods close to dawn or dusk, is 4.3 times its height. The maximum shadow radius from Projected Development Site 1 (1,505 feet) was determined using the Proposed Project's maximum height of approximately 350 feet, which includes bulkhead and rooftop mechanical equipment of the tallest of the three proposed towers (Tier 1 Assessment).[1] Within this longest shadow study area, there are four potentially sunlight-sensitive open space resources and one sunlight-sensitive natural resource.

[1] In accordance with *CEQR Technical Manual* guidance, the maximum shadow radius was calculated by combining the maximum building height of the Proposed Project's tallest building (inclusive of the bulkhead and rooftop mechanical equipment) (totaling approximately 350 feet), and multiplying that number by 4.3.

Therefore, further screening was warranted in order to determine whether any resources could be affected by project-generated shadows.

Tier 2 Screening Assessment

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

Figure 6-1 provides a base map illustrating the results of the Tier 1 and Tier 2 screening assessments (i.e., the portion of the longest shadow study area lying within -108 degrees from the true north and +108 degrees from true north as measured from southernmost portion of the Project Area). A total of five resources were identified as sunlight-sensitive resources that warranted further assessment. A list of these resources is provided below in **Table 6-1**.

TABLE 6-1
Sunlight-Sensitive Resources Warranting Further Assessment Based on Tier 1 and 2 Screening

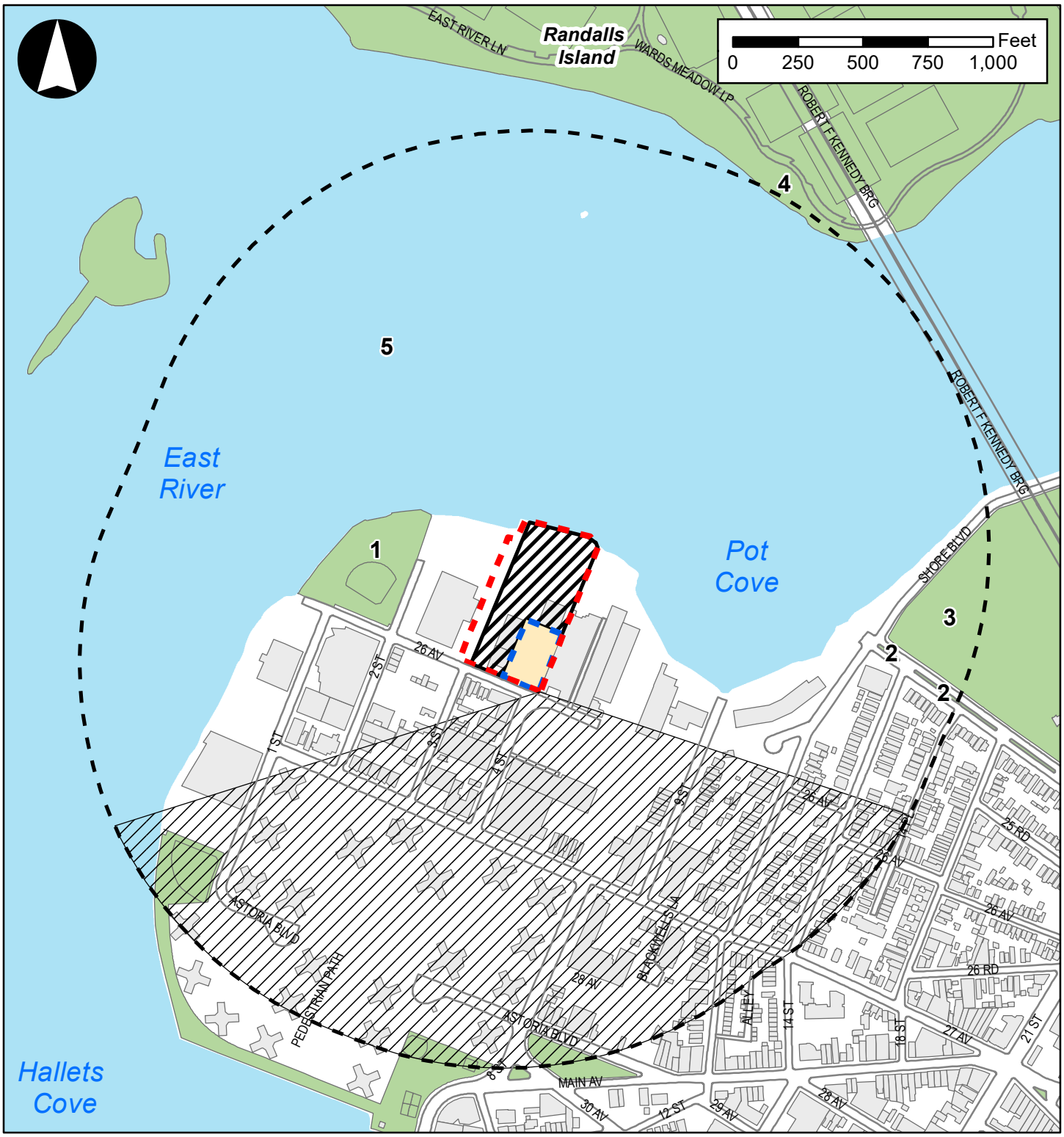
No.[1]	Sunlight-Sensitive Open Space Resources
1	Whitey Ford Field
2	Greenstreet (Astoria Park South between Shore Blvd. & 14 Pl.)
3	Astoria Park
4	Wards Island Park
No.[1]	**Sunlight-Sensitive Natural Resources**
5	East River

Note:
[1] Numbers keyed to **Figure 6-1**.

Tier 3 Screening Assessment

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

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



Legend

- Rezoning Area
- Development Site
- Projected Development Site
- Tier I: Longest Shadow Study Area
- Tier II: Area That Cannot Be Shaded
- 1 Sunlight Sensitive Resources
- Building Footprints

As indicated in **Figures 6-2a** and **6-2b**, two sunlight-sensitive resources would not receive project-generated shadows on any of the four analysis days, and therefore do not require any further analysis: Astoria Park and Wards Island Park. **Table 6-2** presents a summary of the Tier 3 assessment, showing the two sunlight-sensitive open space resources and one natural resource that could, in the absence of intervening buildings, receive project-generated shadows, and on which analysis days the new shadows would occur.

TABLE 6-2
Tier 3 Assessment Results

No.[1]	Name	March 21/Sept. 21 7:36 AM – 4:29 PM	May 6/August 6 6:27 AM – 5:18 PM	June 21 5:57 AM – 6:01 PM	December 21 8:51 AM – 2:53 PM	Number of Analysis Days
1	Whitey Ford Field	**YES**	**YES**	**YES**	**YES**	**4**
2	Greenstreet (Astoria Park South between Shore Blvd. & 14 Pl.)	**NO**	**NO**	**YES**	**NO**	**1**
3	Astoria Park	**NO**	**NO**	**NO**	**NO**	**0**
4	Wards Island Park	**NO**	**NO**	**NO**	**NO**	**0**
5	East River	**YES**	**YES**	**YES**	**YES**	**4**

Note:
[1] Numbers keyed to **Figure 6-1**.

E. DETAILED ASSESSMENT

Resources of Concern

Whitey Ford Field

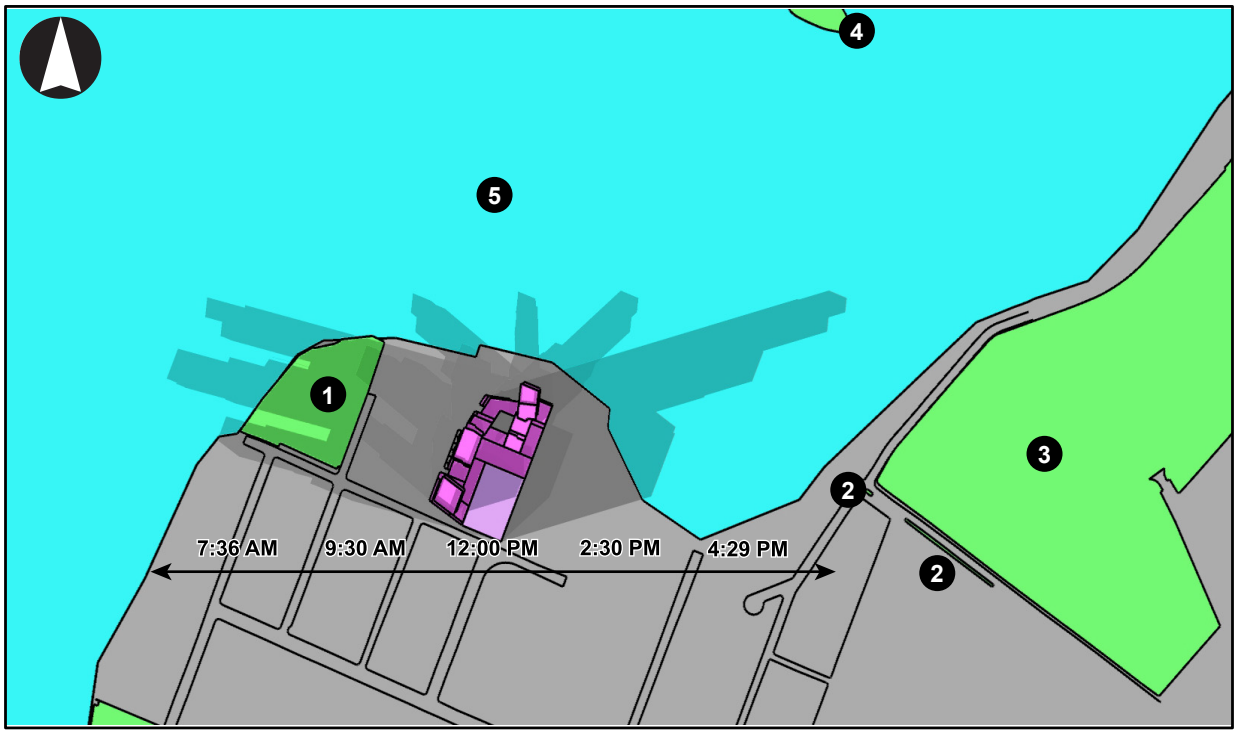
Whitey Ford Field is an approximately 3.62-acre park. The park, located to the northwest of the Project Area, is bounded by the East River waterfront to the north and west, 26th Avenue to the south, and 2nd Street to the east (Block 913, Lot 1). Whitey Ford Field features a baseball diamond, bleachers, benches, and fitness equipment. The park also offers panoramic views of Manhattan and Randall's Island. Whitey Ford Field is open to the public daily from 6:00 AM to 10:00 PM.

Greenstreet

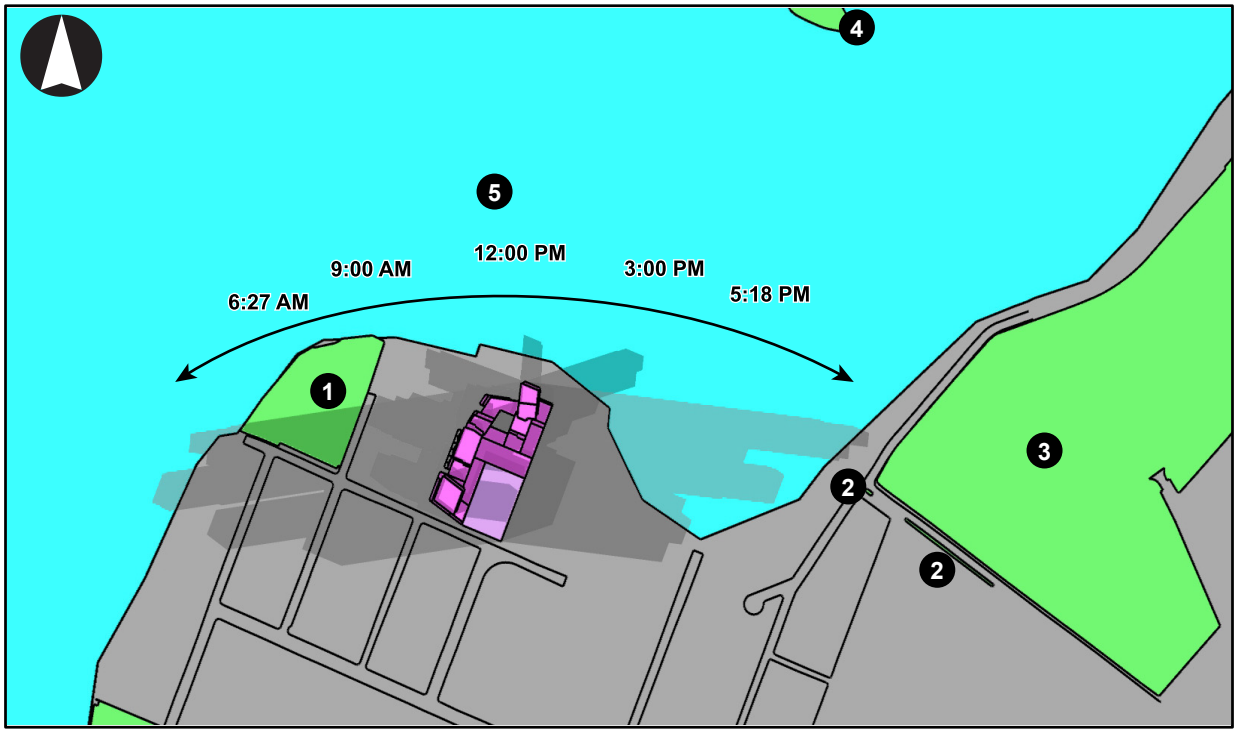
Situated along Astoria Park South, the Greenstreet is located to the east of the Project Area and comprises two sections: one section located between Shore Boulevard and 14th Street and one section located between 14th and 18th Streets. Each section of the Greenstreet features landscaping and trees; no benches are present in either section of the Greenstreet.

East River

The lower portion of the East River, part of the greater Hudson/East River Watershed, is located to the north of the Project Area. This portion of the East River is a degraded natural resource and does not consistently meet standards for adequate ecological health. According to the New York State Department of Environmental Conservation (NYSDEC), the lower portion of the East River is assessed as an impaired waterbody ("Class I") due to recreational uses and fish consumption that are considered to be impaired by floatable debris, as well as PCBs and other toxins. Urban stormwater runoff, combined sewer overflows



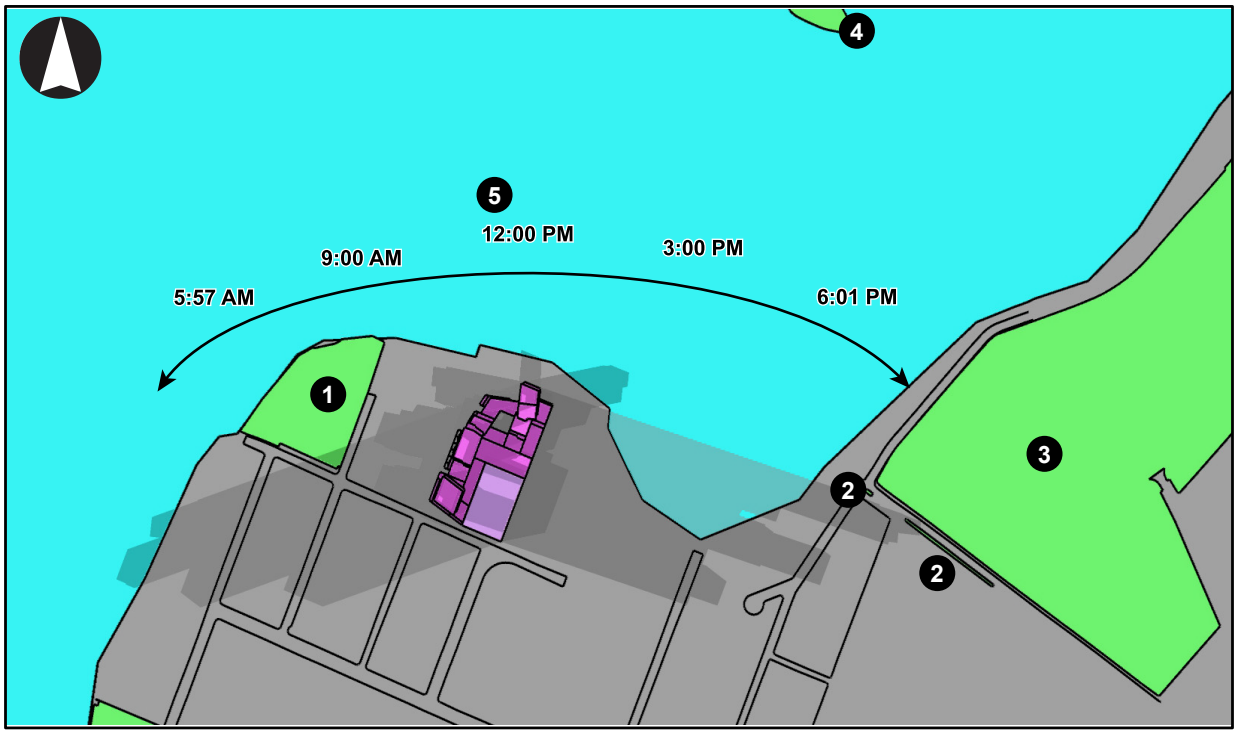
MARCH 21/SEPTEMBER 21



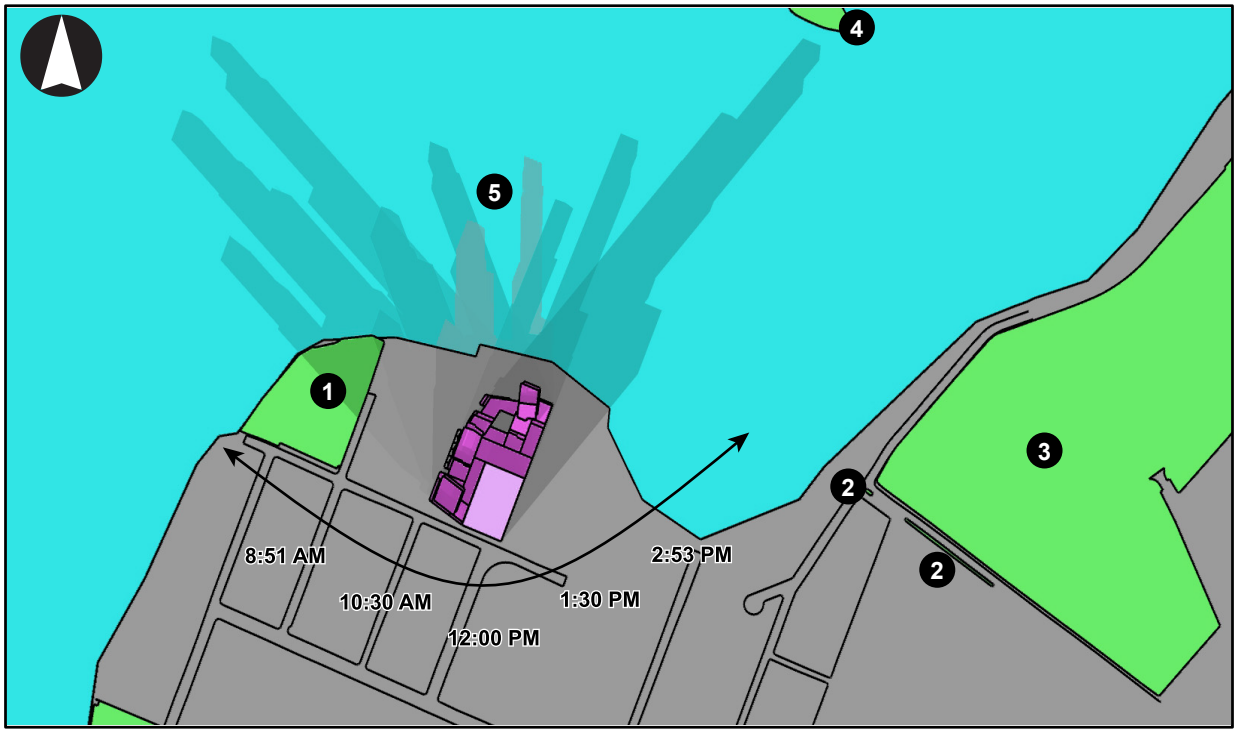
MAY 6/AUGUST 6

Proposed Project
Open Space
Incremental Shadow
Non-Applicant Projected Development Site
Waterbody

Note: Resources keyed to Table 6-1



JUNE 21



DECEMBER 21

Proposed Project

Non-Applicant Projected Development Site

Open Space

Waterbody

Incremental Shadow

Note: Resources keyed to Table 6-1

(CSOs), contaminated sediment, and the industrial use of the waterway result in conditions that negatively impact recreational use. However, recent data shows dissolved oxygen levels in this segment of the East River typically meet applicable water quality standards to support aquatic life.[2]

Shadows Analysis

Per *CEQR Technical Manual* guidance, shadow analyses were performed for the three sunlight-sensitive resources identified above on four representative days of the year: March 21/September 21, the equinoxes; May 6, the midpoint between the summer solstice and the equinox (and equivalent to August 6); June 21, the summer solstice and the longest day of the year; and December 21, the winter solstice and shortest day of the year. CEQR guidance define the temporal limits of a shadow analysis period to fall from 1.5 hours after sunrise to 1.5 hours before sunset. As discussed above, the results of the shadows analysis show the incremental difference in shadow impact between the No-Action and With-Action conditions (refer to **Table 6-3**). Per the *CEQR Technical Manual*, all times reported herein are Eastern Standard Time and do not reflect adjustments for daylight savings time that is in effect from mid-March to early November.

As shown in **Table 6-3**, incremental project-generated shadows would reach the three sunlight-sensitive resources identified in the Tier 3 assessment. Increases in shadow coverage would occur at Whitey Ford Field and the East River on the March 21/September 21, May 6/August 6, June 21, and December 21 representative analysis days. Increases in shadow coverage would occur at the Greenstreet on the June 21 representative analysis day. **Figures 6-3** through **6-10**, provided at the end of this chapter, show representative shadow views for each sunlight-sensitive resource of concern on each of the four representative analysis days mentioned above.

TABLE 6-3
Duration of Shadows on Sunlight Sensitive Resources (Increment Compared to the No-Action Condition)

Resource	Analysis Day	March 21/Sept. 21 7:36 AM – 4:29 PM	May 6/August 6 6:27 AM – 5:18 PM	June 21 5:57 AM – 6:01 PM	December 21 8:51 AM – 2:53 PM
Whitey Ford Field	Shadow enter-exit time	7:36 – 9:53 AM	6:27 – 8:42 AM	6:05 – 8:13 AM	8:51 – 10:44 AM
	Incremental shadow duration	2 hours 17 minutes	2 hours 15 minutes	2 hours 8 minutes	1 hour 53 minutes
Greenstreet	Shadow enter-exit time	N/A	N/A	5:47 – 5:55 PM; 5:58 – 6:01 PM	N/A
	Incremental shadow duration	N/A	N/A	8 minutes; 3 minutes	N/A
East River	Shadow enter-exit time	7:36 AM – 4:29 PM	6:27 – 6:50 AM; 9:07 AM – 5:18 PM	10:06 – 10:22 AM; 11:15 AM – 6:01 PM	8:51 AM – 2:53 PM
	Incremental shadow duration	8 hours 53 minutes	23 minutes; 8 hours 11 minutes	16 minutes; 6 hours 46 minutes	6 hours 2 minutes

Notes:
[A] All times are Eastern Standard Time.
[B] Table indicates the entry and exit times and total duration of incremental shadow for each sunlight-sensitive resource.

[2] NYSDEC. 2017. "Waterbody Inventory/Priority Waterbodies List: Hudson/East River Watershed."

March 21/September 21

On March 21/September 21, the time period for shadows analysis begins at 7:36 AM and continues until 4:29 PM. March is considered the beginning of the growing season in New York City, and September 21, which has the same shadow patterns as March 21, is also within the growing season. On the March 21/September 21 analysis day, incremental shadows from the projected development would reach portions of both Whitey Ford Field and the East River.

The Proposed Project would cast incremental shadows on portions of Whitey Ford Field beginning at 7:36 AM and continuing until 9:53 AM, for a duration of approximately two hours and 17 minutes. After 9:53 AM, the park would not experience any incremental shadow coverage as a result of the Proposed Project. As indicated in **Figure 6-3a**, incremental shadows would enter the open space from the west before moving in an easterly direction across the park towards 2nd Street. As indicated in **Figure 6-3b**, by 9:15 AM, the extent of incremental shadow coverage would decrease, and the majority of the open space would receive direct sunlight. The areas of Whitey Ford Field that would experience incremental shadow coverage contain active uses, including a baseball diamond and fitness equipment, and passive uses, including bleachers and benches. In addition, manicured lawns and several mature trees are located within the areas of Whitey Ford Field that would experience incremental shadow coverage.

The Proposed Project would cast incremental shadows on small portions of the East River and Pot Cove beginning at 7:36 AM and continuing until 4:29 PM, for a duration of approximately eight hours and 53 minutes. As indicated in **Figures 6-4a** through **6-4e**, the majority of the East River and Pot Cove would receive direct sunlight as incremental shadows move from west to east throughout the representative analysis day.

May 6/August 6

On May 6/August 6, the time period for shadows analysis begins at 6:27 AM and continues until 5:18 PM. On the midpoint between the equinoxes and the solstices, incremental shadows from the Proposed Project would reach portions of both Whitey Ford Field and the East River.

The Proposed Project would cast incremental shadows on portions of Whitey Ford Field beginning at 6:27 AM and continuing until 8:42 AM, for a duration of approximately two hours and 15 minutes. After 8:42 AM, the open space would not experience any incremental shadow coverage as a result of the Proposed Project. As indicated in **Figure 6-5a**, incremental shadows would enter the open space from the west before moving in an easterly direction across the park towards 2nd Street. As indicated in **Figure 6-5b**, by 8:00 AM incremental shadow coverage would decrease, and the majority of the open space would receive direct sunlight. The areas of Whitey Ford Field that would experience incremental shadow coverage contain active uses, including a baseball diamond and fitness equipment, and passive uses, including bleachers and benches. In addition, manicured lawns and several mature trees are located within the areas of Whitey Ford Field that would experience incremental shadow coverage.

The Proposed Project would cast incremental shadows on small portions of the East River and Pot Cove beginning at 6:27 AM and continuing until 6:50 AM, for a duration of approximately 23 minutes. At 9:07 AM, incremental shadows would re-enter the natural resource and continue until 5:18 PM, for a duration of approximately eight hours and 11 minutes. As indicated in **Figures 6-6a** through **6-6e**, the majority of the East River and Pot Cove would receive direct sunlight as incremental shadows move from west to east throughout the representative analysis day.

June 21

On June 21, the time period for shadows analysis begins at 5:57 AM and continues until 6:01 PM. On the summer solstice, which is the day of the year with the longest period of daylight, the sun is most directly overhead and generally shadows are shortest and move across the widest angular range from west to east. On this date, incremental shadows from the Proposed Project would reach portions of Whitey Ford Field, the Greenstreet, and the East River.

The Proposed Project would cast incremental shadows on portions of Whitey Ford Field beginning at 6:05 AM and continuing until 8:13 AM, for a duration of approximately two hours and 8 minutes. After 8:13 AM, the open space would not experience any incremental shadow coverage as a result of the Proposed Project. As indicated in **Figure 6-7a**, incremental shadows would enter the open space from the west before moving in an easterly direction across the park towards 2nd Street. As indicated in **Figure 6-7b**, by 7:30 AM incremental shadow coverage would decrease, and the majority of the open space would receive direct sunlight. The areas of Whitey Ford Field that would experience incremental shadow coverage contain a baseball diamond, bleachers, and benches. In addition, manicured lawns and several mature trees are located within the areas of Whitey Ford Field that would experience incremental shadow coverage.

The Proposed Project would cast incremental shadows on the section of the Greenstreet located between Shore Boulevard and 14th Street beginning at 5:47 PM and continuing until 5:55 PM, for a duration of approximately eight minutes. At 5:58 PM, incremental shadows would enter the section of the Greenstreet located between 14th and 18th Streets and continue until 6:01 PM, for a duration of approximately three minutes. Cumulative incremental shadow duration on the Greenstreet would total approximately 11 minutes. Prior to 5:47 PM, neither section of the Greenstreet would not experience any incremental shadow coverage as a result of the Proposed Project. The areas of the Greenstreet that would experience incremental shadow coverage contain landscaping and trees.

The Proposed Project would cast incremental shadows on small portions of the East River and Pot Cove beginning at 10:06 AM and continuing until 10:22 AM, for a duration of approximately 16 minutes. At 11:15 AM, incremental shadows would re-enter the natural resource and continue until 6:01 PM, for a duration of approximately six hours and 46 minutes. As indicated in **Figures 6-8a** through **6-8c**, the majority of the East River and Pot Cove would receive direct sunlight as incremental shadows move from west to east throughout the representative analysis day.

December 21

On December 21, the time period for shadows analysis begins at 8:51 AM and continues until 2:53 PM. On the winter solstice, which is the day of the year with the shortest period of daylight, the sun is low in the sky and shadows are at their longest but move rapidly. On this date, incremental shadows from the Proposed Project would reach portions of both Whitey Ford Field and the East River.

The Proposed Project would cast incremental shadows on portions of Whitey Ford Field beginning at 8:51 AM and continuing until 10:44 AM, for a duration of approximately one hour and 53 minutes. After 10:44 AM, the open space would not experience any incremental shadow coverage as a result of the Proposed Project. As indicated in **Figure 6-9a**, incremental shadows would enter the open space from the west before moving in an easterly direction across the park towards the East River waterfront. As indicated in **Figure 6-9b**, by 10:30 AM incremental shadow coverage would decrease, and the majority of the open

space would receive direct sunlight. The areas of Whitey Ford Field that would experience incremental shadow coverage include manicured lawns and several mature trees.

The Proposed Project would cast incremental shadows on portions of the East River beginning at 8:51 AM and continuing until 2:53 PM, for a duration of approximately six hours and two minutes. As indicated in **Figures 6-10a** through **6-10c**, the majority of the East River would receive direct sunlight as incremental shadows move from west to east throughout the representative analysis day.

Assessment

As described above, a shadow impact occurs when the incremental shadow from a proposed project falls on a sunlight sensitive resource or feature and reduces its direct sunlight exposure. Determining whether this impact is significant or not depends on the extent and duration of the incremental shadow and the specific context in which the impact occurs. For sunlight-sensitive open space resources, the uses and features of the space indicate its sensitivity to shadows. Shadows occurring during the cold-weather months of interest generally do not affect the growing season of outdoor vegetation; therefore, this sensitivity is assessed for both (1) warm-weather-dependent features or vegetation that could be affected by a loss of sunlight during the growing season; and (2) features, such as benches, that could be affected by a loss of winter sunlight. Uses that rely on sunlight include: passive use, such as sitting or sunning; active use, such as playfields or paved courts; and such activities as gardening, or children's wading pools and sprinklers. Generally, four to six hours a day of sunlight, particularly in the growing season, is often a minimum requirement. Consequently, the assessment of an open space resource's sensitivity to increased shadow focuses on identifying the existing conditions of its facilities, plantings, and uses, and the sunlight requirements for each.

Whitey Ford Field

The Proposed Project would cast incremental shadows on Whitey Ford Field on each of the four representative analysis days: March 21/September 21, May 6/August 6, June 21, and December 21. Incremental shadow duration would range from one hour and 53 minutes on December 21 to two hours and 17 minutes on March 21/September 21 and would generally be limited to the early morning hours before 11:00 AM. Incremental shadow coverage would generally be limited in scope and would not be cast on any single area of Whitey Ford Field for an extended period of time, as shadows move from west to east throughout the day, allowing the open space's sunlight-sensitive features to receive adequate direct sunlight (at least four to six hours) throughout the analysis day.

Therefore, as the extent and duration of the incremental shadows would: (1) not significantly reduce or completely eliminate direct sunlight exposure on any of the sunlight-sensitive features found within the open space; and (2) would not significantly alter the public's use of the open space resource or threaten the viability of vegetation or other sunlight-sensitive features, incremental shadows from the Proposed Project on Whitey Ford Field would not be considered a significant adverse impact, in accordance with *CEQR Technical Manual* guidance.

Greenstreet

The Proposed Project would cast incremental shadows on the Greenstreet on one of the four representative analysis days: June 21. Cumulative incremental shadow duration would occur for approximately 11 minutes on June 21 and would generally be limited to the early evening hours after 5:45 PM. Incremental shadow coverage would generally be limited in scope and would not be cast on any single

area of the Greenstreet for an extended period of time, as shadows move from west to east throughout the day, allowing the open space's sunlight-sensitive features to receive adequate direct sunlight (at least four to six hours) throughout the analysis day.

Therefore, as the extent and duration of the incremental shadows would: (1) not significantly reduce or completely eliminate direct sunlight exposure on any of the sunlight-sensitive features found within the open space; and (2) would not significantly alter the public's use of the open space resource or threaten the viability of vegetation or other sunlight-sensitive features, incremental shadows from the Proposed Project on the Greenstreet would not be considered a significant adverse impact, in accordance with *CEQR Technical Manual* guidance.

East River

The Proposed Project would cast incremental shadows on portions of the East River and Pot Cove on each of the four representative analysis days: March 21/September 21, May 6/August 6, June 21, and December 21. Incremental shadow duration would range from six hours and two minutes on December 21 to eight hours and 53 minutes on March 21/September 21. Incremental shadow coverage would generally be limited in scope, primarily affecting areas along the waterfront. While the extent of shadow coverage would be greatest on December 21, shadow coverage would be limited to relatively small areas on the other three representative analysis days (refer to **Figures 6-4**, **6-6**, and **6-8**). The areas that would receive the longest durations of new shadows would continue to receive several hours of sunlight over the course of each analysis day. The East River experiences only limited utilization by fish at various times of the year due to its swift currents, lack of shoals and protected habitat, and poor water quality.

Therefore, as the extent and duration of the incremental shadows would: (1) not significantly reduce or completely eliminate direct sunlight exposure on any of the sunlight-sensitive features found within the natural resource; and (2) would not significantly alter the public's use of the natural resource or threaten the viability of vegetation or other sunlight-sensitive features, incremental shadows from the Proposed Project on the East River would not be considered a significant adverse impact, in accordance with *CEQR Technical Manual* guidance.

Project-Generated Open Space

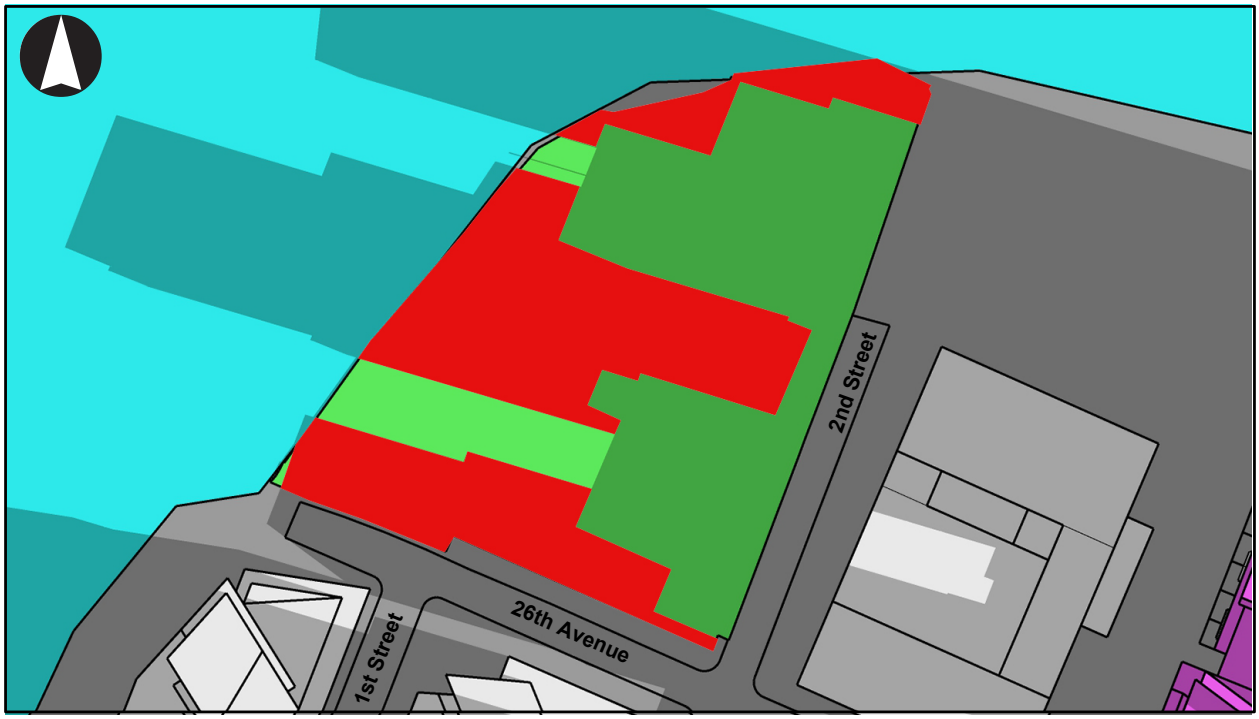
Pursuant to *CEQR Technical Manual* guidance, shadows on project-generated open space are not considered significant. However, as future project-generated open space is included as part of the analysis presented in **Chapter 5, "Open Space,"** a discussion of how shadows could affect the new open space planned as part of the Proposed Project is provided below.

As discussed in **Chapter 5, "Open Space,"** the Proposed Project is expected to include approximately 0.95 acres (41,363 square foot (sf)) of publicly accessible open space. The new open space, which would be bounded by the Development Site to the south and the East River waterfront to the north, would be accessed from the 3rd Street extension, north of 26th Avenue, as well as from the previously approved Astoria Cove Esplanade located to the east.

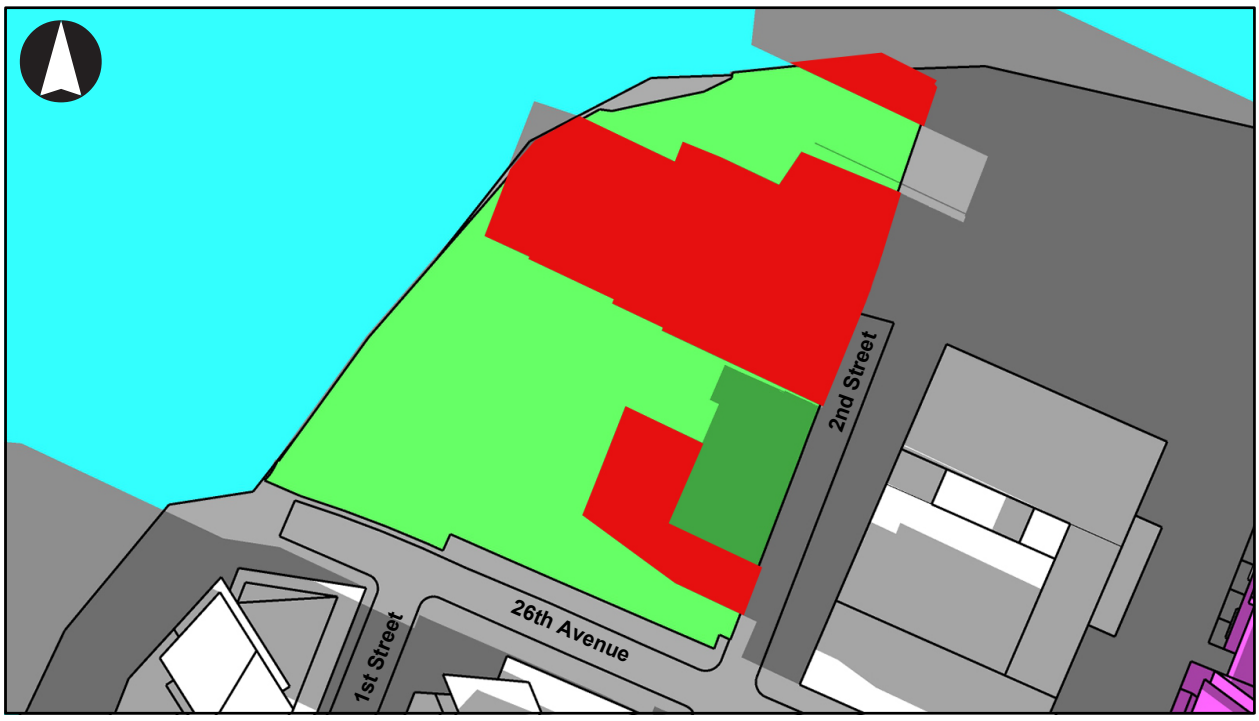
On the March 21/September 21, May 6/August 6, and June 21 representative analysis days, project-generated shadow coverage on future open space is expected to be greatest during the late morning hours (several hours after the start of the analysis period) and the midday and early afternoon hours (several hours before the end of the analysis period). On the December 21 representative analysis day, the future open space would receive the greatest extent of project-generated shadow coverage. Project-

generated shadow coverage would generally be limited to the western portions of the future open space during the late morning hours, but would exit by the early afternoon hours, leaving the western portions almost completely in sun. Because shadows are not static and move from west to east throughout the day, as the western portions of the future open space experience direct sunlight during the afternoon hours, the eastern portions of the future open space would receive project-generated shadow coverage. Therefore, it is anticipated that the majority of future open space areas would receive adequate direct sunlight throughout the day (at least the four to six hour minimum specified in the *CEQR Technical Manual*), and vegetation would not be affected. As the programming for the project-generated open space is not yet finalized, it is difficult to project what types of features and amenities would experience incremental shadow coverage. However, it is expected that the future open space areas would be designed to account for project-generated shadows.

Incremental Shadows on March 21st/September 21st - Whitey Ford Field



7:45 AM



8:30 AM

Proposed Project

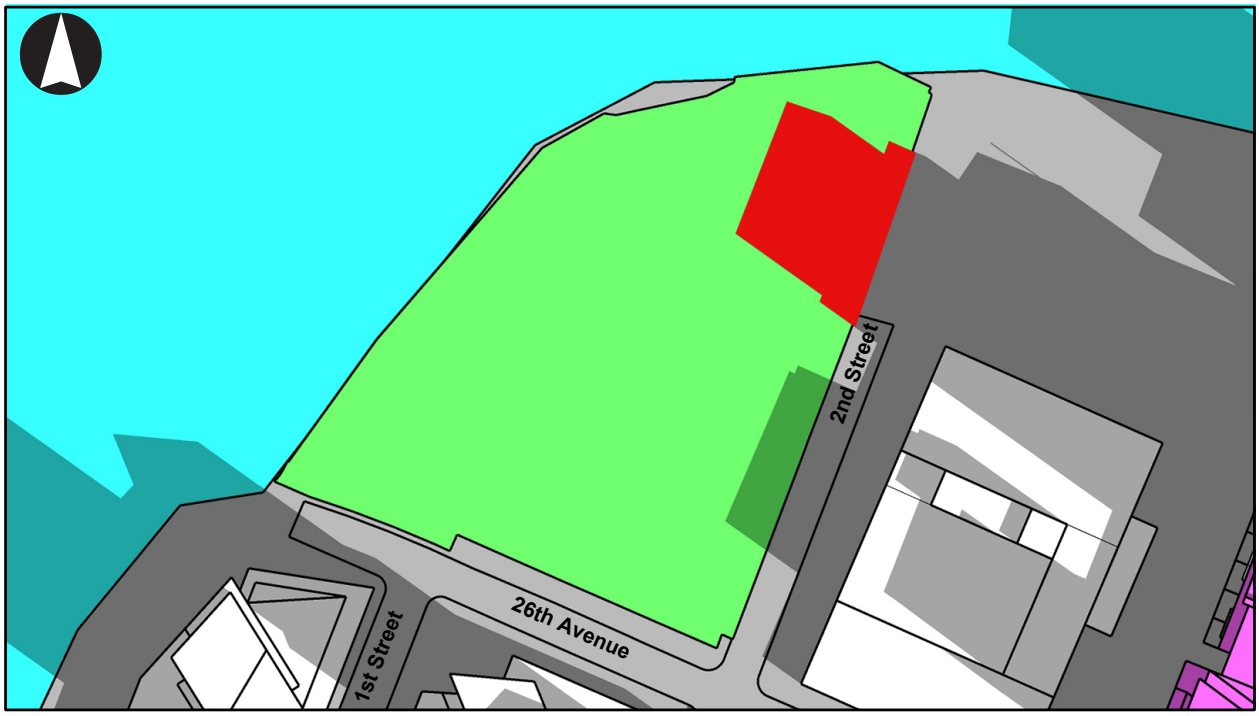
Area of Open Space in Direct Sunlight

Area of Open Space in New Shadow

Non-Applicant Projected Development Site (Not shown in this figure)

Area of Open Space in Existing Shadow

Incremental Shadows on March 21st/September 21st - Whitey Ford Field



9:15 AM

Proposed Project

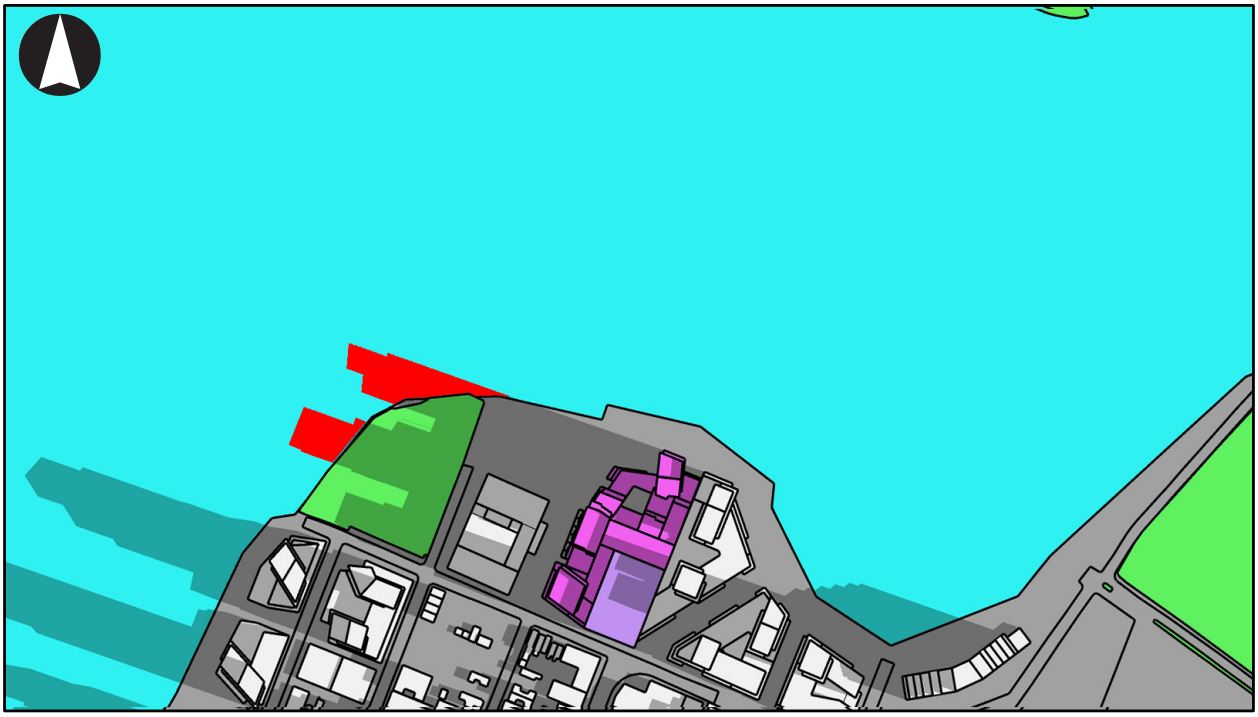
Area of Open Space in Direct Sunlight

Area of Open Space in New Shadow

Non-Applicant Projected Development Site (Not shown in this figure)

Area of Open Space in Existing Shadow

Incremental Shadows on March 21st/September 21st - East River



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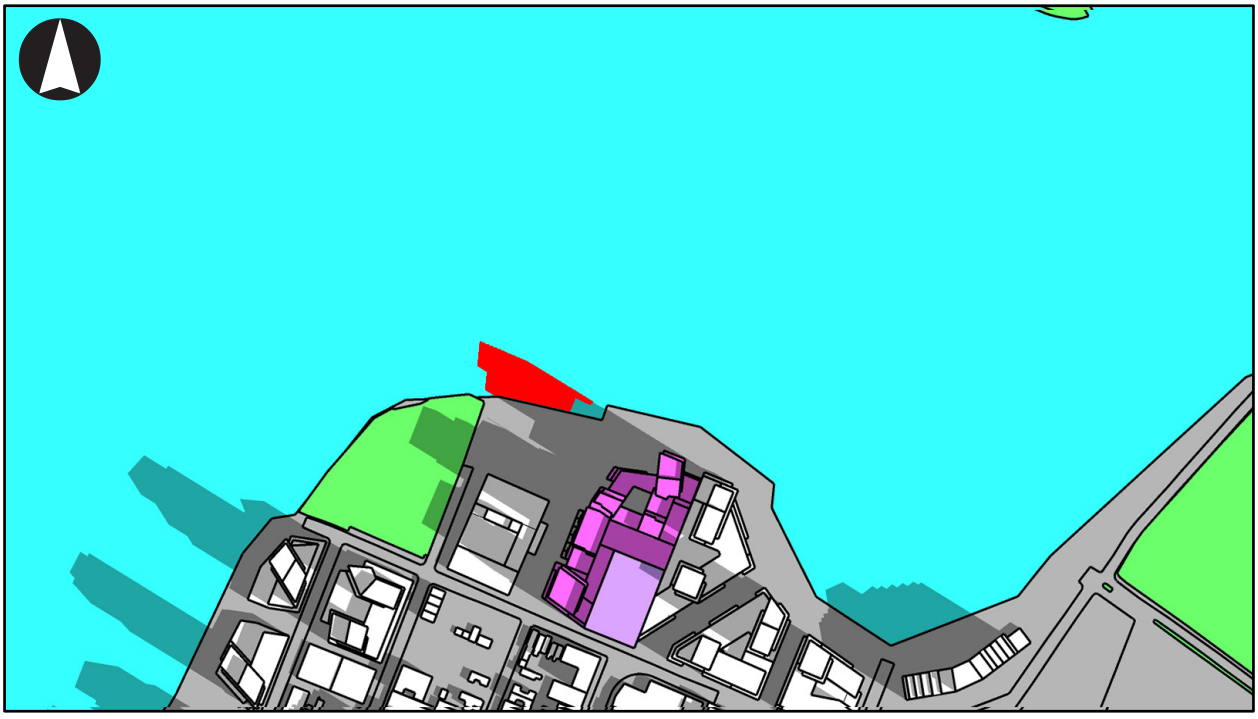


9:00 AM

Proposed Project

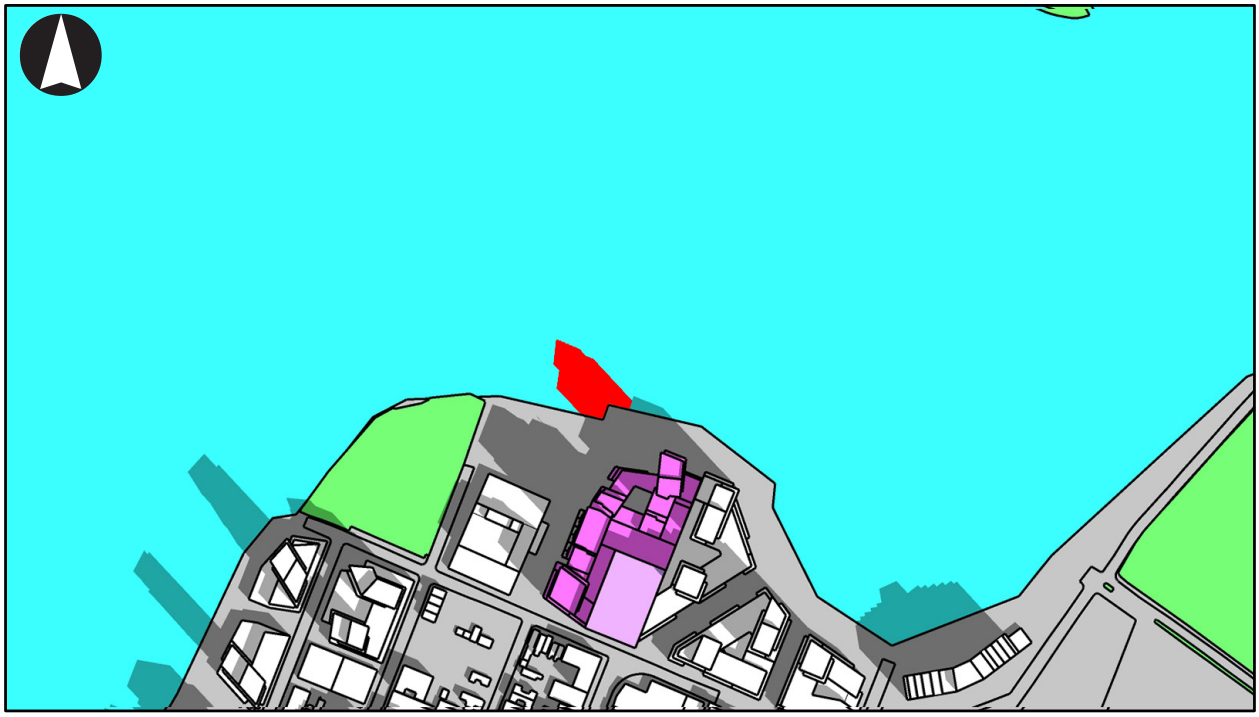
Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on March 21st/September 21st - East River



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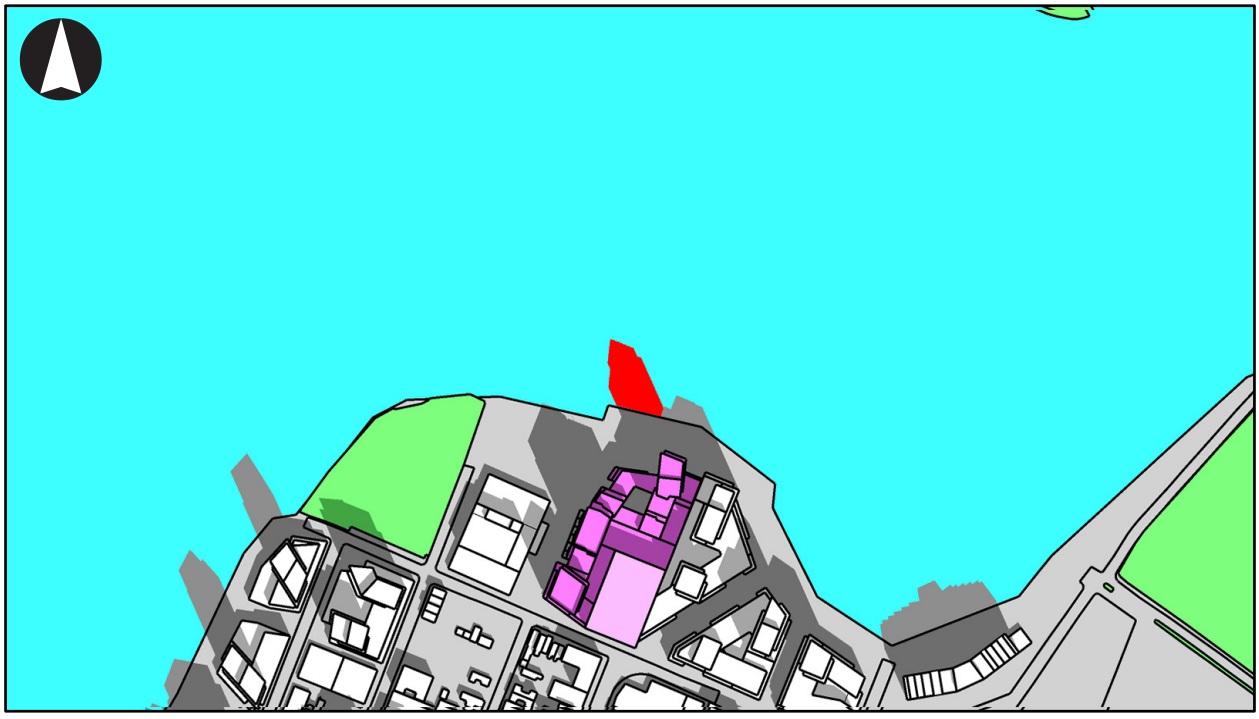


11:00 AM

Proposed Project

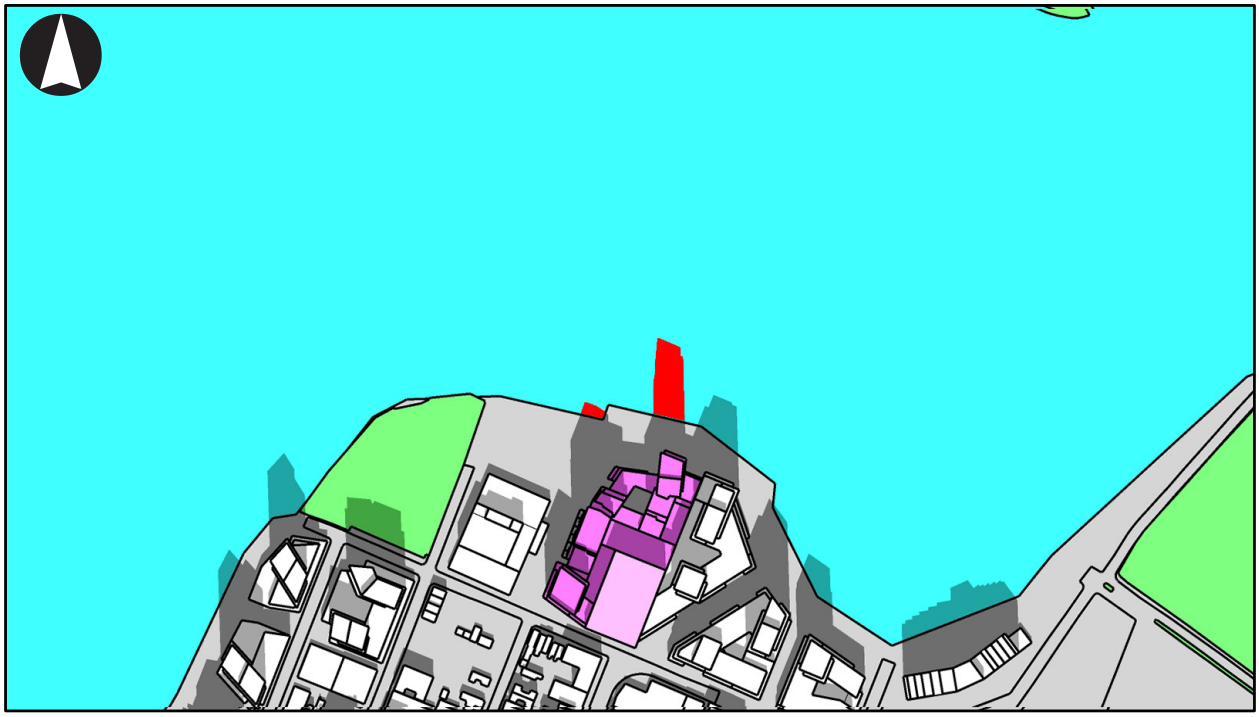
Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on March 21st/September 21st - East River



12:00 PM



1:00 PM

Proposed Project

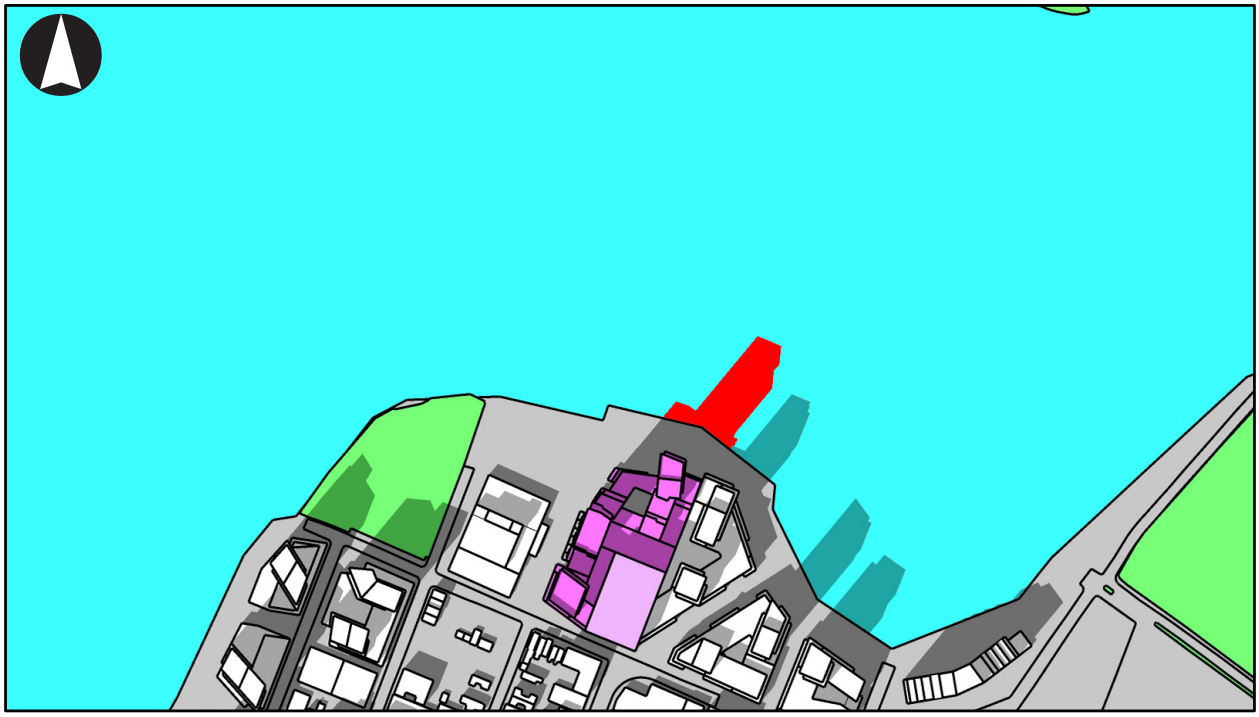
Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

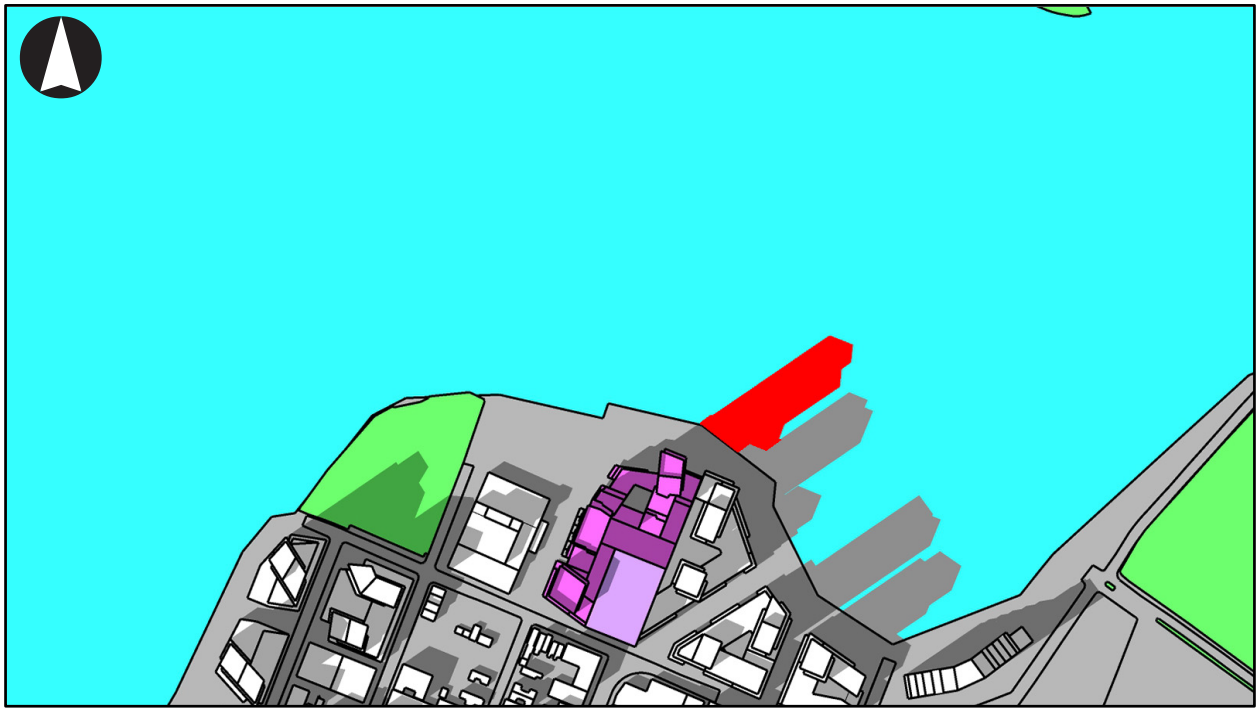
Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on March 21st/September 21st - East River



2:00 PM



3:00 PM

Proposed Project

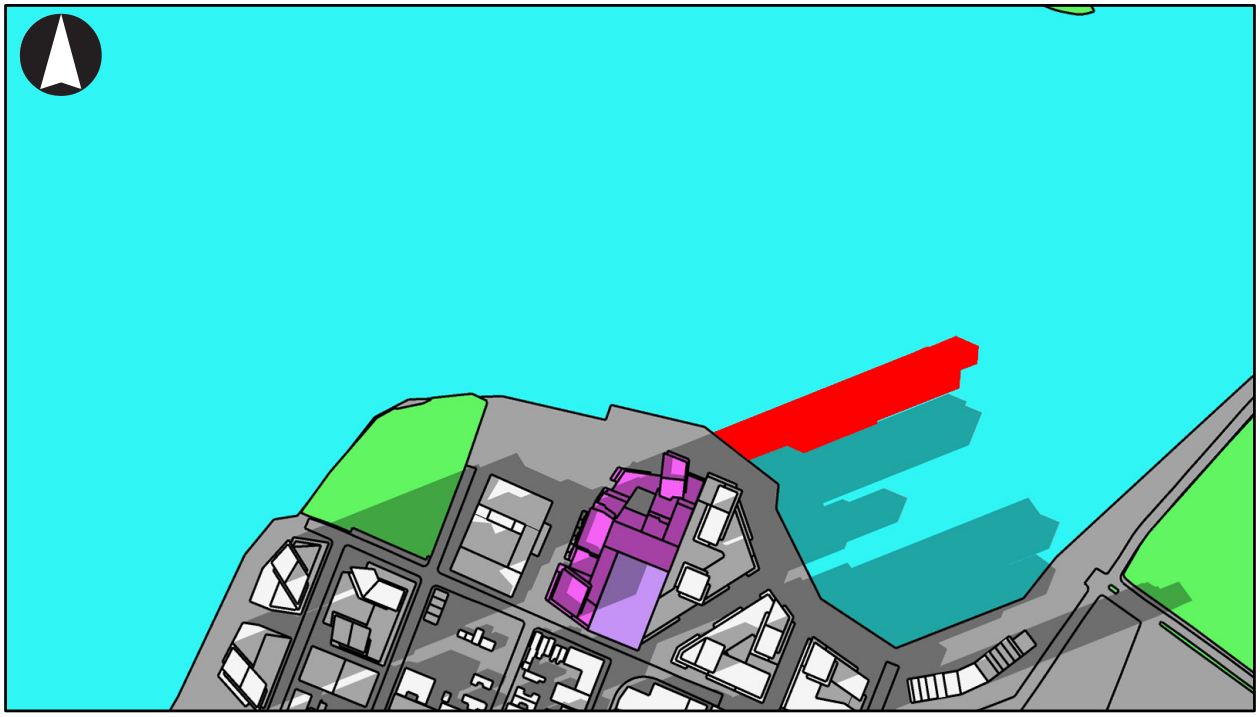
Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on March 21st/September 21st - East River



4:00 PM

Proposed Project

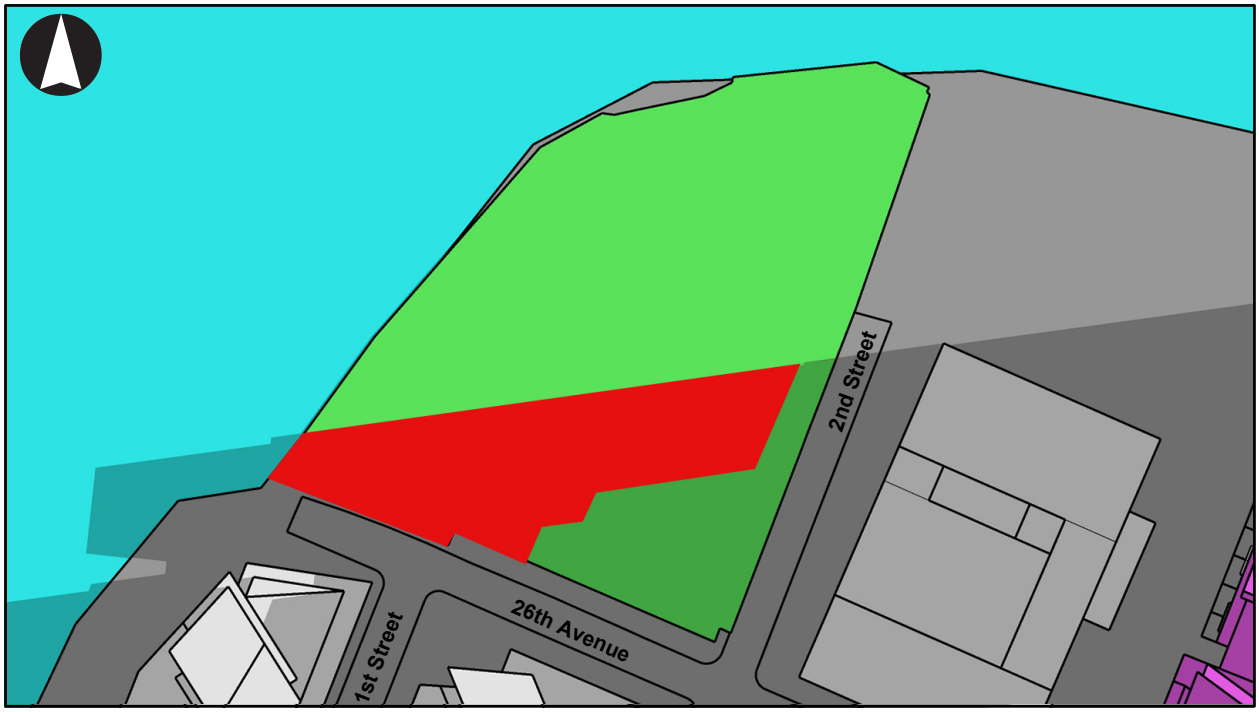
Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on May 6th/August 6th - Whitey Ford Field



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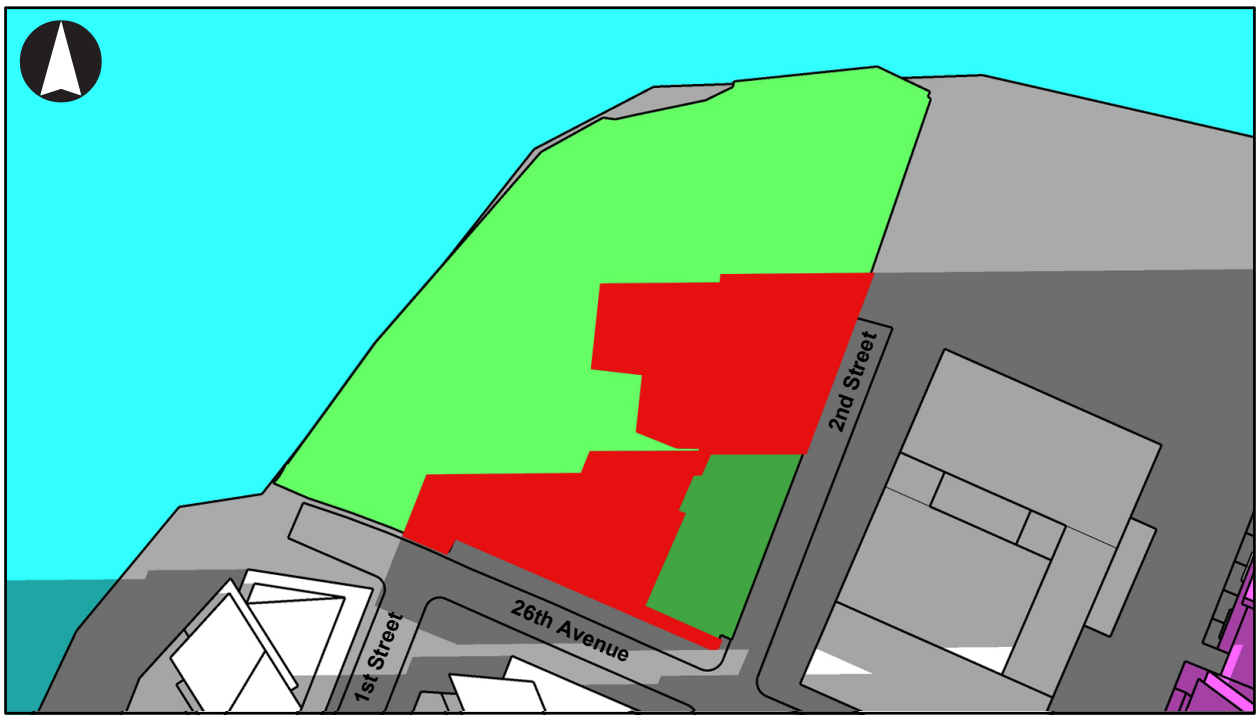


7:15 AM

Proposed Project

Area of Open Space in Direct Sunlight

Area of Open Space in New Shadow

Non-Applicant Projected Development Site (Not shown in this figure)

Area of Open Space in Existing Shadow

Incremental Shadows on May 6/August 6th- Whitey Ford Field



8:00 AM

Proposed Project

Area of Open Space in Direct Sunlight

Area of Open Space in New Shadow

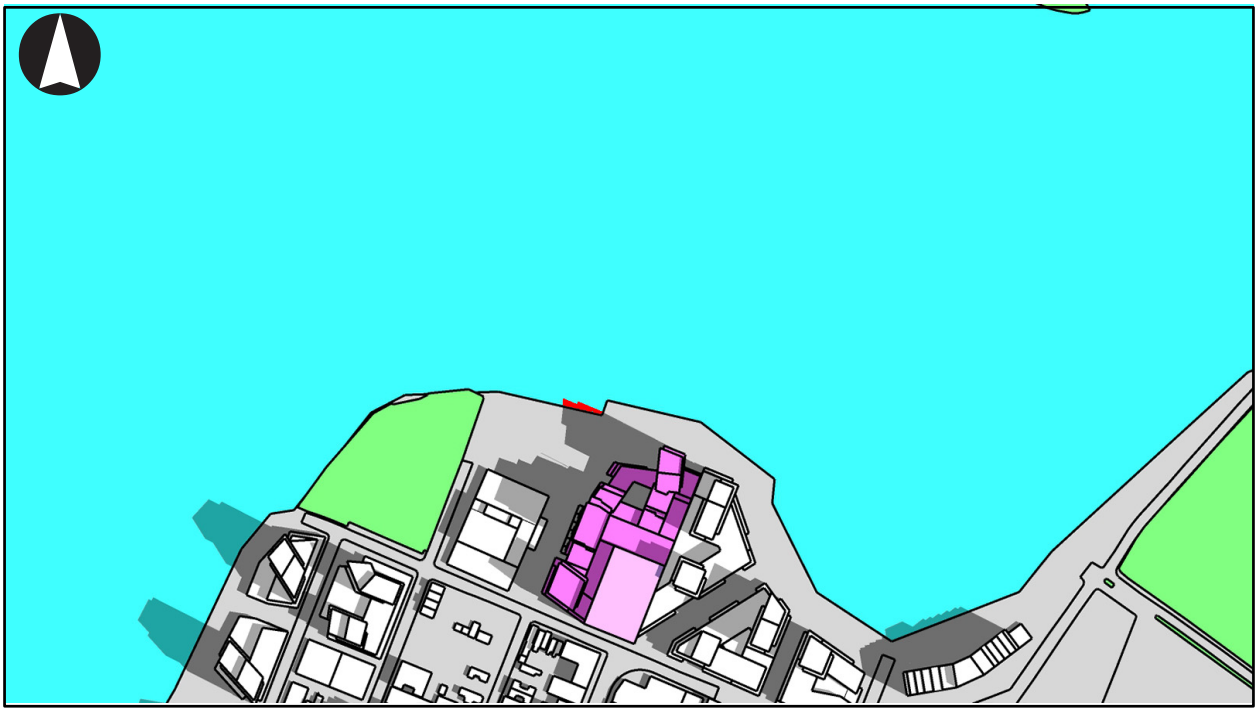
Non-Applicant Projected Development Site (Not shown in this figure)

Area of Open Space in Existing Shadow

Incremental Shadows on May 6th/August 6th - East River



6:30 AM



9:30 AM

Proposed Project

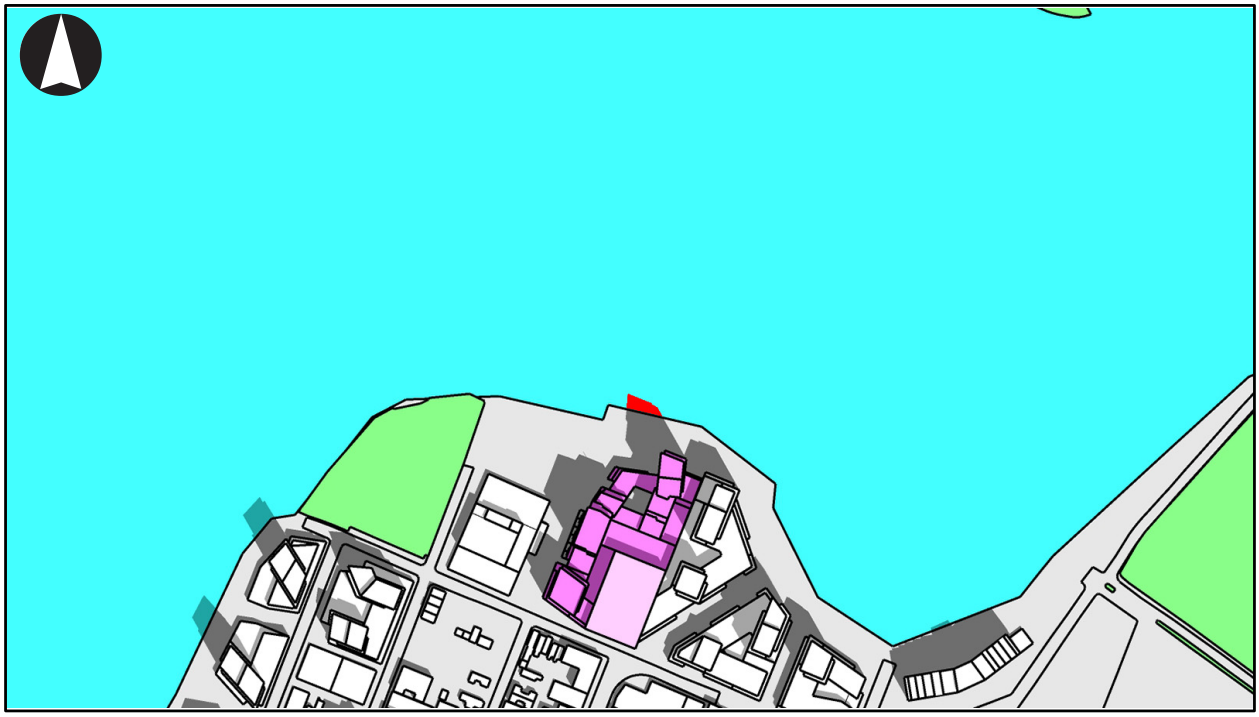
Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on May 6th/August 6th - East River



11:00 AM



12:00 PM

Proposed Project

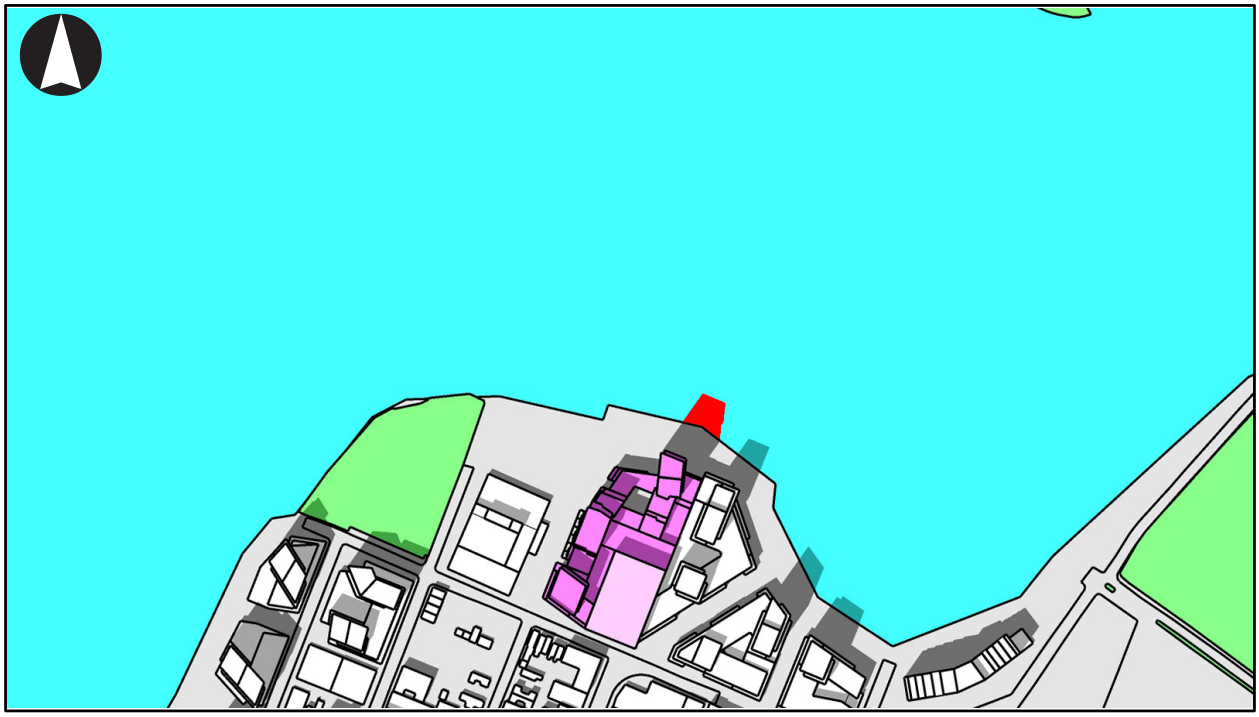
Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on May 6th/August 6th - East River



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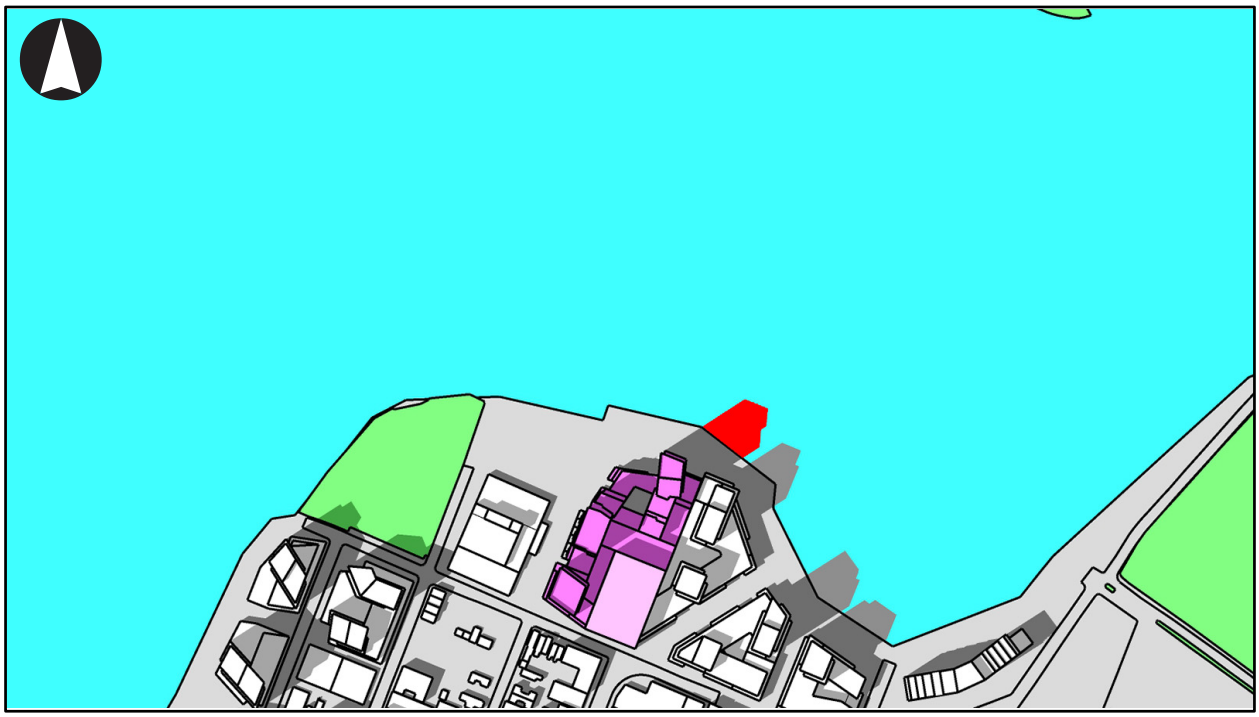


2:00 PM

Proposed Project

Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on May 6th/August 6th - East River



3:00 PM



4:00 PM

Proposed Project

Area of Resource in Direct Sunlight

Area of Open Space in New Shadow

Non-Applicant Projected Development Site

Area of Resource in Existing Shadow

Incremental Shadows on May 6th/August 6th - East River



5:00 PM

Proposed Project

Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on June 21st - Whitey Ford Field



6:30 AM



7:00 AM

Proposed Project

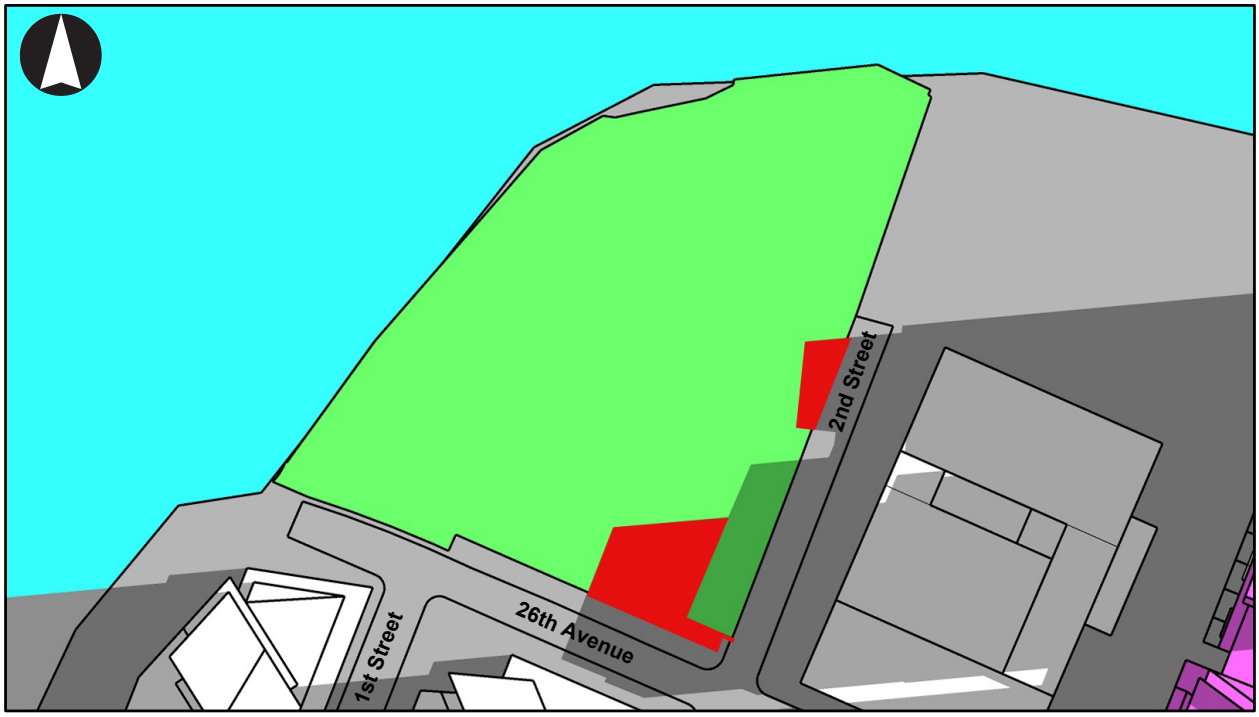
Area of Open Space in Direct Sunlight

Area of Open Space in New Shadow

Non-Applicant Projected Development Site (Not shown in this figure)

Area of Open Space in Existing Shadow

Incremental Shadows on June 21st - Whitey Ford Field



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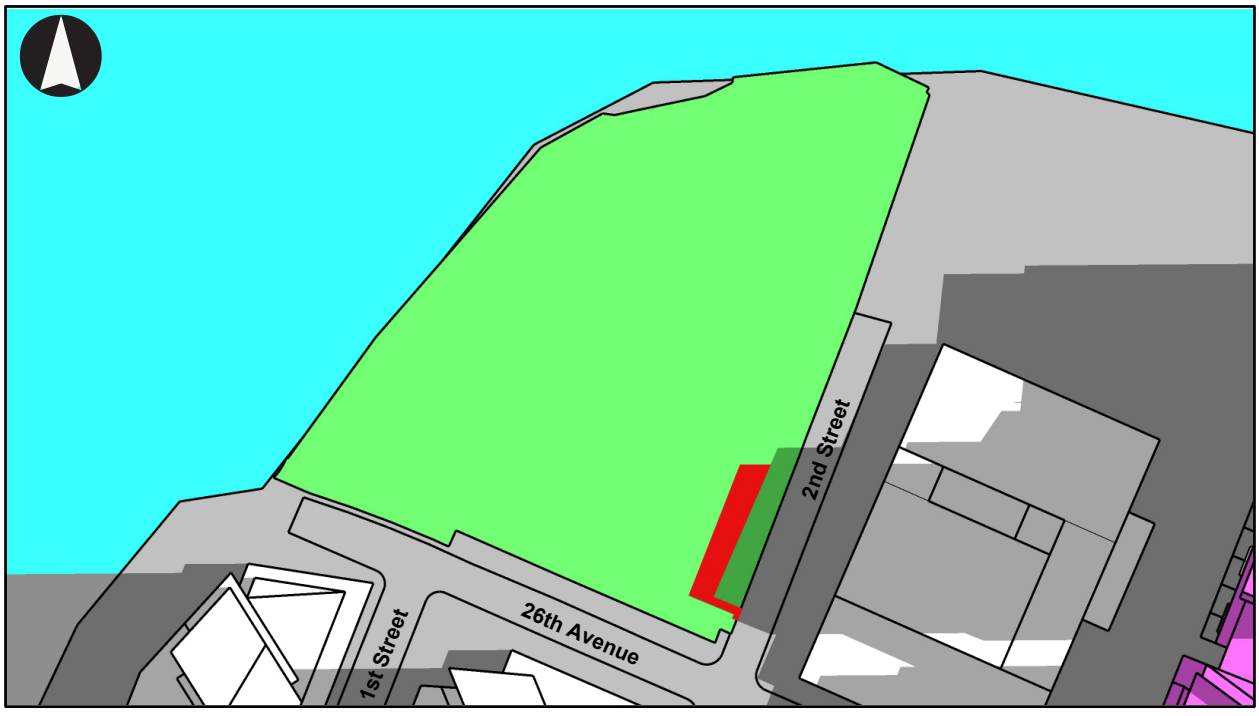


8:00 AM

Proposed Project

Area of Open Space in Direct Sunlight

Area of Open Space in New Shadow

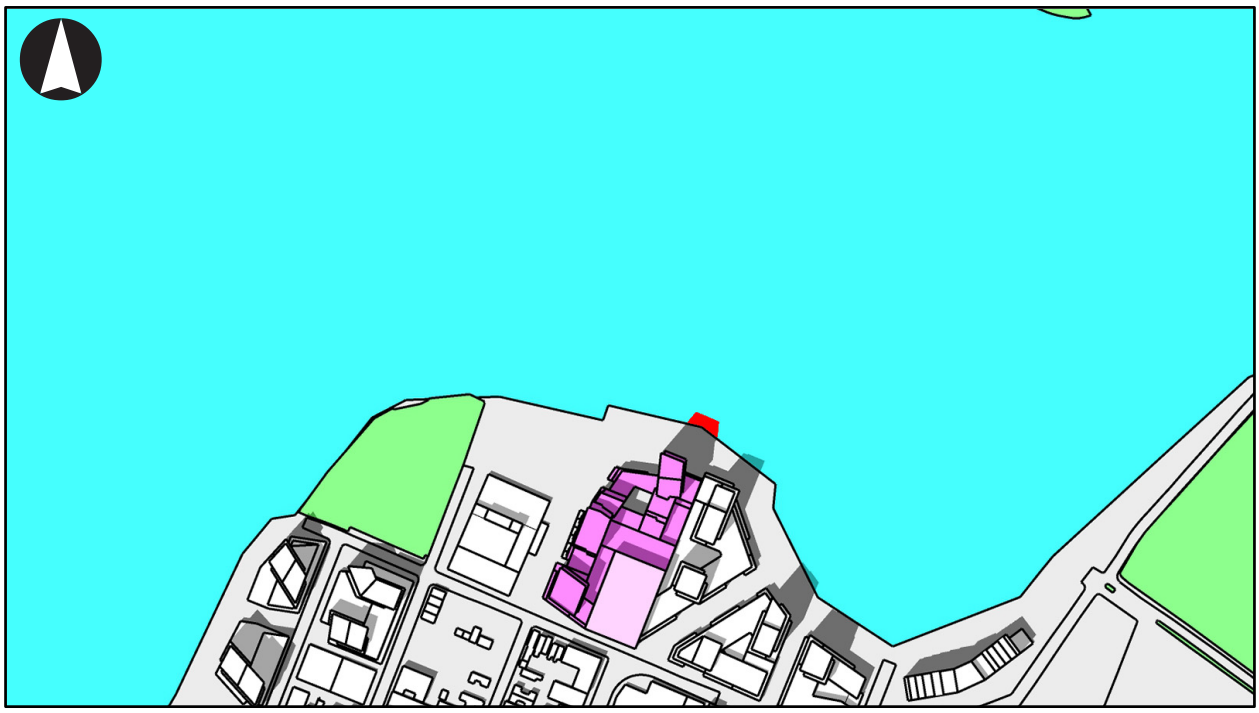
Non-Applicant Projected Development Site (Not shown in this figure)

Area of Open Space in Existing Shadow

Incremental Shadows on June 21st - East River



12:00 PM



1:00 PM

Proposed Project

Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on June 21st - East River



2:00 PM



3:00 PM

Proposed Project

Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on June 21st - East River



4:00 PM



5:00 PM

Proposed Project

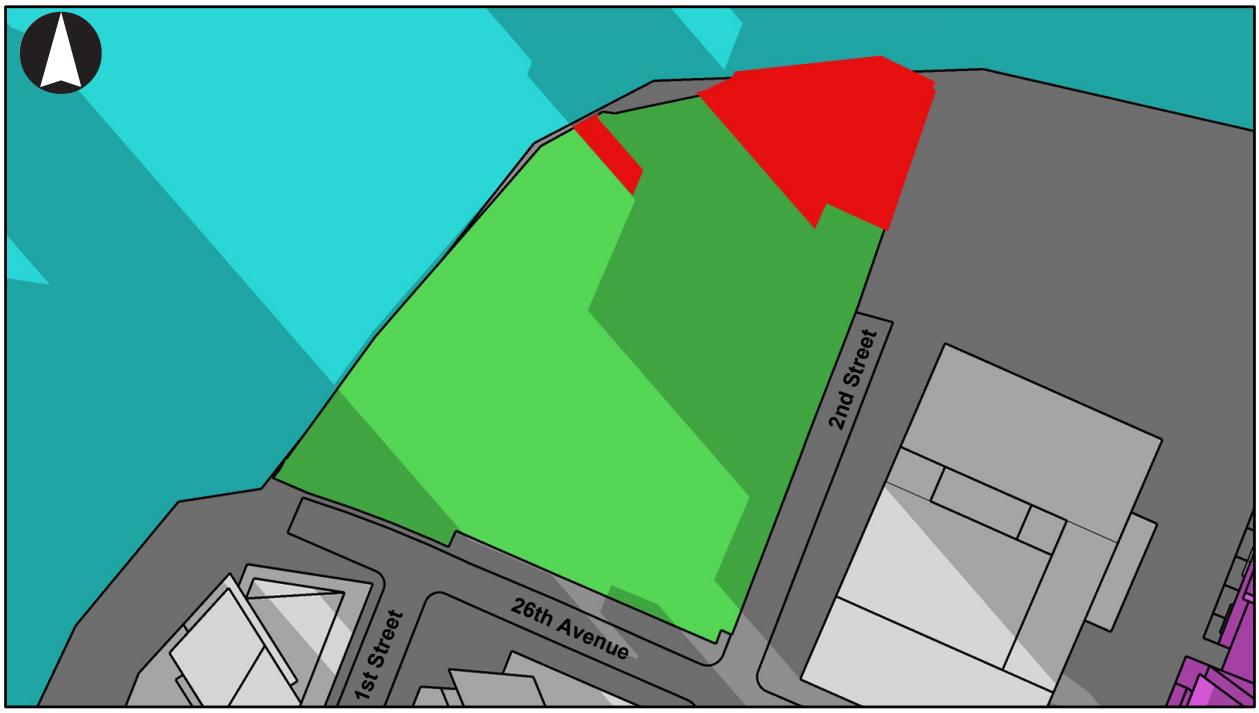
Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on December 21st - Whitey Ford Field



9:00 AM



9:45AM

Proposed Project

Non-Applicant Projected Development Site (Not shown in this figure)

Area of Open Space in Direct Sunlight

Area of Open Space in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on December 21st - Whitey Ford Field



10:30 AM

Proposed Project

Non-Applicant Projected Development Site (Not shown in this figure)

Area of Open Space in Direct Sunlight

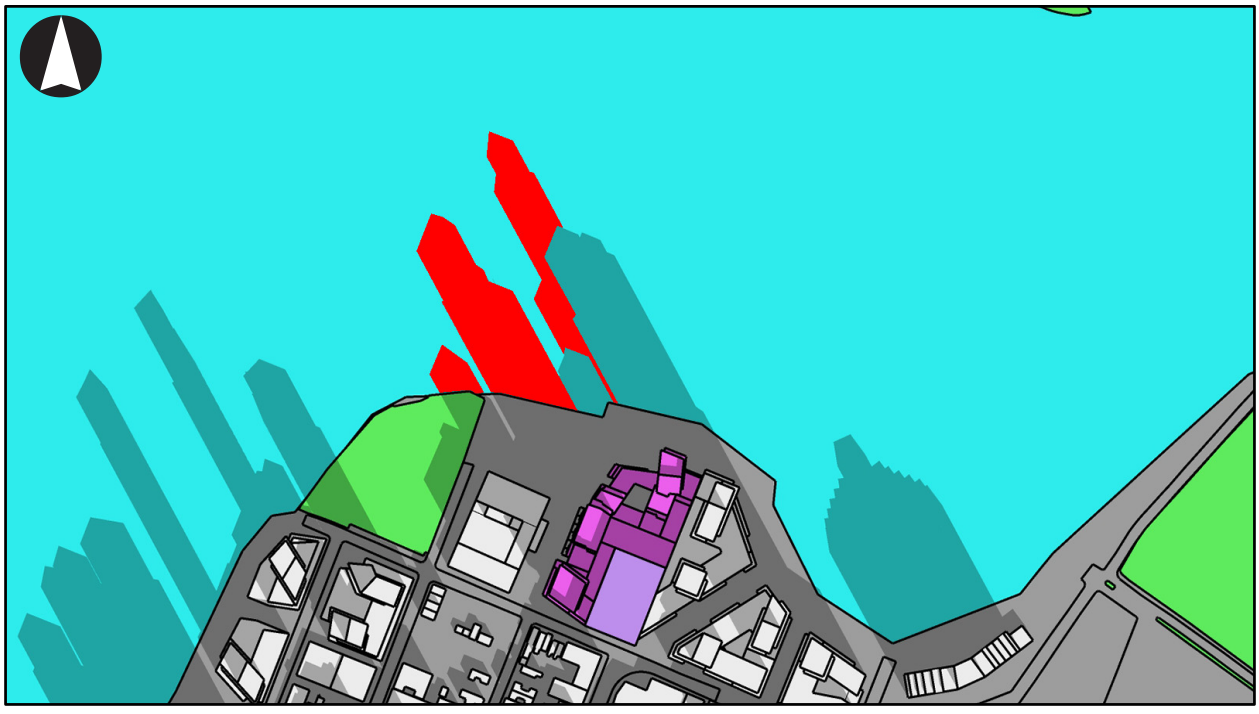
Area of Open Space in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on December 21st - East River



9:00 AM



10:00 AM

Proposed Project

Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

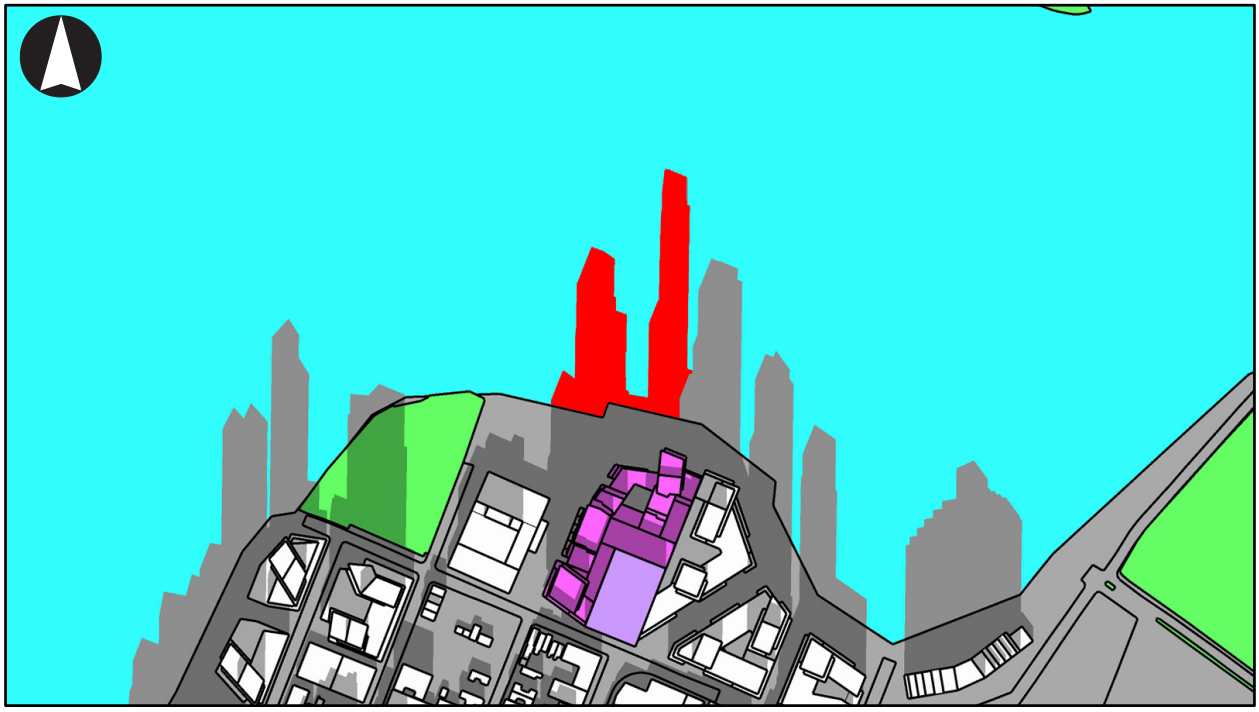
Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on December 21st - East River



11:00 AM



12:00 PM

Proposed Project

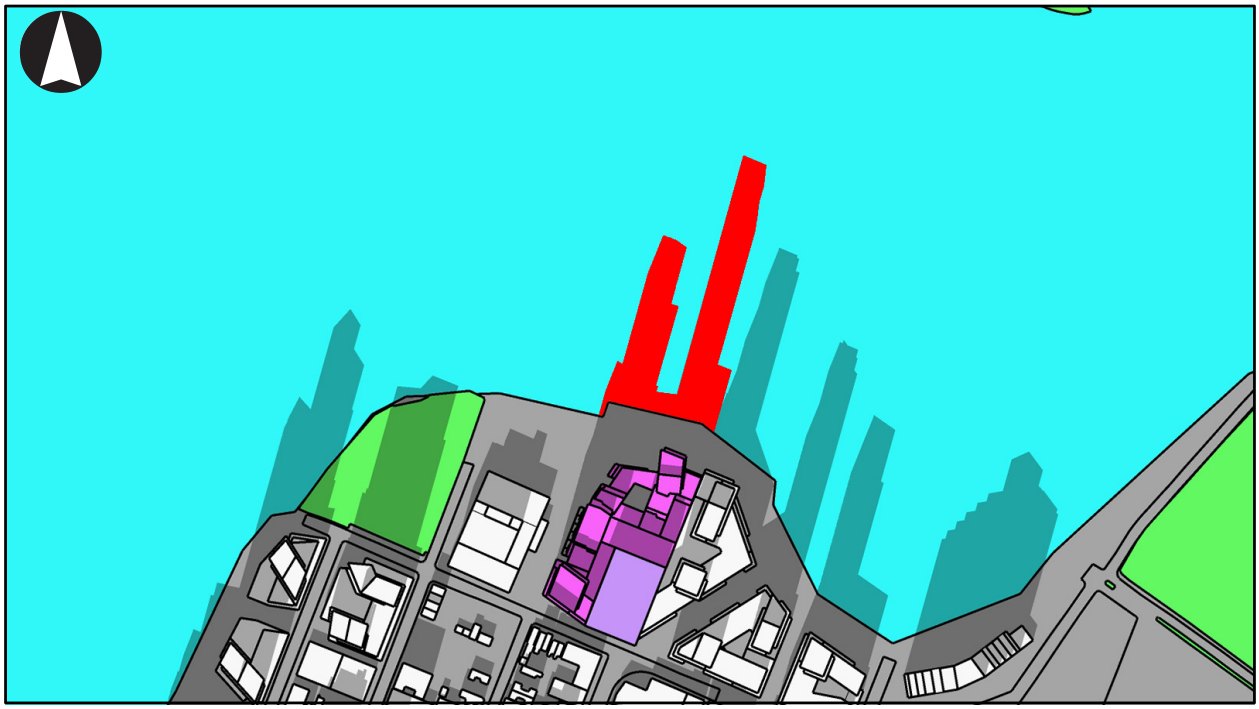
Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow

Incremental Shadows on December 21st - East River



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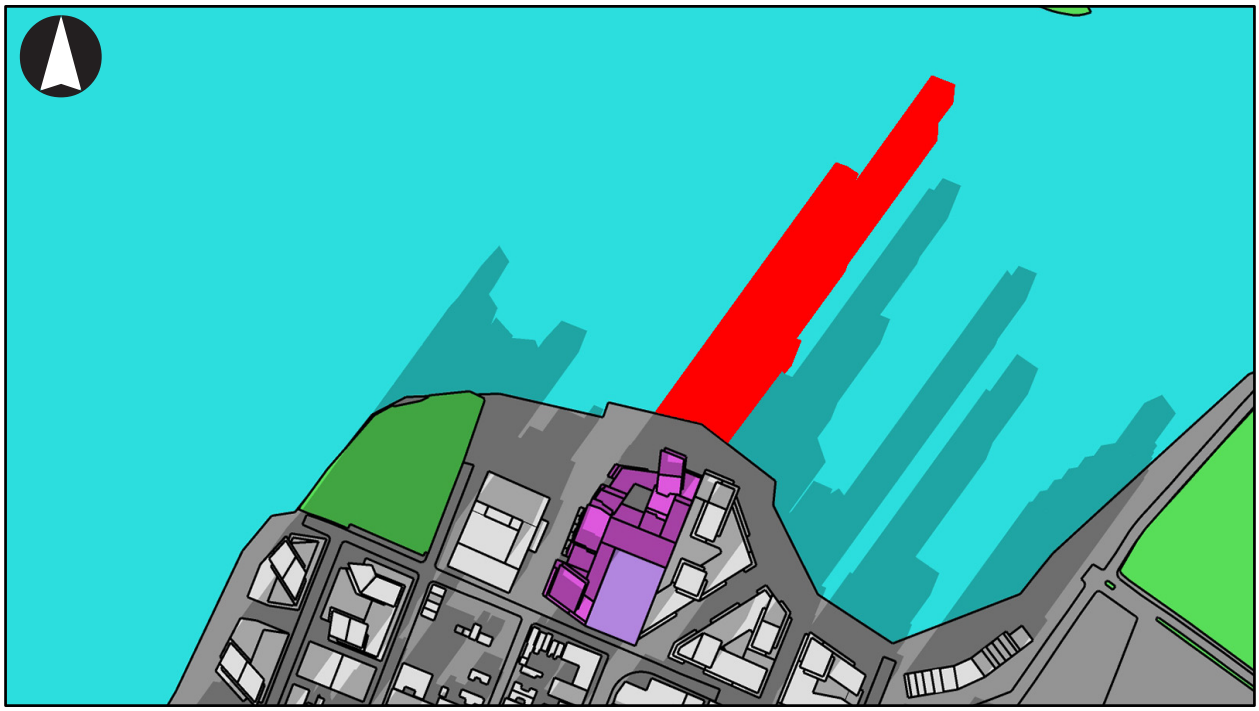

2:30 PM

Proposed Project

Non-Applicant Projected Development Site

Area of Resource in Direct Sunlight

Area of Resource in Existing Shadow

Area of Open Space in New Shadow