5

Shadows

A shadow is defined in the *2021 CEQR Technical Manual* as the condition that results when a building or other built structure blocks the sunlight that would otherwise directly reach a certain area, space, or feature. The purpose of this chapter is to assess whether new structures may cast shadows on sunlight-sensitive, publicly accessible resources or other resources of concern such as natural resources, and to assess the significance of their impact.

Introduction

According to the *2021 CEQR Technical Manual*, a shadows assessment is warranted for proposed actions that would result in new structures greater than 50 feet in height or located adjacent to, or across the street from, a sunlight-sensitive resource. Such resources include publicly accessible open spaces, important sunlight-sensitive natural features, or historic resources with sun-sensitive features. A significant adverse shadow impact occurs when the incremental shadow added by a proposed project 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.

The Proposed Actions would facilitate the construction of the Proposed Project, which would consist of multiple new buildings (illustratively shown as Buildings A, B1, and B2)[1] (see **Figure 1-2**), all of which would exceed 50 feet in height. The height of the eastern building would be up to

[1] As design progresses for the Proposed Project, it is likely that the building on the eastern portion of the Development Site (i.e., Building A) would be designed as two buildings with independent utility systems to accommodate separation between the public school and CUNY facilities.

approximately 370 feet, the midblock building would be up to approximately 420 feet, and the height of the western building would be up to approximately 500 feet. Therefore, further assessment is warranted to understand the potential for the Proposed Project to result in shadows impacts under *CEQR Technical Manual* criteria.

Principal Conclusions

Tier 1 through Tier 3 and detailed shadows analyses were undertaken for the Proposed Project since future development on the Development Site is expected to exceed 50 feet in height, the CEQR threshold for a shadows analysis. Several sunlight-sensitive resources were identified within the potential Tier 3 shadow sweep that were advanced to a detailed analysis: one historic resource, Parish of Our Lady of the Scapular and Saint Stephen's (H1); three open space resources, including Bellevue South Park (O1), Alexandria Center Public Plaza and Urban Garden (O3), and East River Greenway (O5); and one natural resource, the East River (N1). In addition, a fourth open space that is privately owned but currently not secured by a fence was considered: the Bellevue Sobriety Garden (O6).

A detailed analysis was conducted for the resources that could receive incremental shadow on one or more of the analysis days. For H1, it was determined that given the short duration (12 minutes) of shading on the stained-glass windows, the public's enjoyment of this resource would not be affected. For the open space resources that were studied in the detailed shadows assessment, although incremental shading could eliminate sunlight from the resources during the day in some of the analysis periods, incremental shadows would be of limited duration and would occur on spaces that either receive uninterrupted sunlight during other periods of the analysis day or on spaces that do not receive uninterrupted sunlight under existing conditions. Thus, it was determined that incremental shadows would not adversely impair the public's enjoyment of the space or the viability of vegetation of these resources. Finally, for N1, incremental shading would occur over limited portions of the East River for brief periods of time during the afternoon. Based on the foregoing, no adverse impacts to sunlight sensitive resources would occur due to shadows from the Proposed Project.

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. In accordance with the *CEQR Technical Manual*, a preliminary screening assessment is conducted to ascertain whether shadows resulting from a project could reach any sunlight-sensitive resource at any time of year; if the preliminary assessment indicates that, in the absence of intervening buildings, shadows from a project could reach sunlight-sensitive resources on any of the representative analysis days, a detailed analysis is typically warranted.

Sunlight-Sensitive Resources

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: [2]

- Public open space (e.g., parks, beaches, playgrounds, plazas, schoolyards, greenways, and landscaped medians with seating). Planted areas within unused portions of roadbeds that are part of the Greenstreets program are also considered sunlight-sensitive resources. The uses and vegetation in an open space establish its sensitivity to shadows. This sensitivity is assessed for both (1) warm-weather-dependent features like wading pools and sand boxes, 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 uses, such as sitting or sunning; active uses, 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, 4 to 6 hours a day of sunlight, particularly in the growing season, is a minimum requirement for most vegetation. Consistent with *CEQR Technical Manual* methodology, private open spaces are not considered in a shadows analysis. Therefore, the Bellevue Hospital Center Plaza, which contains trees, landscaping, a fountain, and walkways, and is a private open space, was not considered. Similarly, open spaces associated with residential buildings, such as the private open space associated with the 344 East 28th Street housing complex, are not considered. In addition, historic resources that do not have sunlight sensitive features, such as the Bellevue Hospital Center, are not considered in the shadows analysis.
- 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 waterbodies, wetlands, or designated resources such as coastal fish and wildlife habitats.

Preliminary Assessment

The preliminary screening assessment consists of three tiers of analysis:

[2] According to the *CEQR Technical Manual*, City streets, sidewalks, and private open spaces (such as private residential front and backyards, stoops, and vacant lots) are not considered to be sunlight-sensitive resources.

- **Tier 1 Screening:** The first tier determines a simple radius around the proposed building representing the longest shadow that could be cast. If there are sunlight-sensitive resources within the radius, the analysis proceeds to the second tier;
- **Tier 2 Screening:** The second-tier analysis 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. According to the *CEQR Technical Manual*, shadows cannot be cast within New York City within 108 degrees from True North. Topographic lines are included to demonstrate the terrain of the area;
- **Tier 3 Screening:** 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. For the Tier 3 screening, three-dimensional modeling software with the capacity to model shadows is used, and the maximum building envelope that could be achieved as a result of the Proposed Project is modeled and geo-located within the program. Terrain, which has been included in the Tier 1 and Tier 2 Screenings, is also incorporated into the model to account for how changes in elevation throughout the study area can influence shadows that could be cast by the Proposed Project. The representative days are December 21 (winter solstice), June 21 (summer solstice), March 21/September 21 (vernal/autumnal equinox), and May 6/August 6 (halfway between summer solstice and the equinoxes). The modeling software is also used to approximate times that shadows cast from the Proposed Project could enter and exit a resource.

Determination of Significance

As described in the *CEQR Technical Manual*, an incremental shadow is generally not considered significant when its duration is no longer than 10 minutes at any time of year and the resource continues to receive substantial direct sunlight. A significant shadow impact can occur when an incremental shadow of 10 minutes or longer falls on a sunlight-sensitive resource and results in one of the following:

- Vegetation: a substantial reduction in sunlight available to a sunlight-sensitive feature of the resource to less than the minimum time necessary for its survival (when there was 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, with consideration given to anticipated new users and the open space's utilization rates throughout the affected time periods as well as to the inventory of available open space resources in the study area.
- 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.

Preliminary Assessment

Tiers 1 and 2 Screening

As described above, the tallest of the buildings would be a maximum of up to 500 feet tall (including the mechanical bulkhead).[3] The Development Site is oriented roughly northeast to southwest along the street grid of Manhattan in the Kips Bay neighborhood. The buildings would be oriented in a C-shape transitioning from a taller building on the western side of the Development Site to a shorter building on the eastern side of the Development Site anchored by SPARC Square, the proposed 0.60-acre publicly accessible open space (see **Figure 5-1**). For conservative analysis and simplicity purposes, the maximum screening radius was drawn based on the height of the tallest portion of the western building, or 500 feet.

[3] The proposed maximum height including bulkhead is assessed for illustrative purposes. As design progresses, it is anticipated that the maximum building height will be shorter. However, to be consistent with the *CEQR Technical Manual*, the maximum envelope is considered.

Figure 5-1 Illustrative Site Plan



Source: SPARC Kips Bay project

Note: Site plan is shown for illustrative purposes only, and the building massing used for the shadows analysis shows the maximum envelope that could be constructed under the Proposed Actions. The actual building design would result in building massing that is smaller than what is represented in the shadows model.

As the radius of the longest shadow was based on the maximum building height for the tallest of the buildings on the site, a shadow screening study radius of 2,150 feet was established from the boundaries of the Development Site. Consistent with the *CEQR Technical Manual* for site-specific projects, the area that cannot be shaded by the Development Site was drawn from the southernmost point of the Development Site rather than from each individual building. **Table 5-1** lists and **Figure 5-2** shows the potential sunlight-sensitive resources identified in the Tier 1 and Tier 2 screening assessment. The figure also shows the current topographic elevation of the Development Site and surrounding area, which ranges from approximately 10 feet to 50 feet.

One sunlight-sensitive resource, Asser Levy Playground, is partially within the overall shadow screening study radius of 2,150 feet; however, this resource is located within the area that cannot be shaded by the Proposed Project (i.e., to the south and not within ±108 degrees of True North). As such, further assessment is not warranted. Therefore, adverse shadow impacts on Asser Levy Playground from the Proposed Project are not anticipated.

Table 5-1 Sunlight-Sensitive Resources in the Study Area

Map ID	Resource Name	Potential Resource Summary	Sunlight-Sensitive Elements
Historic Resources			
H1	**Parish of Our Lady of the Scapular and Saint Stephen's**	Catholic church built in 1898 featuring Romanesque Revival architecture	Stained-glass windows
H2	**Good Shepherd Episcopal Church**	Church built in 1902 known for its clock and large stained-glass windows	Stained-glass windows
Open Space Resources			
O1	**Bellevue South Park**	Neighborhood park featuring a dog run, game tables, play equipment, spray showers, a basketball court, seating, and the Skagerrak sculpture	Active and passive recreation and vegetation
O2	**Vincent F. Albano Jr. Playground**	Playground featuring play equipment and handball courts	Active recreation and vegetation
O3	**Alexandria Center Public Plaza and Urban Garden**	Privately owned, publicly accessible urban farm created with support from GrowNYC featuring a plaza along the East River	Vegetation
O4	**240 East 27 Street Plaza (Parc East Tower Apartments)**	Plaza with seating, tables, and trees	Vegetation
O5	**East River Greenway**[1]	Esplanade that contains a bike path and walkways for pedestrians with views of the waterfront	Active recreation
O6	**Bellevue Sobriety Garden**[2]	Privately owned space with seating and landscaping	Passive recreation and vegetation
O7	**Augustus Street Gaudens Playground**	Playground with basketball courts, play equipment, and spray showers	Active recreation
O8	**Peter's Field**	Space with basketball and tennis courts and a baseball field	Active recreation and vegetation
Natural Resources			
N1	**East River**	Waterbody off Manhattan's east coast	Surface waterbody

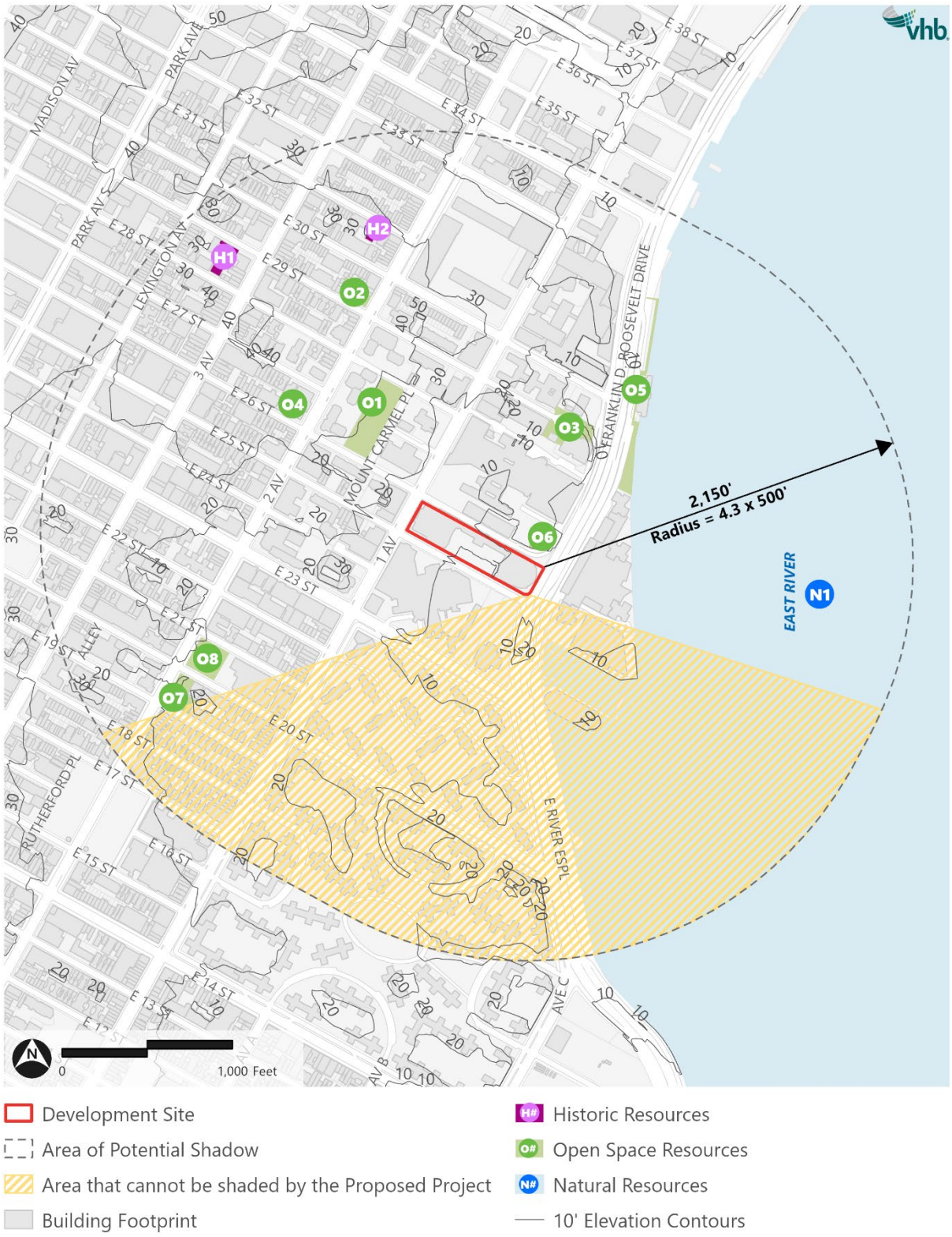
Source: New York City Department of Parks and Recreation open space database

Notes:

[1] The portion of the East River Greenway that occurs in the study area and is publicly accessible was included in this shadows assessment.

[2] The Sobriety Garden is a privately owned space that is open to Bellevue patients, staff, and visitors. The space is intended for therapeutic, recuperative care and is a meditative space controlled by Bellevue. The space is closed at times to serve Bellevue's needs.

Figure 5-2 Tier 1 and Tier 2 Screening



Tier 3 Screening Assessment

In accordance with the *CEQR Technical Manual*, a Tier 3 screening assessment was performed because the Tier 1 and Tier 2 assessments identified several sunlight-sensitive resources within ±108 degrees of True North and within the area of the longest shadow that could be cast by the Proposed Project.

The Tier 3 screening assessment was performed for the four representative days of the year set forth in the *CEQR Technical Manual*: December 21, the winter solstice and shortest day of the year; March 21/September 21, the equinoxes; May 6/August 6, the midpoints between the summer solstice and the equinoxes; and June 21, the summer solstice and the longest day of the year.

In accordance with the *CEQR Technical Manual*, a model of the building in the With-Action condition was developed in a three-dimensional computer program (Rhinoceros 3D). The model was geo-located, and the surrounding terrain was imported into the model to account for differences in topography. As noted above, the Tier 3 shadow screening shows the shadows that could be cast as a result of the Proposed Project but does not account for existing buildings which may already cast shadows on the identified resources. **Figure 5-3** to **Figure 5-6** below show Tier 3 screening results.

The Tier 3 screening indicates that in the absence of intervening structures, the Proposed Project could cast shadows on one historic resource, Parish of Our Lady of the Scapular and Saint Stephen's (H1); five open space resources, Bellevue South Park (O1), Alexandria Center Public Plaza and Urban Garden (O3), 240 East 27 Street Plaza (Parc East Tower Apartments) (O4), East River Greenway (O5), and Bellevue Sobriety Garden (O6); and one natural resource, the East River (N1). Good Shepherd Episcopal Church (H2), Vincent F. Albano Jr. Playground (O2), Augustus Street Gaudens Playground (O7), and Peter's Field (O8) would not experience shadows from the Proposed Project; therefore, significant adverse shadows impacts from the Proposed Project are not anticipated and further analysis of these resources is not warranted (see **Table 5-2**).

Table 5-2 Tier 1-3 Screening Results

Map ID	Resource Name	Tier 1-3 Results
Historic Resources		
H1	Parish of Our Lady of the Scapular and Saint Stephen's	Detailed analysis
H2	Good Shepherd Episcopal Church	Screened at Tier 3
Open Space Resources		
O1	Bellevue South Park	Detailed analysis
O2	Vincent F. Albano Jr. Playground	Screened at Tier 3
O3	Alexandria Center Public Plaza and Urban Garden	Detailed analysis
O4	240 East 27 Street Plaza (Parc East Tower Apartments)	Detailed analysis
O5	East River Greenway	Detailed analysis
O6	Bellevue Sobriety Garden	Detailed analysis
O7	Augustus Street Gaudens Playground	Screened at Tier 3
O8	Peter's Field	Screened at Tier 3
Natural Resources		
N1	East River	Detailed analysis

Figure 5-3 Tier 3 Screening, December 21 Analysis Day

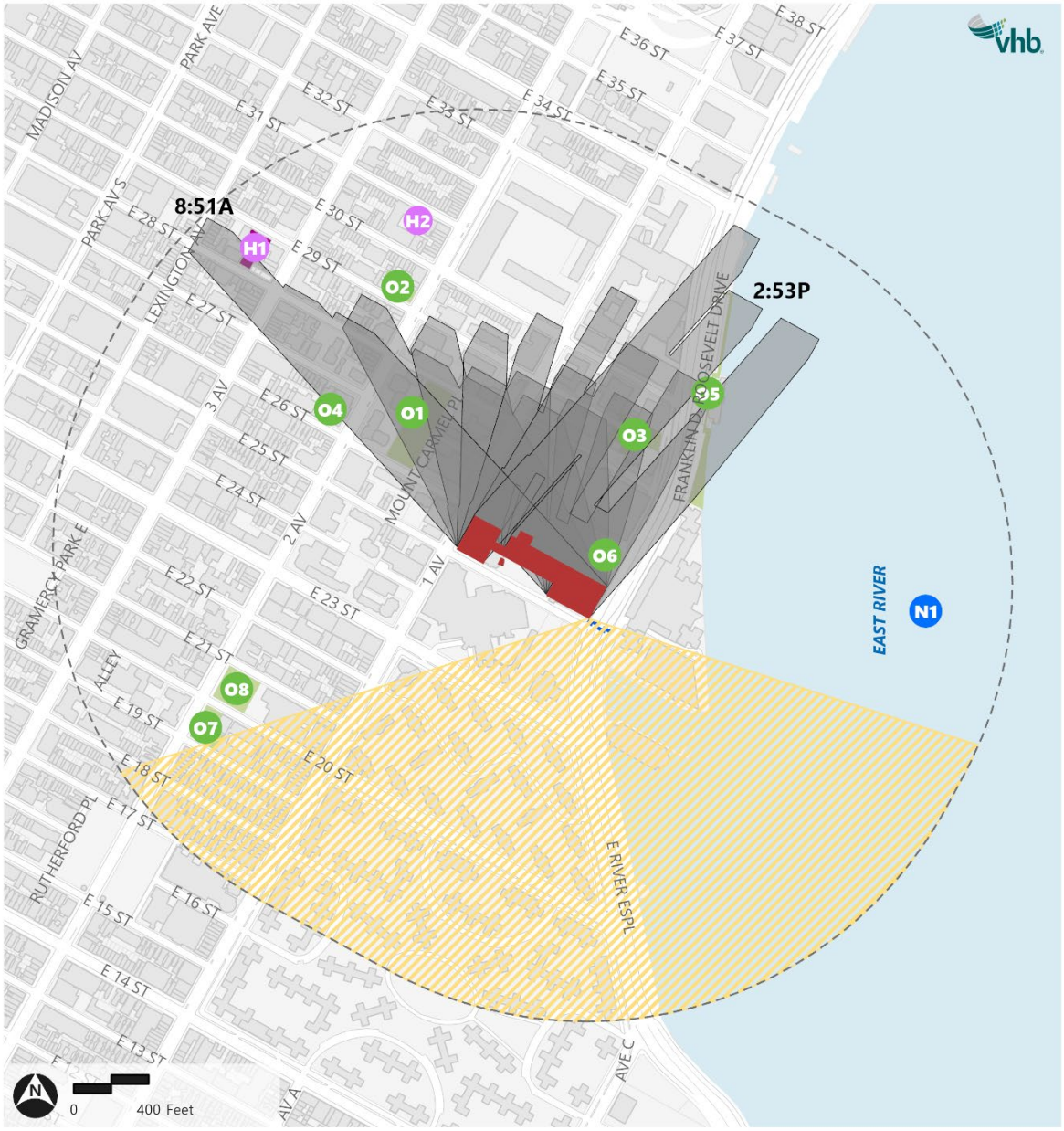


Figure 5-4 Tier 3 Screening, March 21 / September 21 Analysis Day

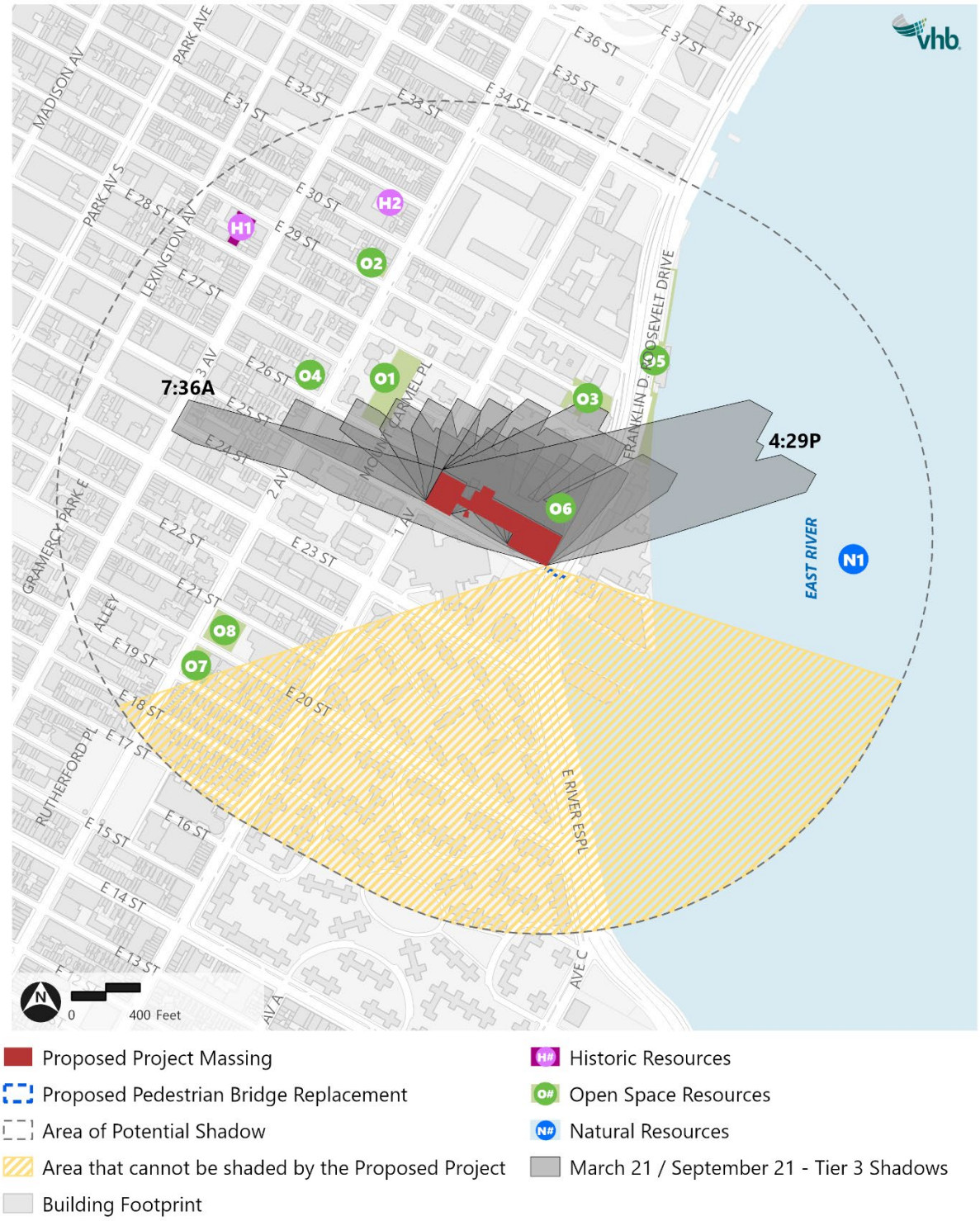


Figure 5-5 Tier 3 Screening, May 6 / August 6 Analysis Day

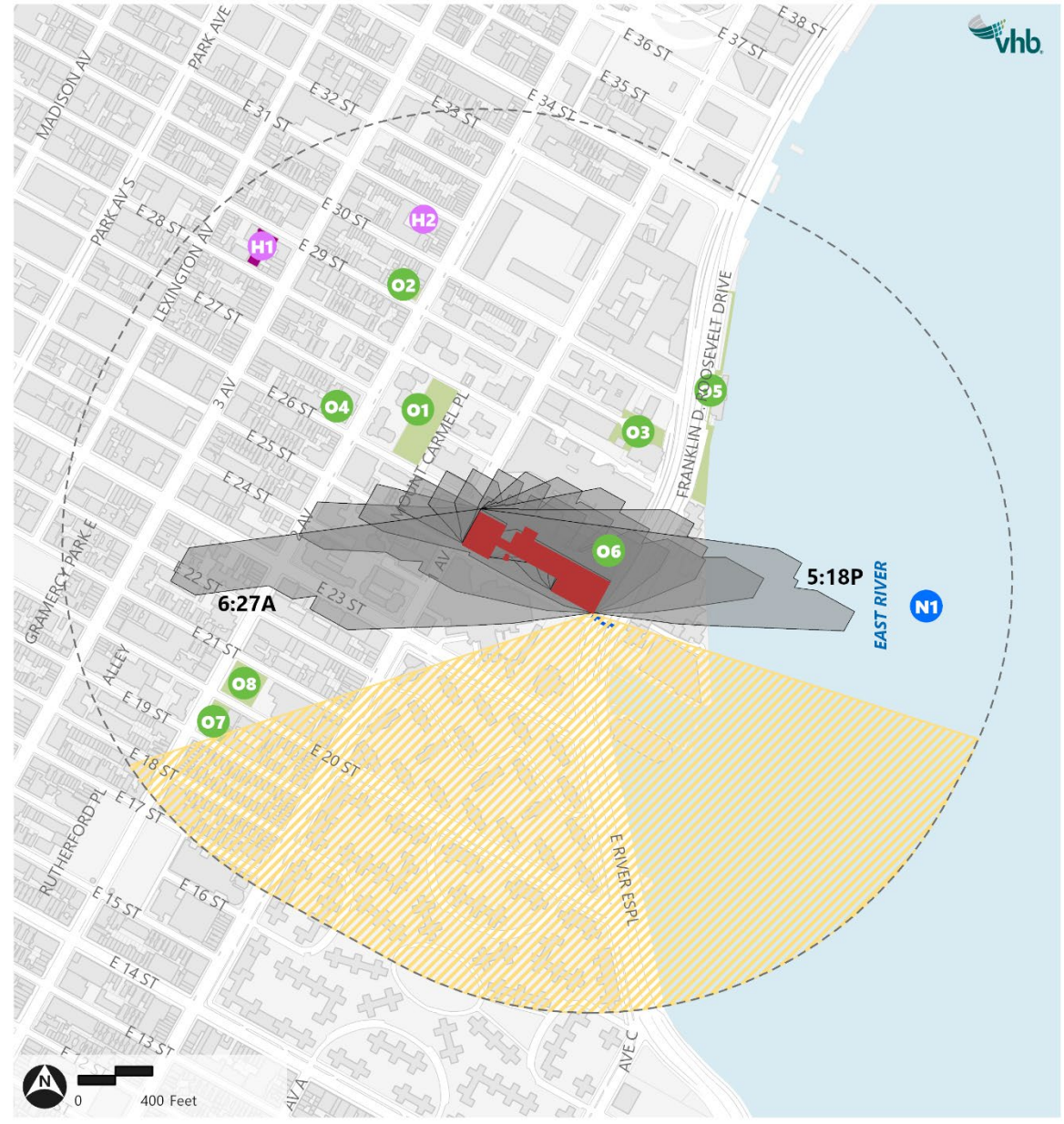
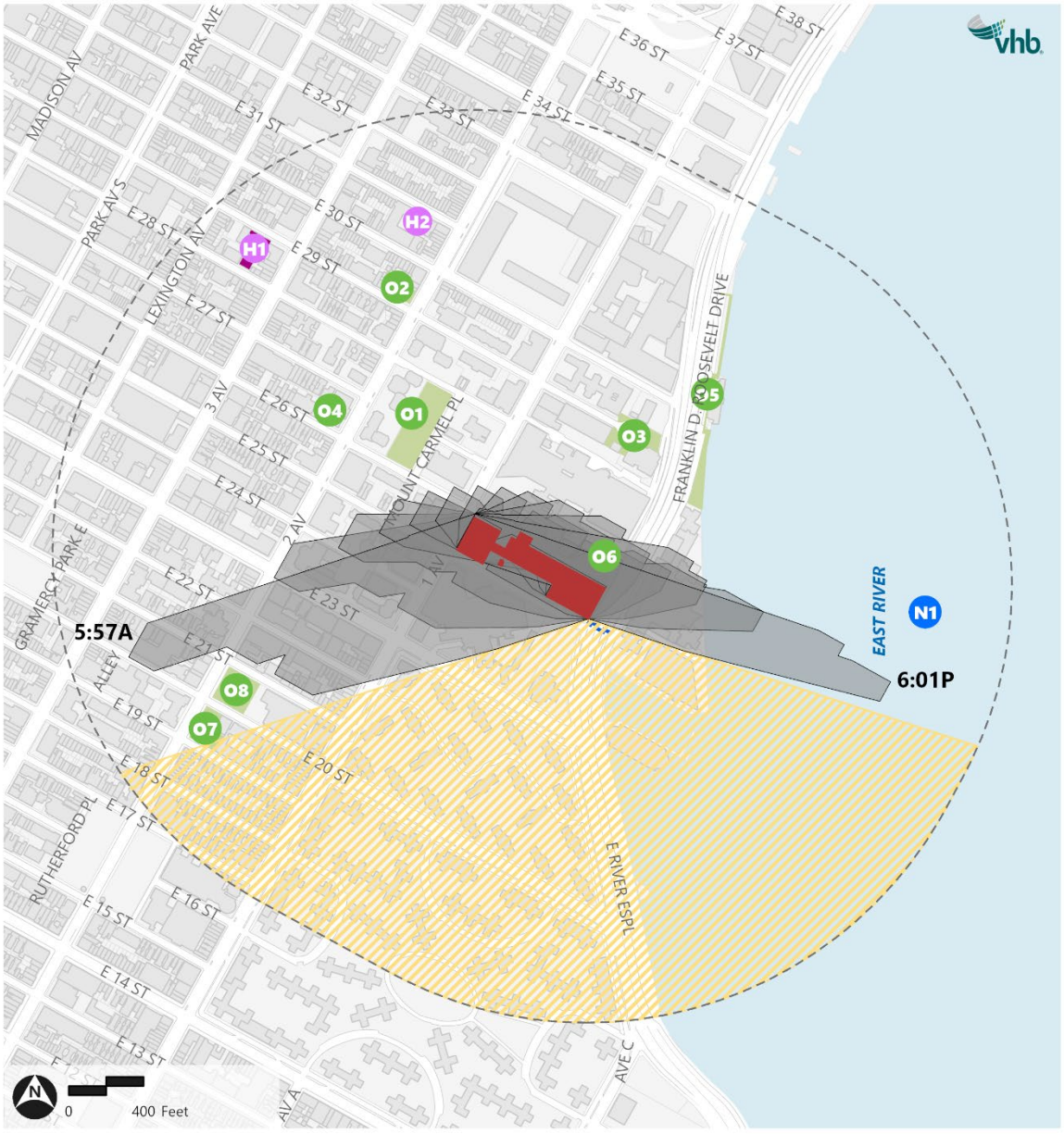


Figure 5-6 Tier 3 Screening, June 21 Analysis Day



Detailed Assessment

As discussed above, a detailed shadow analysis accounts for incremental shadows cast by existing buildings or buildings that may be constructed in an area in the No-Action condition. The detailed shadow analysis models a baseline condition (future No-Action condition) that is compared to the future condition with the Proposed Project (future With-Action condition) to distinguish the additional (incremental) shadow cast by the Proposed Project.

No-Action Condition

In the 2031 No-Action condition, the existing buildings would remain, and the Development Site would continue to accommodate the existing CUNY Hunter College Brookdale Campus. Additionally, the existing East 25th Street pedestrian bridge would remain in its current condition.

As discussed in **Chapter 2, Land Use, Zoning, and Public Policy**, there are five projects within the quarter-mile study area that are planned to be completed by 2031.

1. **Innovation East/455 First Avenue.** This project, which is proposed for the existing Public Health Laboratory site at East 26th Street and First Avenue, would result in the construction of a 270-foot-tall, approximately 609,998-gross-square-foot (gsf) commercial Life Sciences building and ground-floor retail. This project is expected to be complete in 2030.
2. **Alexandria Center (Phase II – North Tower)**. This project, which is located at 29th Street and First Avenue between Bellevue Hospital and NYU Langone Health, would replace the existing surface parking lot with approximately 371,000 gsf of office and laboratory space. This project is expected to be complete in 2029.
3. **429 Second Avenue**. This project would consist of 44,571 gsf of residential space, projected to contain 59 units in a 150-foot-tall building. This project would be complete in 2025.
4. **Stuyvesant Cove Park – Solar 2.** This project would be located on the northern end of Stuyvesant Cove Park and would include the replacement of the existing Solar One structure with a new two-story, 6,409-gsf learning center to allow for the teaching and demonstration of urban environmental stewardship. This project would be complete in 2024.
5. **KBCR Floodwall.** The project would provide a flood barrier around the Bellevue Hospital campus as well as elevated and/or hardened space for critical mechanical, electrical, and plumbing equipment. It would also provide redundant systems for important hospital infrastructure to ensure that the hospital is fully operational under backup systems.

Since the Alexandria Center project is still in the planning phases, detailed information about its proposed massing and building height was unavailable at the time of this EIS. Therefore, this project was excluded from the detailed shadows analysis, which results in a more conservative assessment as there would be less shadow introduced in the No-Action condition that would be considered. The 150-foot-tall building at 429 Second Avenue, which is located to the southwest of the Development Site and the 270-foot-tall building at 455 First Avenue located directly northwest of the Development Site, were included in the detailed assessment.

With-Action Condition

In the With-Action condition, the Proposed Project would result in new buildings on the Development Site, the tallest of which would be a maximum of up to approximately 500 feet tall

(with bulkhead). The detailed shadow analysis builds on the three-dimensional modeling used in the Tier 3 analysis to identify whether the buildings proposed under the With-Action condition could cast shadows on the identified resources of concern compared to the No-Action condition. Any new shadows projected to be cast onto the identified resources from the Proposed Project are considered "incremental shadows."

Table 5-3 provides the modeled incremental shadow entry/exit times for the sunlight sensitive resources that require a detailed analysis. For 240 East 27 Street Plaza (Parc East Tower Apartments) (O4), the detailed analysis showed that there would be no incremental shading on this resource; therefore, significant adverse impacts are not anticipated, and further analysis of this resource is not warranted. Detailed shadow analyses are discussed for each resource in the relevant sub-sections below.

Table 5-3 Detailed Analysis Summary of Incremental Shadow Entry/Exit Times

	Analysis Day			
Resource	**December 21 8:51 AM – 2:53 PM**	**March 21/September 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**
Historic Resources				
H1 – Parish of Our Lady of the Scapular and Saint Stephen's	8:51 AM to 9:03 AM (12 minutes)	--	--	--
Open Space Resources				
O1 – Bellevue South Park	8:51 AM to 10:21 AM (1 hour and 30 minutes)	9:03 AM to 10:35 AM (1 hour and 32 minutes)	--	--
O3 – Alexandria Center Public Plaza and Urban Garden	12:50 PM to 1:55 PM (1 hour and 5 minutes)	3:00 PM to 3:30 PM (30 minutes)	--	--
O4 – 240 East 27 Street Plaza	No incremental shading	--	--	--
O5 – East River Greenway	2:01 PM to 2:53 PM (52 minutes)	No incremental shading	--	--
O6 – Bellevue Sobriety Garden	10:41 AM to 2:53 PM (4 hours and 12 minutes)	10:12 AM to 4:29 PM (6 hours and 17 minutes)	10:40 AM to 5:10 PM (6 hours and 30 minutes)	11:10 AM to 5:10 PM (6 hours)
Natural Resources				
N1 – East River	2:21 PM to 2:53 PM (32 minutes)	3:20 PM to 4:29 PM (1 hour and 9 minutes)	4:00 PM to 5:18 PM (1 hour and 18 minutes)	4:30 PM to 6:01 PM (1 hour and 31 minutes)

Daylight saving time was not used, consistent with *CEQR Technical Manual* guidance.

Historic Resources

H1 – Parish of Our Lady of the Scapular and Saint Stephen's

Parish of Our Lady of the Scapular and Saint Stephen's (H1), located northwest of the Development Site, is a parish that contains stained glass windows. These features are considered to be sunlight-sensitive elements per the *CEQR Technical Manual*. As discussed in the section below, the Proposed Project would cast incremental shadows on this resource on the December 21 analysis day.

December 21 Analysis Day

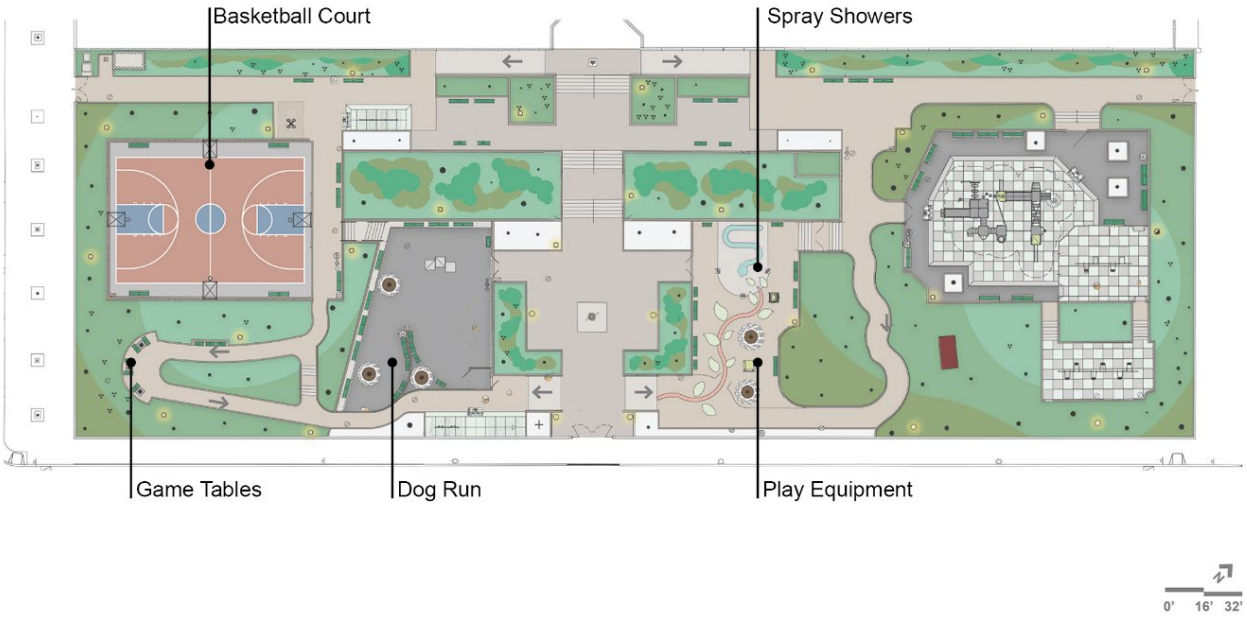
Incremental shadows would be cast on the December 21 analysis day from 8:51 AM to 9:03 AM for a total duration of approximately 12 minutes (see **Figure 5-7**). Incremental shadows would be cast on the middle portion of the southern façade of the building. Although portions of this area contain stained glass windows, given the short duration of the shading, it is not anticipated to affect the public's enjoyment of this resource. Furthermore, the façade would experience uninterrupted sunlight from 10:10 AM to 12:50 PM for approximately 2 hours. Therefore, significant adverse shadows impacts are not anticipated as a result of the Proposed Project.

Open Space Resources

O1 – Bellevue South Park

Bellevue South Park (O1) is located west of the Development Site. This recently renovated neighborhood park features a dog run, game tables, play equipment, spray showers, a basketball court, seating, and the Skagerrak sculpture. As described below, the Proposed Project would cast incremental shadows on the December 21 and the March 21/September 21 analysis days.

Figure 5-7 Bellevue South Park Schematic Layout



Source: NYC Department of Parks & Recreation
Note: The original schematic diagram was edited to include labels; the layout above is shown for illustrative purposes only.

December 21 Analysis Day

Existing/No-Action Condition

In the existing condition during the December 21 analysis day, because shadows are long at this time of year, Bellevue South Park experiences shadows from surrounding buildings over a majority of the park space. In the early morning hours, most of the park is cast in shadow with a few pockets of sunlight over the playground and basketball court. As the sun moves farther west, more of the park is cast in shadow eliminating sunlight in the playground and basketball court and introducing small sections of sunlight on the western and northern portions of the park which mostly contains landscaping. After approximately 12:21 PM, the northern half of the park receives sunlight with minor shading along the eastern boundary and southern portions of the park. During this time, the play equipment receives uninterrupted sunlight. Then, starting from approximately 2:30 PM, the southern half of the park begins to experience shading which extends farther north until most of the park is cast in shadow again by the end of the analysis day.

With-Action Condition

With the Proposed Project, incremental shadows would be cast on portions of the park on the December 21 analysis day from 8:51 AM to 10:21 AM for a total duration of approximately 1 hour and 30 minutes (see **Figure 5-8** to **Figure 5-10**). Incremental shadows would enter from the southwestern portion of the park concurrently covering the northwestern portions at 8:51 AM or the beginning of the analysis day, then move to the northwest, and finally exit to the northeast. Throughout this period, shadows introduced by the Proposed Project would travel north covering portions of landscaped areas, the basketball court, the dog run, and the play equipment. Due to the configuration of existing and planned buildings around the park and the amount of existing and

anticipated shading on the park, it is anticipated that the incremental shadow could eliminate sunlight from the park for a period of approximately 30 minutes from 9:21 AM to 9:51 AM (see **Figure 5-10**). Incremental shading during this 30-minute duration would occur mostly on the pathways and the landscaped areas in the northern portion of the park. Beginning again at 11:11 AM, portions of the park would receive sunlight and the areas of the park in sunlight would increase through the end of the analysis period.

Overall, on the December 21 analysis day, incremental shadows would be cast on the park during the early morning hours of the winter season, when park utilization would typically be at its lowest, and most of the park would already be in shadow. Given that the extent of incremental shadow on this analysis day would be relatively small and consistent with the character of shadows on the park in the existing condition, it would not affect the public's continued enjoyment of this resource.

March 21/September 21 Analysis Day

Existing/No-Action Condition

Similar to the December 21 analysis day, under existing conditions, the park receives shading in the early morning hours of the March 21/September 21 analysis day with a few areas of sunlight on the play equipment and dog run. As the sun travels west, more areas of the park receive sunlight with the greatest extent of sunlight occurring at approximately 12:38 PM. During this time, only some of the landscaping along the southern boundary of the park receives shadow while the rest of park would receive sunlight. Then, starting at approximately 2:38 PM, shadows cast from the surrounding buildings cover additional areas of the park such that by the end of the analysis day, only small portions of the play equipment and dog run receive sunlight.

With-Action Condition

With the Proposed Project, incremental shadows would be cast on the March 21/September 21 analysis day from 9:03 AM to 10:35 AM for a total duration of approximately 1 hour and 32 minutes (see **Figure 5-11** to **Figure 5-14**). The shadow would move from the southwest to the northeast in the lower portion of the park. This area of the park that would be shaded contains portions of landscaped areas, the basketball court, the dog run, and the game tables. Even at its greatest extent, incremental shadow would never eliminate sunlight entirely from the park and the park would be increasingly in sun until 12:38 PM when project shadows would no longer reach the park. At this point, the park would receive uninterrupted sunlight for approximately 2 hours, between approximately 12:38 PM and 2:38 PM, before buildings adjacent to the park on the southwest and west would begin to cast shadow.

During the period of incremental shadow, areas within the park that would receive sunlight include portions of the playground, the basketball court, the dog run, the spray showers, and the middle of the park. At any time during the period of incremental shadows, park visitors would be able to find seating or enjoy active recreation that would receive sunlight. Given that substantial portions of the park would remain in sun during the period when the project would cast shadow, particularly after 10:35 AM, it is not expected that the public's enjoyment of this resource would be adversely affected by the Proposed Project.

Given the fact that the park would receive uninterrupted sunlight for approximately 2 hours, the incremental shading would occur for less than 2 hours, and the fact that incremental shading would

be limited to early morning hours of the analysis period, it is not anticipated that incremental shading on the vegetation would have adverse effects.

O3 – Alexandria Center Public Plaza and Urban Garden

Alexandria Center Public Plaza and Urban Garden (O3) is located north of the Development Site and is a privately owned, publicly accessible urban farm created with support from GrowNYC featuring a plaza along the East River. The plaza mostly contains pavement, portions of which are interrupted by landscaping and seating. The space used to contain an urban farm but was relocated elsewhere on the Alexandria Center site. The Proposed Project would cast incremental shadows on the December 21 and the March 21/September 21 analysis days, which is discussed in the sections below.

December 21 Analysis Day

Existing/No-Action Condition

In the existing condition during the December 21 analysis day, because shadows are long at this time of year, the plaza experiences shadows from surrounding buildings over a majority of the plaza. From the early morning hours to the afternoon, shadows travel from west to east and cover increasing portions of the plaza with a few pockets of sunlight in the southwestern and northwestern portions of the space. As the sun moves farther west, shadows are cast from the surrounding buildings over larger portions of the plaza. After approximately 12:40 PM, the western half of the plaza begins to receive sunlight with shading along the eastern portions of the plaza. Beginning again at approximately 2:10 PM, the plaza is fully cast in shadow until the end of the analysis period. Portions of the plaza are in shadow throughout the analysis day.

With-Action Condition

Incremental shadows would be cast on the December 21 analysis day from 12:50 PM to 1:55 PM for a total duration of approximately 1 hour and 5 minutes (see **Figure 5-15** to **Figure 5-17**). Incremental shadows would travel from southwest to east covering the middle portion of the plaza. At its greatest extent, the incremental shadow could eliminate sunlight from the plaza for a period of approximately 28 minutes from 12:50 PM to 1:18 PM.

Beginning again at 1:18 PM, portions of the plaza would receive sunlight and shadows from the Proposed Project would align with the shading pattern as discussed above under Existing Conditions section.

Overall, on the December 21 analysis day, incremental shadows would be cast on the plaza during the afternoon hours of the winter season when most of the plaza would already be in shadow. Given that the extent of incremental shadow on this analysis day would be relatively small and consistent with the character of shadows on the plaza in the existing condition, it would not affect the public's enjoyment of this resource.

March 21/September 21 Analysis Day

Existing/No-Action Condition

Under existing conditions, the plaza receives shading throughout the March 21/September 21 analysis day with the northern half of the plaza receiving sunlight. As the sun travels west, fewer

areas of the plaza receive sunlight with the greatest extent of shadow occurring at approximately 12:00 PM. During this time, only the northwestern and northeastern portions receive sunlight. However, after 12:00 PM, the western and middle portions of the plaza would receive sunlight until the end of the analysis day. Similar to the December 21 analysis day, portions of the plaza are in shadow throughout the analysis day.

With-Action Condition

Incremental shadows would be cast on the March 21/September 21 analysis day from 3:00 PM to 3:30 PM for a total duration of approximately 30 minutes (see **Figure 5-18** to **Figure 5-19**). Incremental shadows would travel from west to east and would be limited to the southern portion of the plaza in the middle, an area that is mostly pavement. Given the short duration of the incremental shading, it is not anticipated to affect the public's enjoyment of this resource. Furthermore, because the shading would occur over pavement, the vegetation on this resource would not be affected. Therefore, significant adverse impacts are not anticipated as a result of the Proposed Project.

O5 – East River Greenway

The East River Greenway (O5) is an esplanade located east of the Development Site. The contains a bike path and walkways as well as limited seating for pedestrians with views of the waterfront. The detailed shadows modelling showed that incremental shading would not occur on this resource on the March 21/September 21 analysis day; therefore, further assessment is not warranted for this analysis period. However, the Proposed Project would cast incremental shadow on the December 21 analysis day, which is discussed in the section below.

December 21 Analysis Day

With the Proposed Project, incremental shadows would be cast on portions of the esplanade on the December 21 analysis day from 2:01 PM to 2:53 PM for a total duration of approximately 52 minutes (see **Figure 5-20** to **Figure 5-21**). The shadow would enter the middle portion of the esplanade and as the sun moves west, incremental shading would cover the northern and southern portions of the esplanade. At its greatest extent, the shadow could eliminate sunlight from a portion of the park for a period of approximately 3 minutes from 2:50 PM to 2:53 PM (see **Figure 5-21**). Incremental shading during this 3-minute duration would occur mostly on the esplanade and seating areas in the northern portion. It is important to note that under existing conditions, substantial portions of the esplanade study area are cast in shadow due to the fact that shadows during this analysis day are longer.

Overall, on the December 21 analysis day, incremental shadows would be cast on the park during the late afternoon hours of the winter season. Given that the extent of incremental shadow on this analysis day would be relatively small and for short durations, it would not affect the public's enjoyment of this resource.

O6 – Bellevue Sobriety Garden

The Bellevue Sobriety Garden (O1) is located directly northeast of the Development Site in the Bellevue Hospital campus. It is privately own space that is open to Bellevue patients, staff, and visitors. The space is intended for therapeutic, recuperative care and is a meditative space controlled by Bellevue. The space is closed at times to serve Bellevue's needs and is accessed from the Bellevue

Hospital property near the southbound FDR Drive service road and continuation of the former East 26th Street. The garden contains stone sculptures, vegetation, paved walkways, and seating. As described below, the Proposed Project would cast incremental shadows on all four of the analysis days.

December 21 Analysis Day

With the Proposed Project, incremental shadows would be cast on portions of the garden on the December 21 analysis day from 10:41 AM to 2:53 PM for a total duration of approximately 4 hours and 12 minutes (see **Figure 5-23** to **Figure 5-31**). Incremental shadows would enter from the southernmost point of the garden at 10:41 AM and would travel northeast. From approximately 1:11 PM to 2:53 PM (the end of the analysis day), incremental shading would eliminate the remaining sunlight on the garden for a period of approximately 1 hour and 42 minutes. Thus, for a period of approximately 4 hours, the garden would receive indirect and intermittent sunlight.

March 21/September 21 Analysis Day

With the Proposed Project, incremental shadows would be cast on the March 21/September 21 analysis day from 10:12 AM to 4:29 PM for a total duration of approximately 6 hours and 17 minutes (see **Figure 5-32** to **Figure 5-44**). Incremental shadows would enter from the southernmost point of the garden at 10:12 AM and would travel northeast. From approximately 1:12 PM to 4:29 PM or the end of the analysis day, incremental shading would eliminate the remaining sunlight on the entire garden for a period of approximately 3 hours and 17 minutes. Thus, for a period of approximately 5 hours, the garden would receive indirect and intermittent sunlight.

May 6/August 6 Analysis Day

With the Proposed Project, incremental shadows would be cast on the May 6/August 6 analysis day from 10:40 AM to 5:10 PM for a total duration of approximately 6 hours and 30 minutes (see **Figure 5-45** to **Figure 5-57**). Incremental shadows would enter from the southernmost point of the garden at 10:12 AM and would travel northeast. From approximately 1:40 PM to 5:10 PM, incremental shading would eliminate the remaining sunlight on the garden for a period of approximately 3 hours and 30 minutes. Thus, for a period of approximately 7 hours, the garden would receive indirect and intermittent sunlight. Beyond 5:10 PM to the end of the analysis day, the garden would be entirely in shadow from surrounding buildings.

June 21 Analysis Day

With the Proposed Project, incremental shadows would be cast on the June 21 analysis day from 11:10 AM to 5:10 PM for a total duration of approximately 6 hours (see **Figure 5-58** to **Figure 5-69**). Incremental shadows would enter from the southernmost point of the garden at 11:10 AM and would travel northeast. From approximately 3:40 PM to 5:10 PM, incremental shading would eliminate the remaining sunlight on the entire garden for a period of approximately 1 hour and 30 minutes. Thus, for a period of approximately 9 hours, the garden would receive indirect and intermittent sunlight. After 5:10 PM, the garden would be entirely in shadow from existing surrounding buildings.

Overall Assessment

The Proposed Project would introduce incremental shading over portions of the garden and would eliminate sunlight from the garden towards the end of each analysis day. On the December 21 analysis day, utilization would typically be at its lowest, and most of the garden would already be in shadow. Furthermore, December is not part of the growing season. As such, adverse impacts on the viability of the vegetation and enjoyment of the resource are not anticipated. The remaining analysis days are all part of the growing season. Although the Proposed Project would eliminate sunlight later on these three analysis days, generally beginning at 1:12 PM at the earliest, the garden would receive at least 4 hours of intermittent sunlight and would continue to experience indirect sunlight. Generally peak utilization of this type of space occurs in the afternoon to late afternoon hours of the day. However, under existing conditions, the garden is entirely in shadow during a portion of this time. Therefore, the Proposed Project would not be introducing conditions substantially different than existing conditions. Importantly, this space is owned and maintained by a private entity. Thus, while the public may have access at the time of this Environmental Impact Statement (EIS), such conditions could change in the future such that this space is relocated elsewhere or is developed by the property owner. Therefore, significant adverse impacts are not anticipated as a result of the Proposed Project.

Natural Resources

N1 – East River

The East River (N1) is a surface waterbody located east of the Development Site. The East River would experience incremental shading on all four analysis days. Further assessment of this resource is provided in the sections below.

December 21 Analysis Day

Incremental shading would be cast on the December 21 analysis day from 2:21 PM to 2:53 PM for a total duration of approximately 32 minutes (see **Figure 5-70** to **Figure 5-71**). Throughout the analysis period, the incremental shadow coverage areas would continue to increase. Most of the incremental shading throughout the analysis period would be limited to the shoreline of the waterbody.

March 21/September 21 Analysis Day

Incremental shading would be cast on the March 21/September 21 analysis day from 3:20 PM to 4:29 PM for a total duration of approximately 1 hour and 9 minutes (see **Figure 5-72** to **Figure 5-74**). Incremental shadows would travel from west to east. The greatest extent of shading would occur during the end of the analysis period. Throughout the analysis period, incremental shadows would increase. Most of the incremental shading throughout the analysis period would be limited to the middle portions of the waterbody.

May 6/August 6 Analysis Day

Incremental shading would be cast on the May 6/August 6 analysis day from 4:00 PM to 5:18 PM for a total duration of approximately 1 hour and 18 minutes (see **Figure 5-75** to **Figure 5-77**). Incremental shadows would travel from west to east. The greatest extent of shading would occur

during the end of the analysis period. Throughout the analysis period, incremental shadows would increase. Most of the incremental shading throughout the analysis period would be limited to the middle portions of the waterbody.

June 21 Analysis Day

Incremental shading would be cast on the June 21 analysis day from 4:30 PM to 6:01 PM for a total duration of approximately 1 hour and 31 minutes (see **Figure 5-78** to **Figure 5-81**). Incremental shadows would travel from west to east. The greatest extent of shading would occur during the end of the analysis period. Throughout the analysis period, incremental shadows would increase. Most of the incremental shading throughout the analysis period would be limited to the middle portions of the waterbody.

Overall Assessment

Although the incremental shadow extent for each analysis day would increase, they would occur over limited portions of the East River. Also, relative to the overall size of the East River, the areal extent of shading would be limited to a minimal portion of the resource. Additionally, due to their dynamic (i.e., constantly moving) nature, shadows impact at individual locations within the overall affected area of the East River would be temporary and of limited duration. Incremental shading would be limited to the late afternoon hours during all analysis days and would not occur within the remaining sunlight hours of the respective analysis days, thereby allowing for substantial periods of direct sunlight to biological resources within the affected areas. By definition, surface waterbodies are not static; they are dynamic environments that are affected by natural processes such as currents, tides, wind, temperature gradients, etc. that move water. Therefore, resident organisms within the water column are in a constant state of movement and would be carried through areas impacted by incremental shading, resulting in only temporary exposure to such organisms. Further, many biological organisms that inhabit waterbodies are capable of locomotion and therefore can move from shaded to sunlit areas (or vice versa) of their own volition. For those organisms that are not moved by natural processes or capable of locomotion, the effects of incremental shadows would be temporary and of limited duration. Therefore, significant adverse impacts are not anticipated as a result of the Proposed Project.

H1 – Parish of Our Lady of the Scapular and Saint Stephen's

Figure 5-8 December 21 – 8:51 AM



O1 – Bellevue South Park

Figure 5-9 December 21 – 8:51 AM



Figure 5-10 December 21 – 9:21 AM



Figure 5-11 December 21 – 9:51 AM



Figure 5-12 March 21 – 9:03 AM

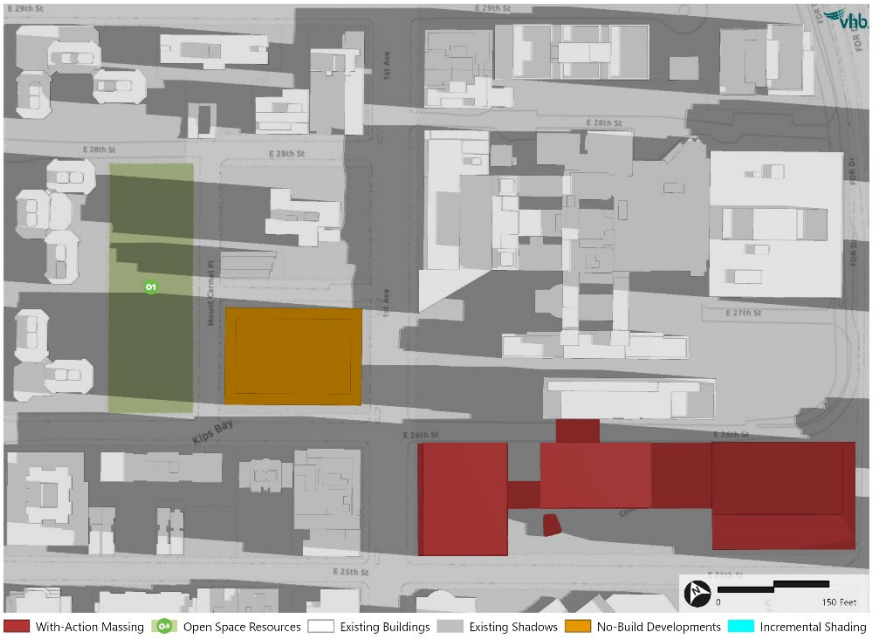


Figure 5-13 March 21 – 9:33 AM

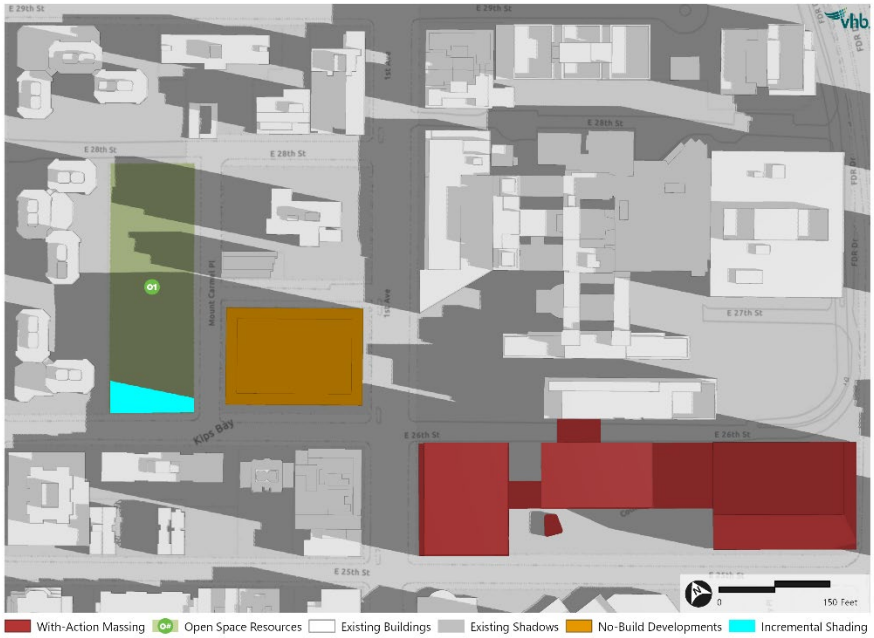


Figure 5-14 March 21 – 10:03 AM



Figure 5-15 March 21 – 10:33 AM



O3 – Alexandria Center Public Plaza and Urban Garden

Figure 5-16 December 21 – 12:50 PM



Figure 5-17 December 21 – 1:20 PM



Figure 5-18 December 21 – 1:50 PM



Figure 5-19 March 21 – 3:00 PM



Figure 5-20 March 21 – 3:30 PM



O5 – East River Greenway

Figure 5-21 December 21 – 2:01 PM



Figure 5-22 December 21 – 2:31 PM



O6 – Bellevue Sobriety Garden

Figure 5-23 December 21 – 10:41 AM

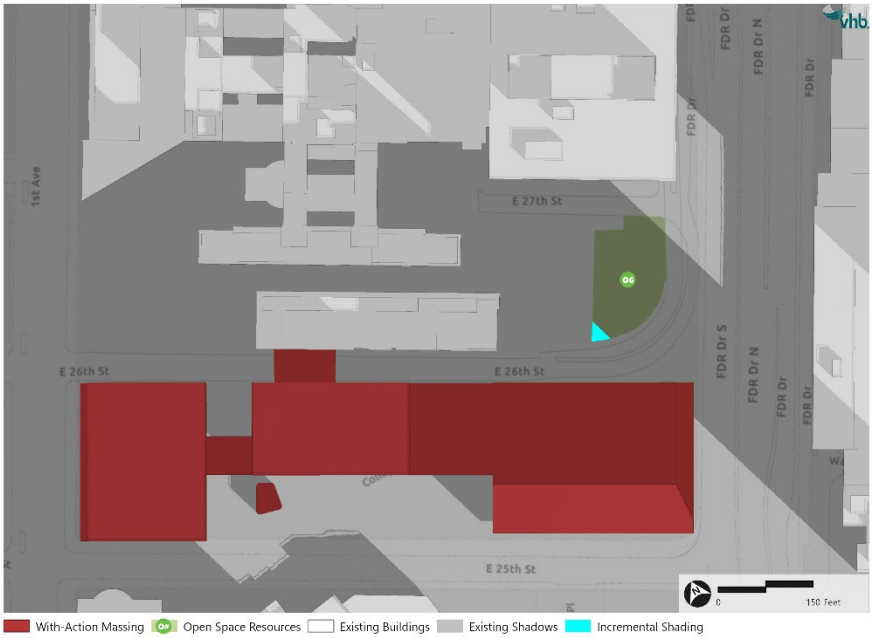


Figure 5-24 December 21 – 11:11 AM



Figure 5-25 December 21 – 11:41 AM

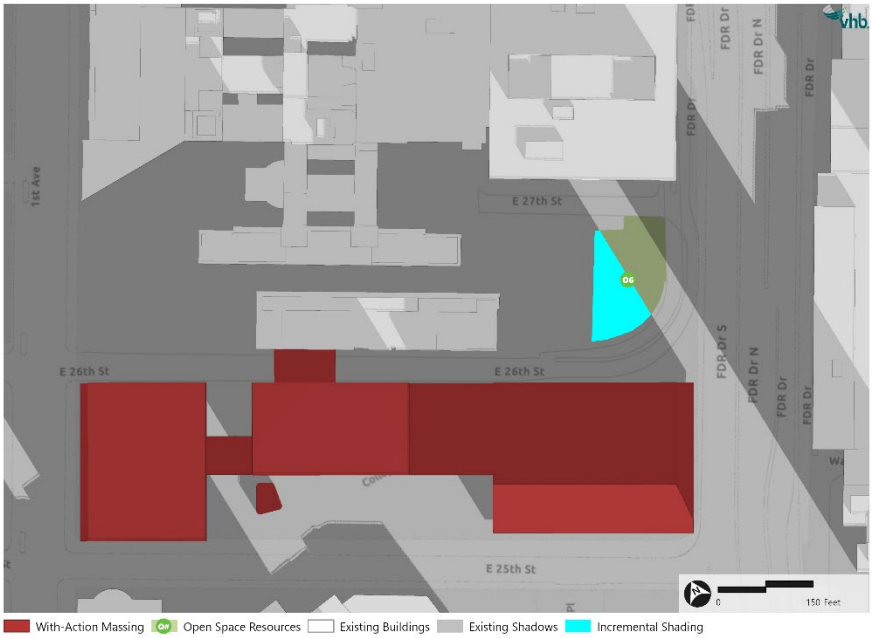


Figure 5-26 December 21 – 12:11 PM

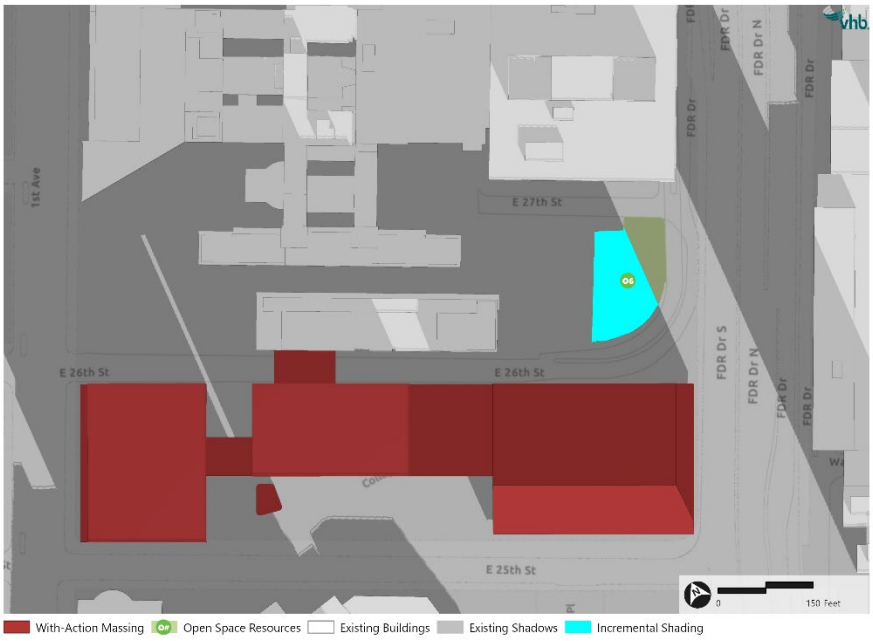


Figure 5-27 December 21 – 12:41 PM

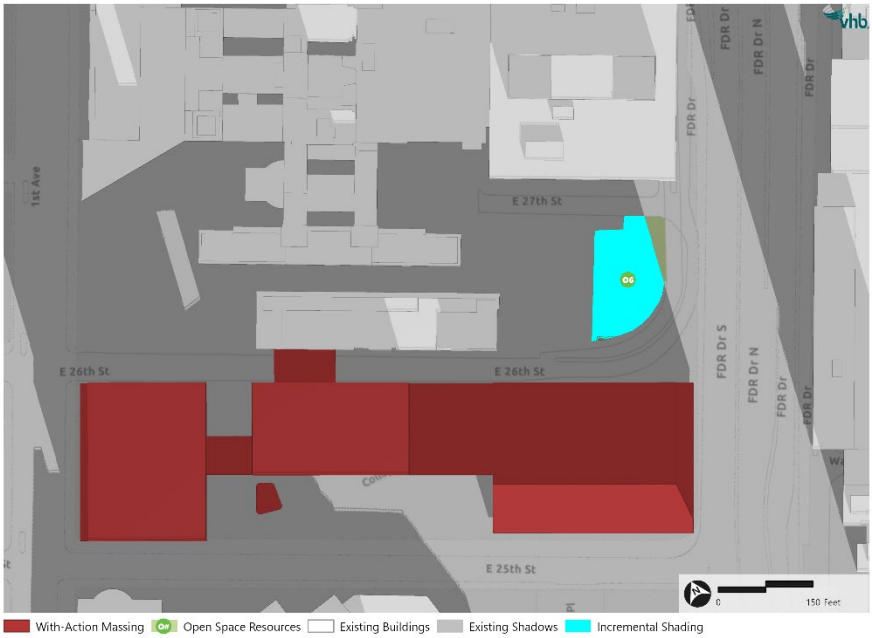


Figure 5-28 December 21 – 1:11 PM

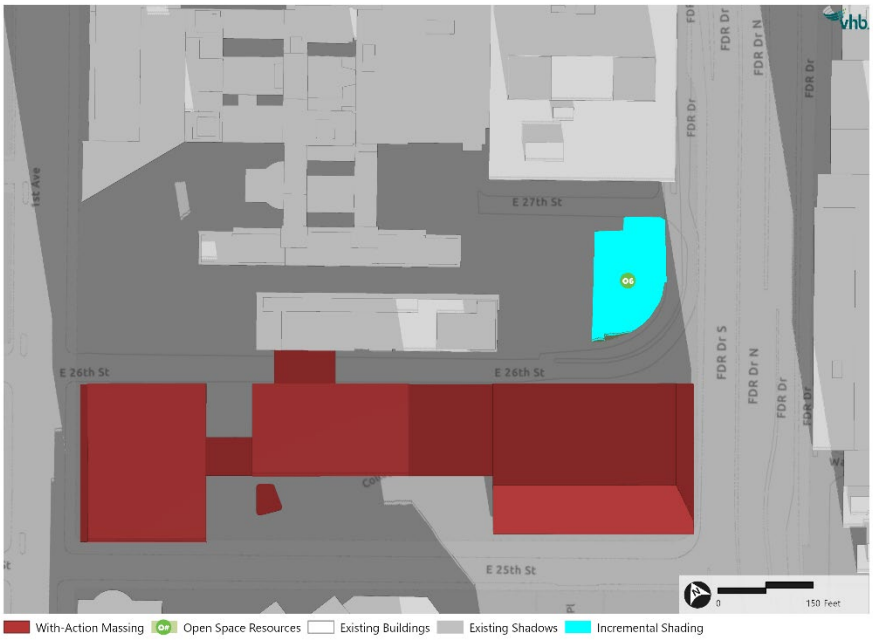


Figure 5-29 December 21 – 1:41 PM

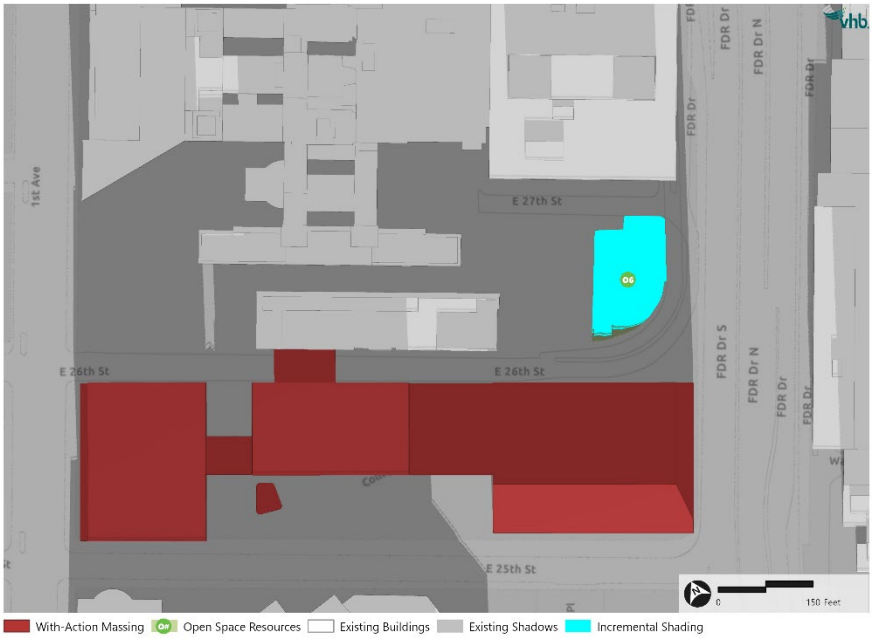


Figure 5-30 December 21 – 2:11 PM



Figure 5-31 December 21 – 2:41 PM



Figure 5-32 March 21 – 10:12 AM

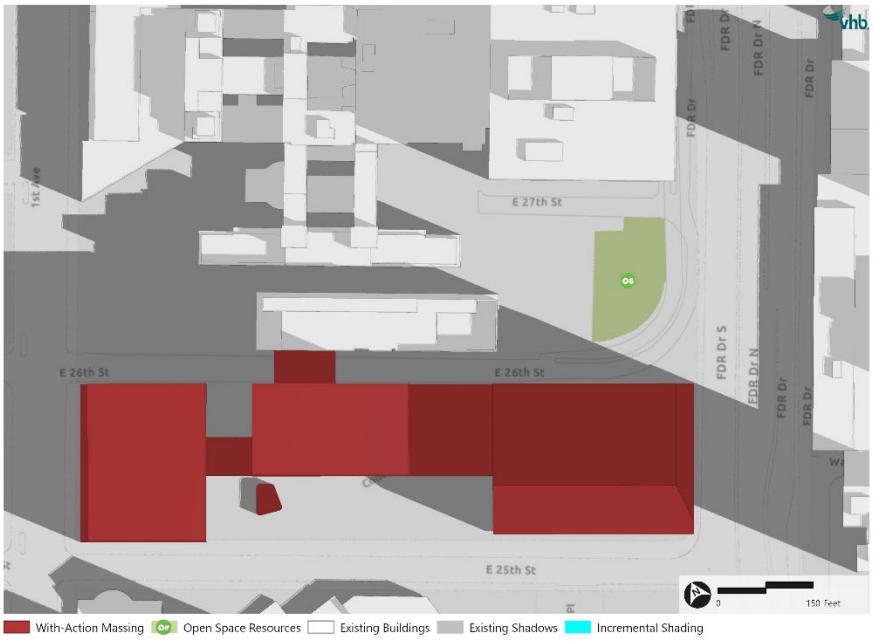


Figure 5-33 March 21 – 10:42 AM

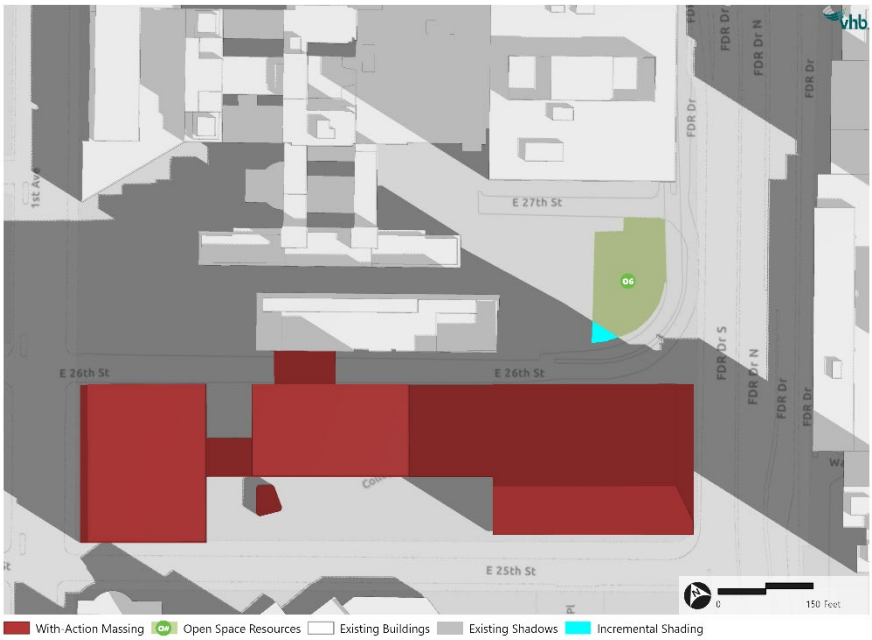


Figure 5-34 March 21 – 11:12 AM

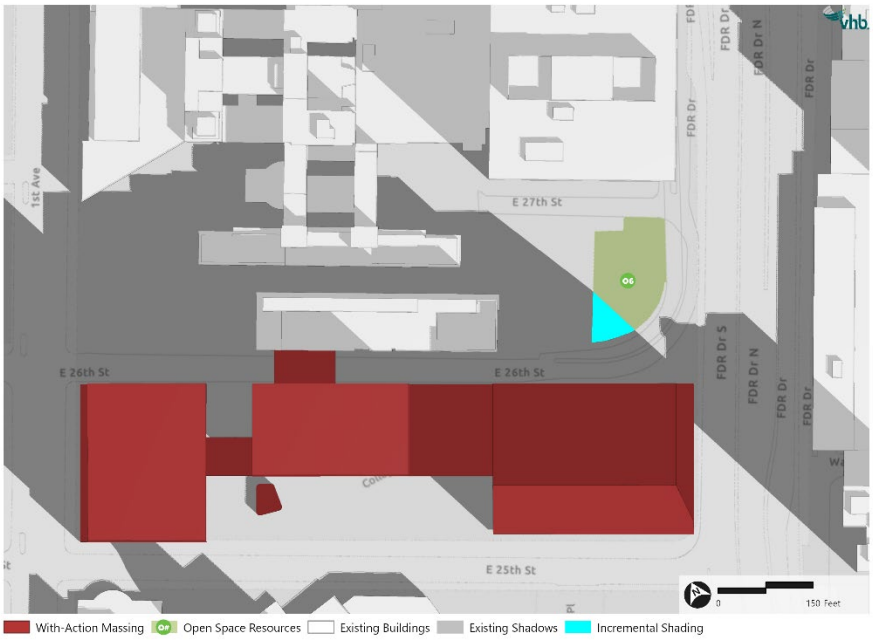


Figure 5-35 March 21 – 11:42 AM

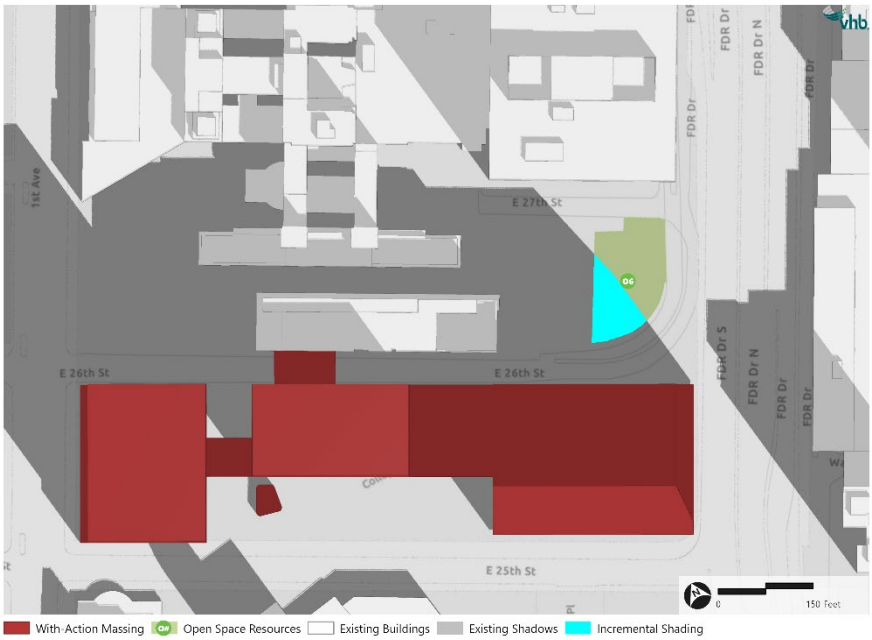


Figure 5-36 March 21 – 12:12 PM

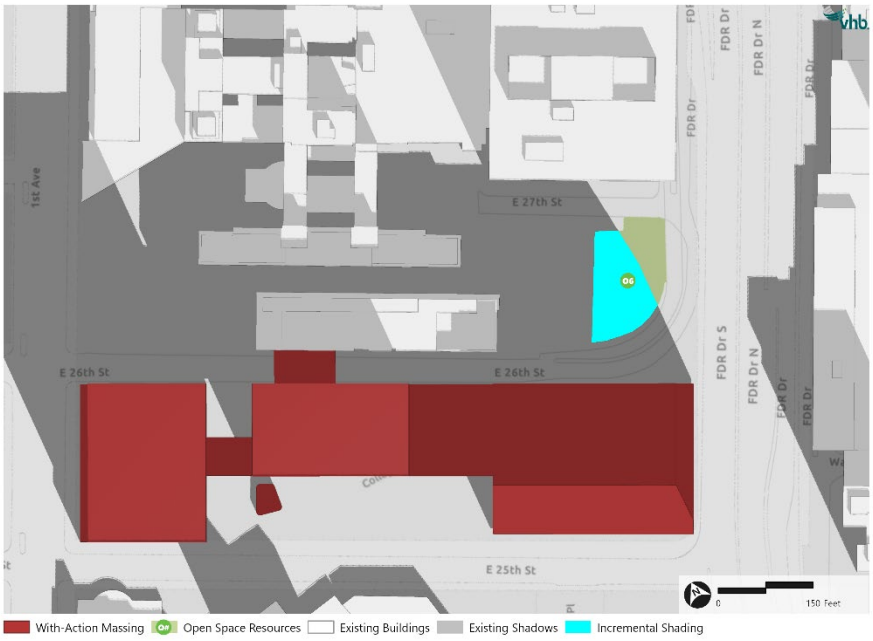


Figure 5-37 March 21 – 12:42 PM



Figure 5-38 March 21 – 1:12 PM

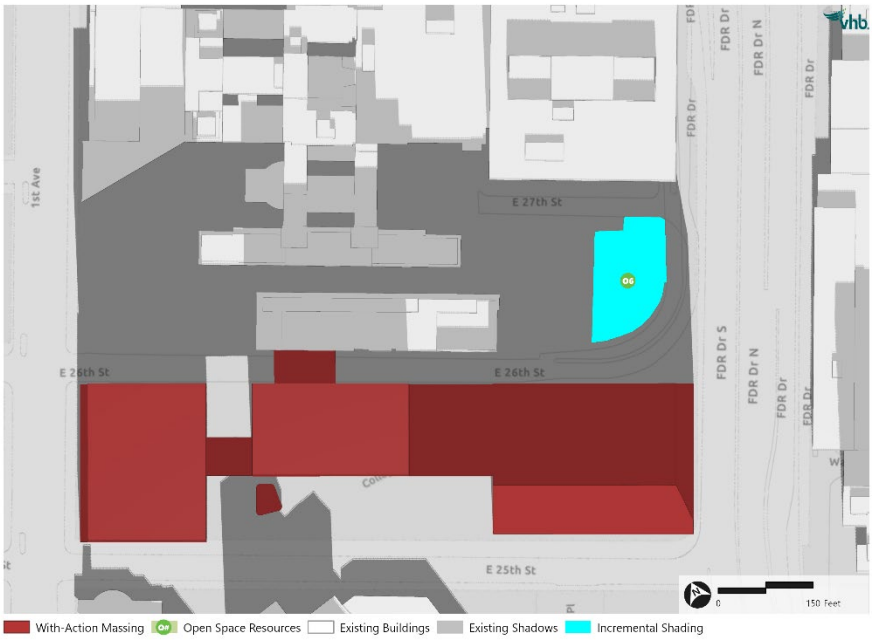


Figure 5-39 March 21 – 1:42 PM



Figure 5-40 March 21 – 2:12 PM



Figure 5-41 March 21 – 2:42 PM

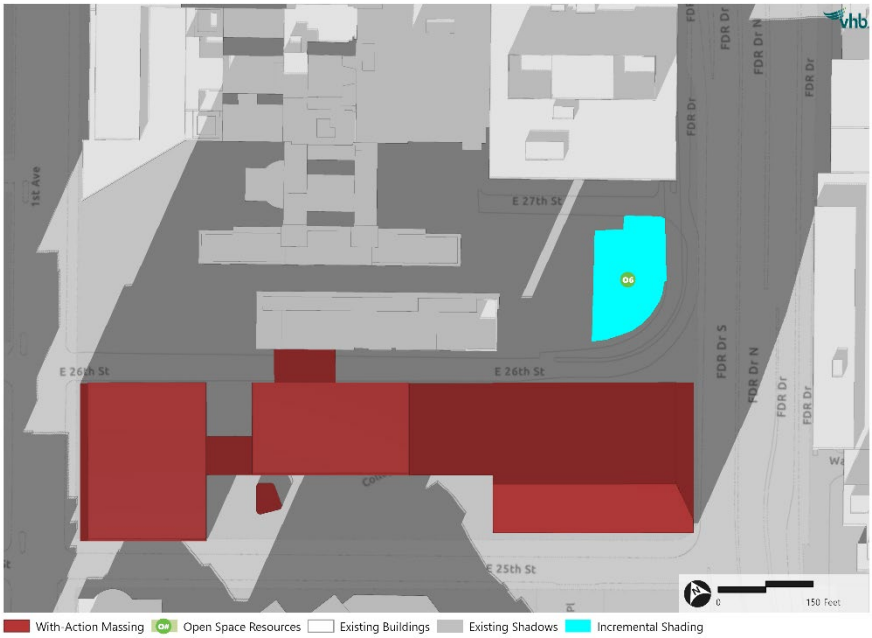


Figure 5-42 March 21 – 3:12 PM

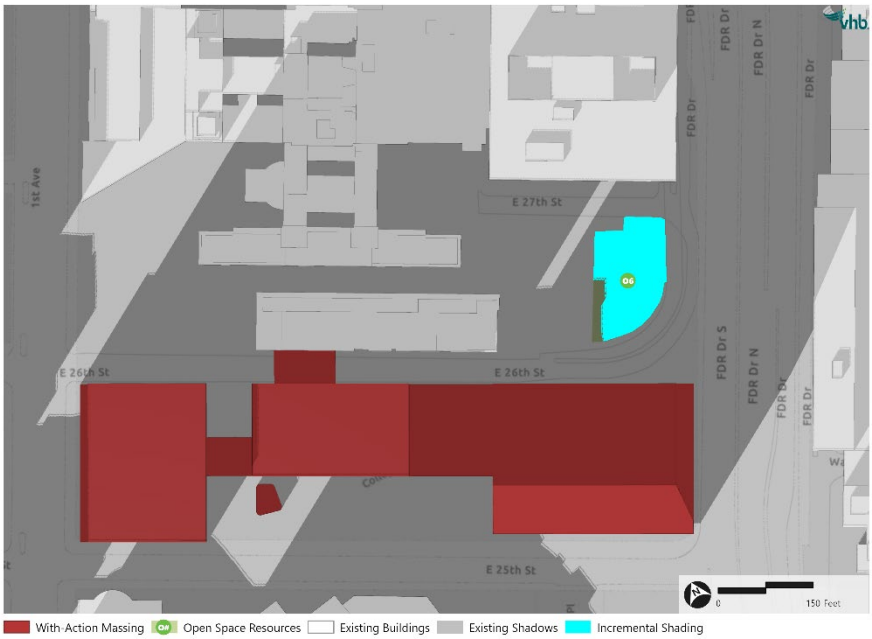


Figure 5-43 March 21 – 3:42 PM

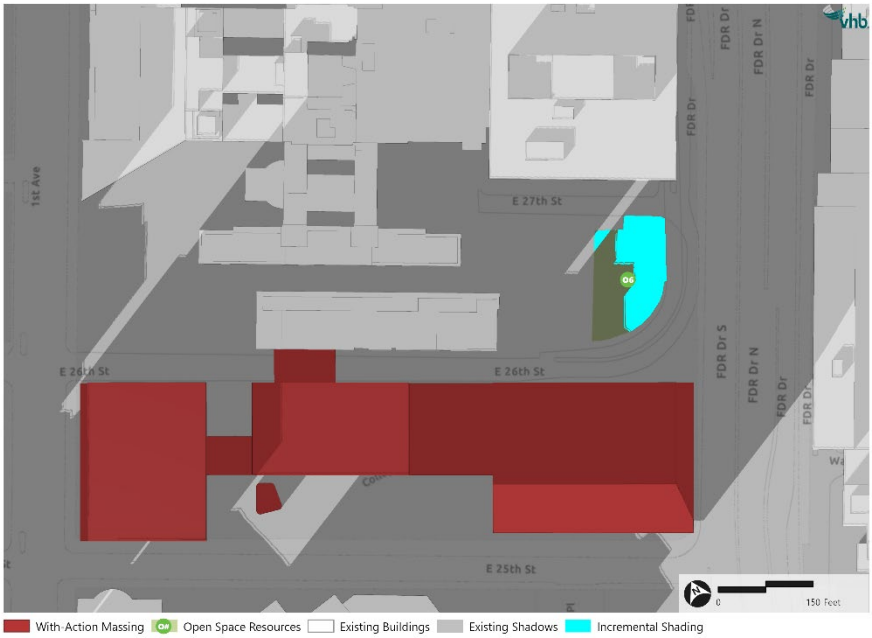


Figure 5-44 March 21 – 4:12 PM

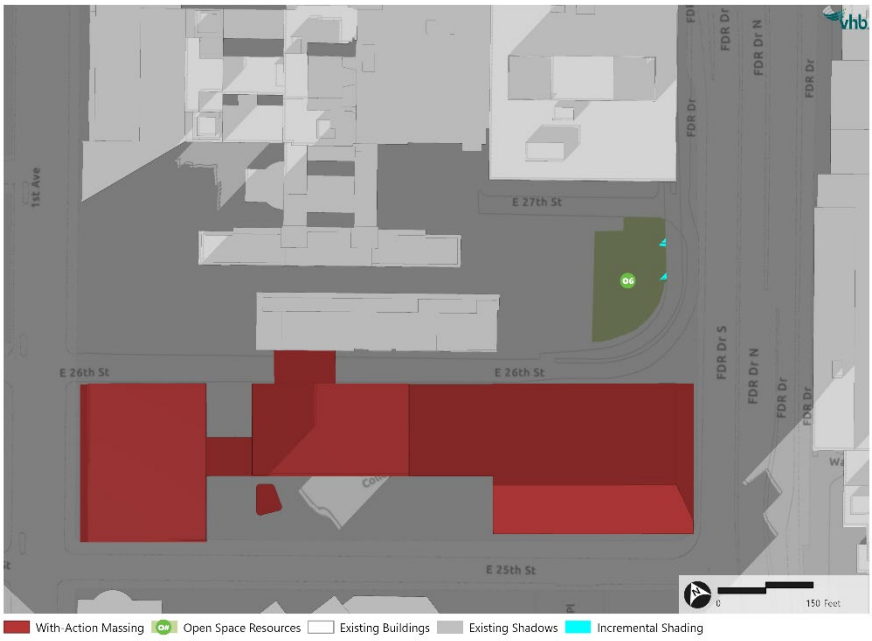


Figure 5-45 May 6 – 10:40 AM

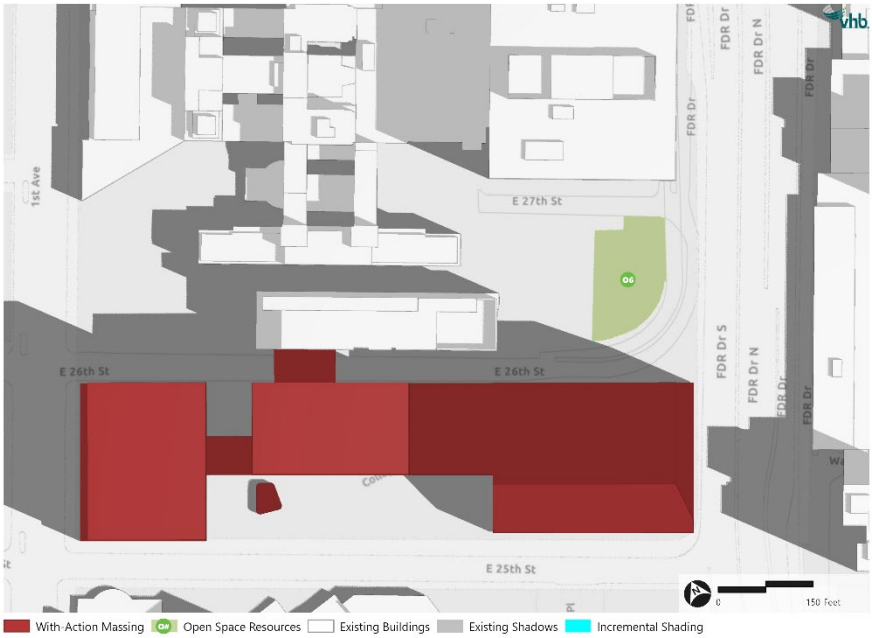


Figure 5-46 May 6 – 11:10 AM



Figure 5-47 May 6 – 11:40 AM



Figure 5-48 May 6 – 12:10 PM



Figure 5-49 May 6 – 12:40 PM

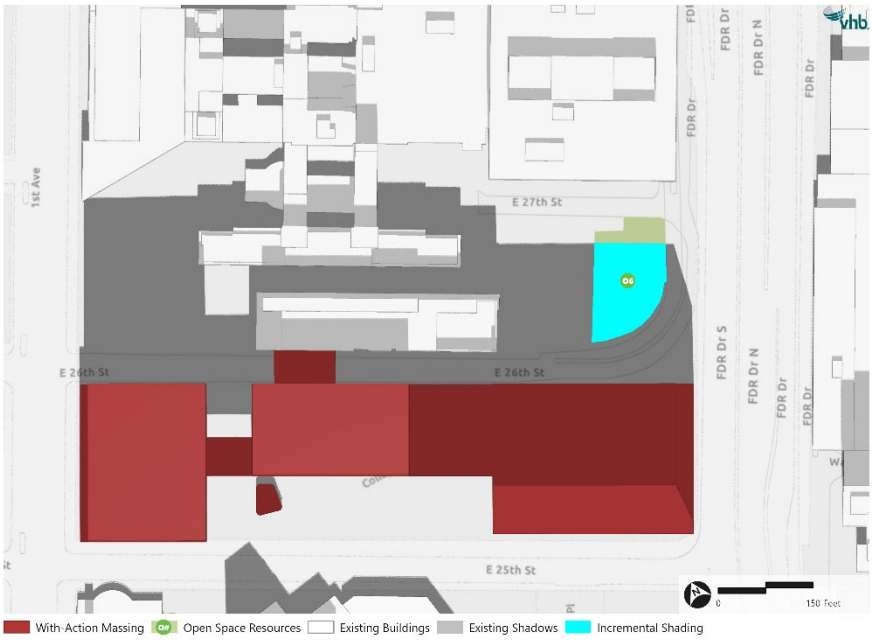


Figure 5-50 May 6 – 1:10 PM



Figure 5-51 May 6 – 1:40 PM



Figure 5-52 May 6 – 2:10 PM

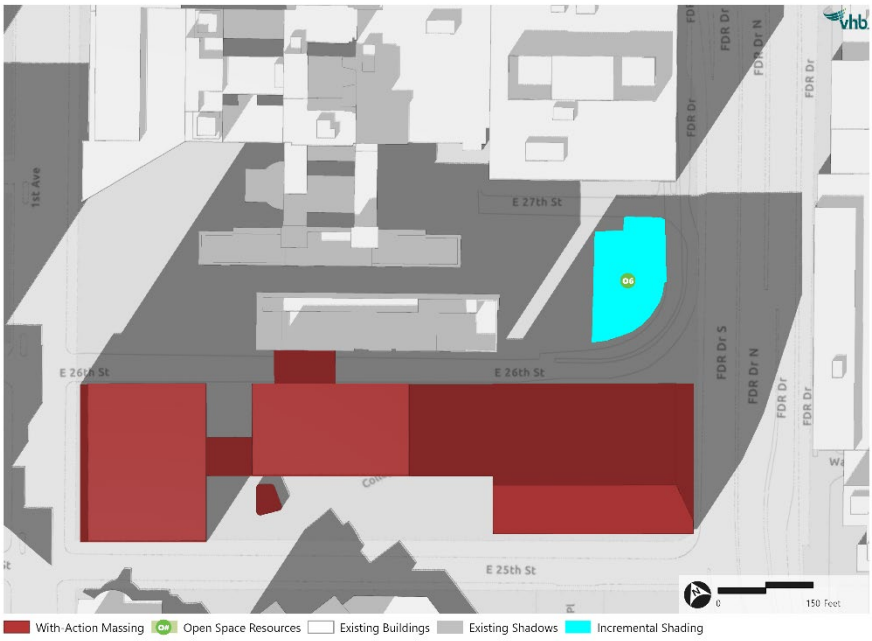


Figure 5-53 May 6 – 2:40 PM



Figure 5-54 May 6 – 3:10 PM

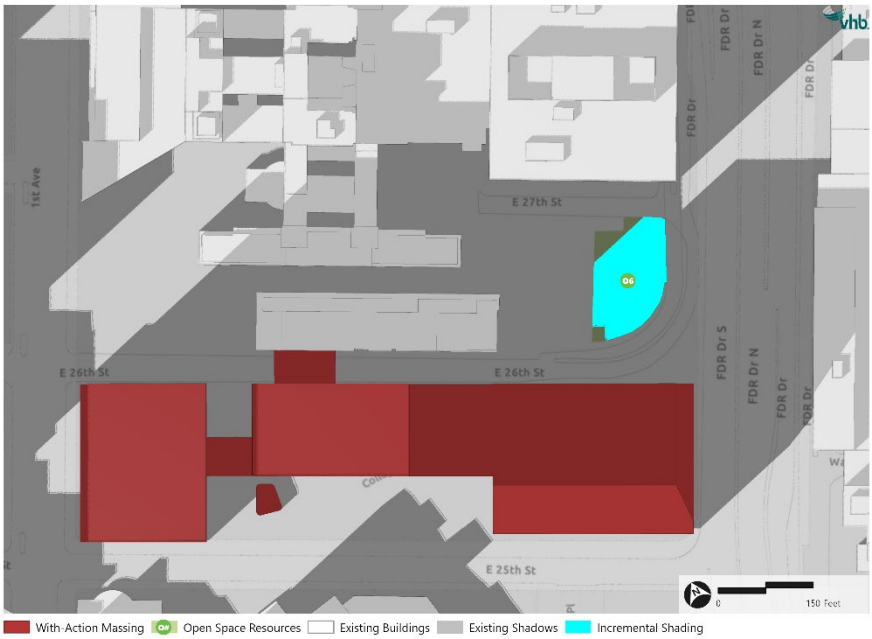


Figure 5-55 May 6 – 3:40 PM



Figure 5-56 May 6 – 4:10 PM

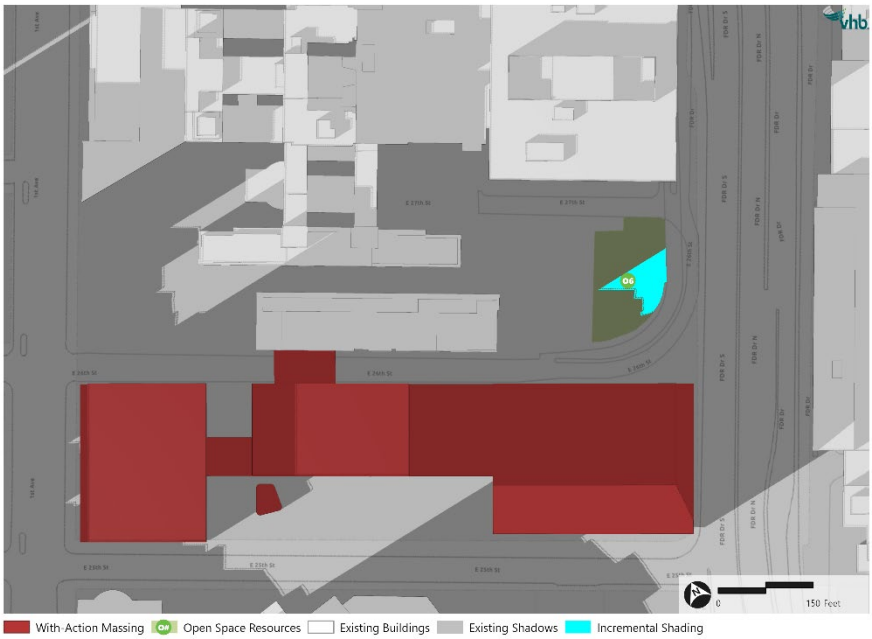


Figure 5-57 May 6 – 4:40 PM



Figure 5-58 June 21 – 11:10 AM

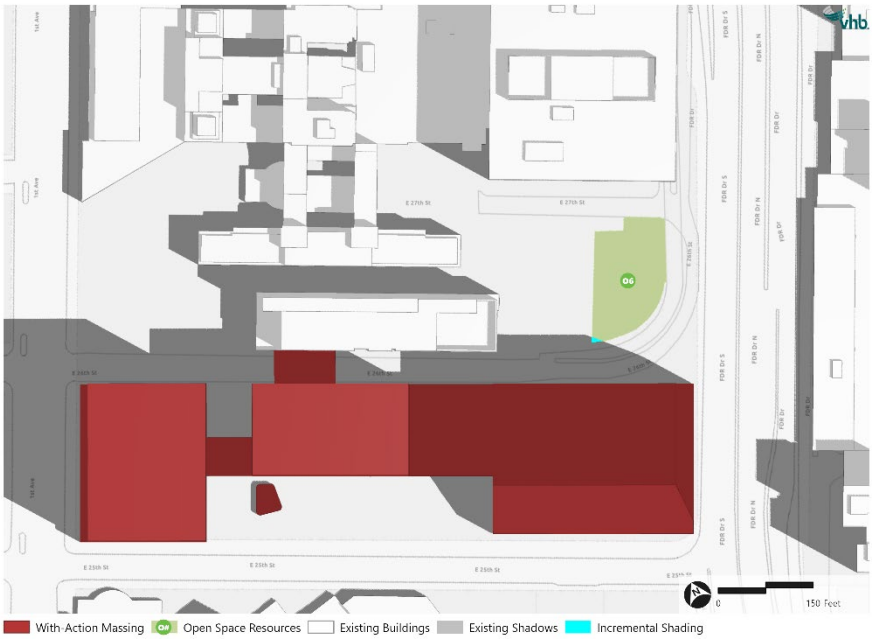


Figure 5-59 June 21 – 11:40 AM



Figure 5-60 June 21 – 12:10 PM



Figure 5-61 June 21 – 12:40 PM



Figure 5-62 June 21 – 1:10 PM



Figure 5-63 June 21 – 1:40 PM

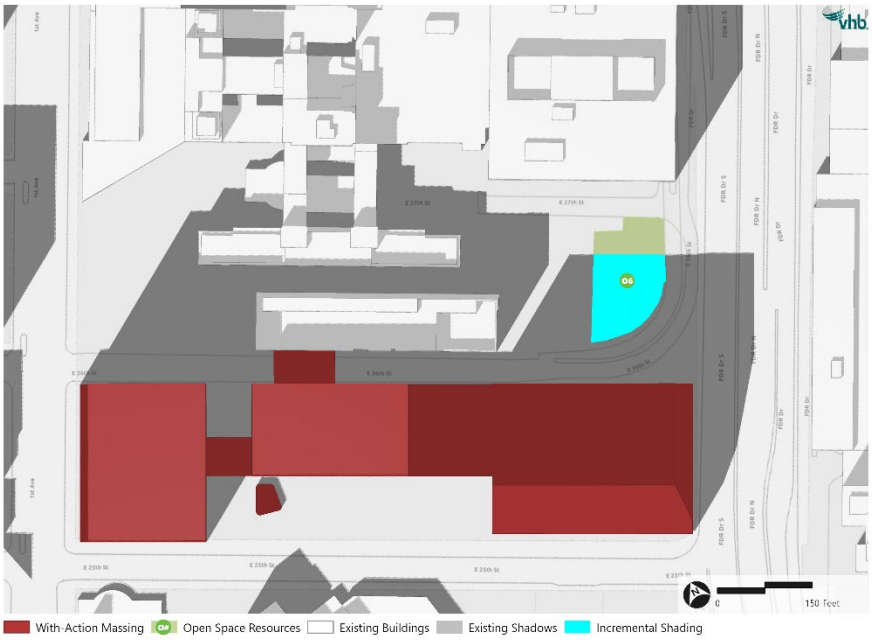


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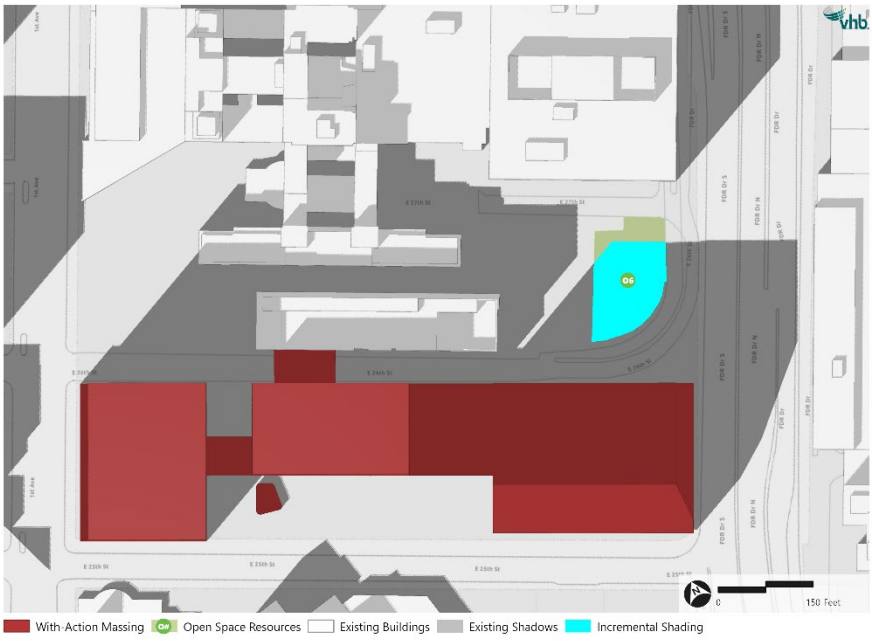


Figure 5-65 June 21 – 2:40 PM



Figure 5-66 June 21 – 3:10 PM



Figure 5-67 June 21 – 3:40 PM



Figure 5-68 June 21 – 4:10 PM



Figure 5-69 June 21 – 4:40 PM



N1 – East River

Figure 5-70 December 21 – 2:21 PM

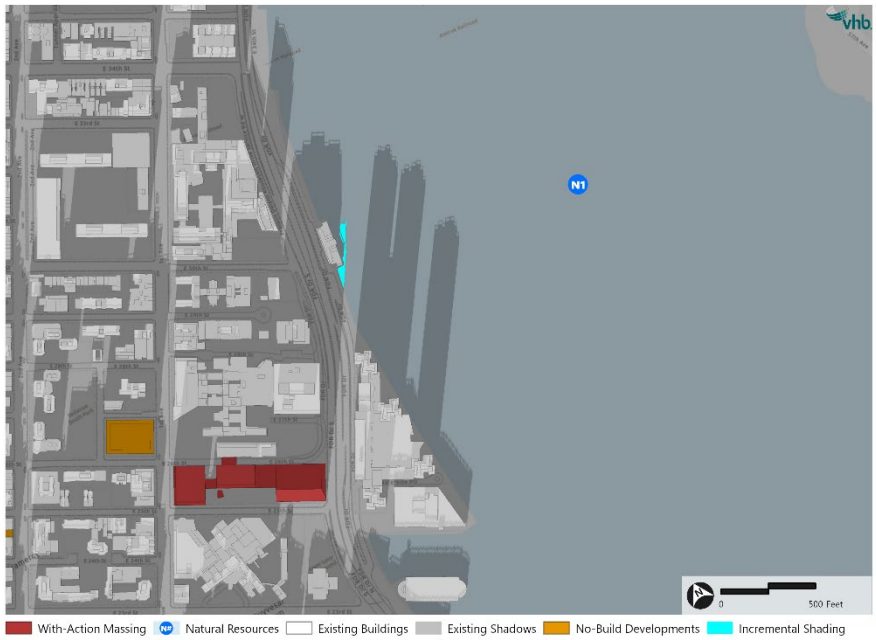


Figure 5-71 December 21 – 2:51 PM

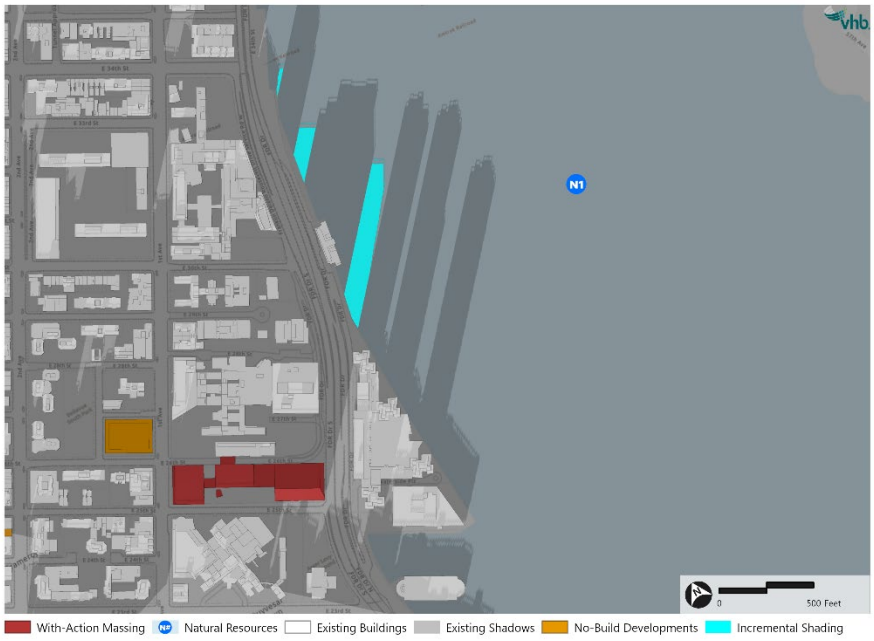


Figure 5-72 March 21 – 3:20 PM

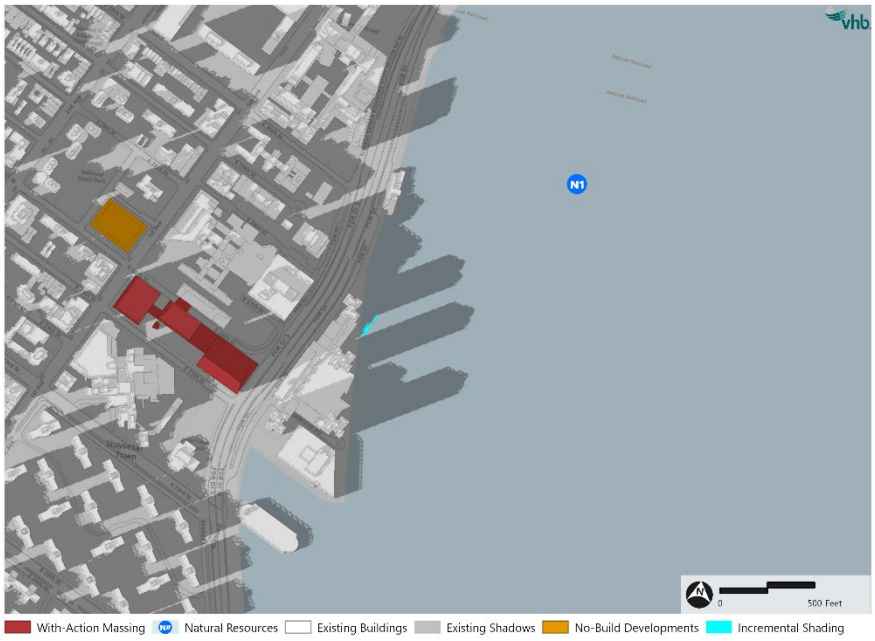


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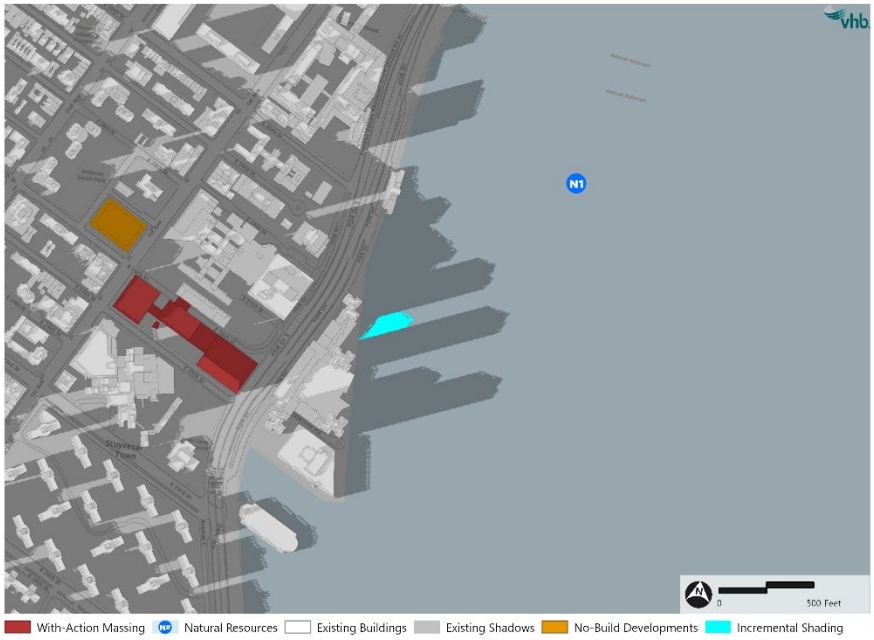


Figure 5-74 March 21 – 4:20 PM

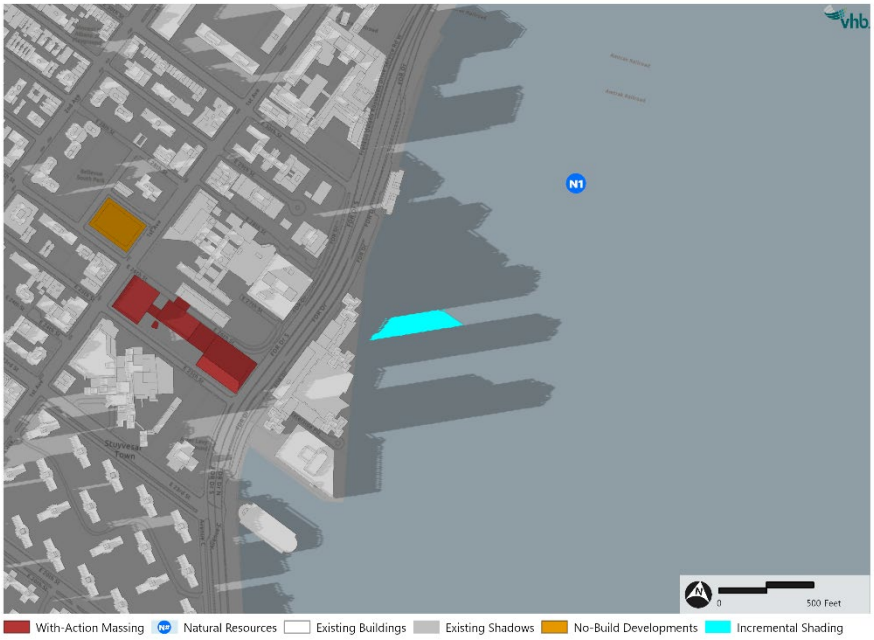


Figure 5-75 May 6 – 4:00 PM

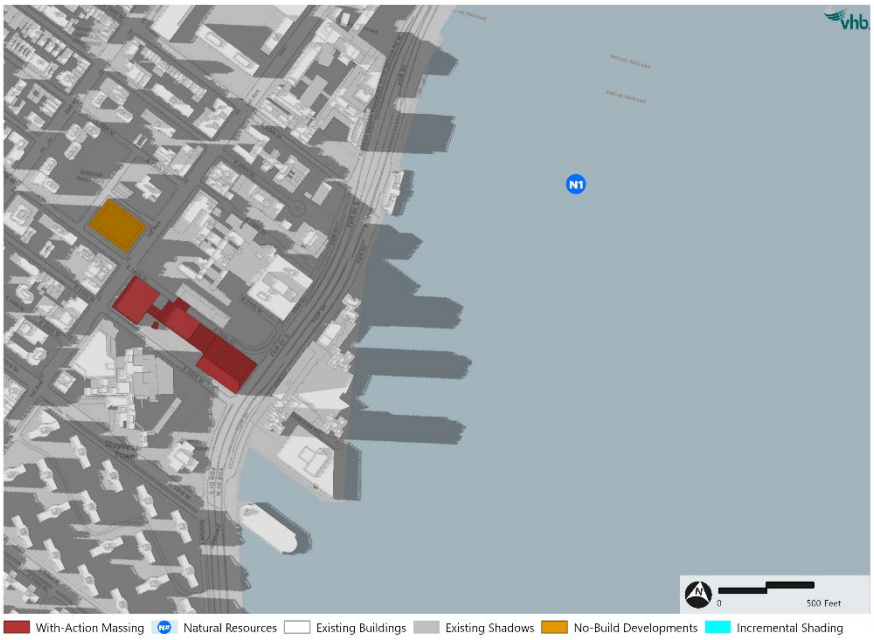


Figure 5-76 May 6 – 4:30 PM

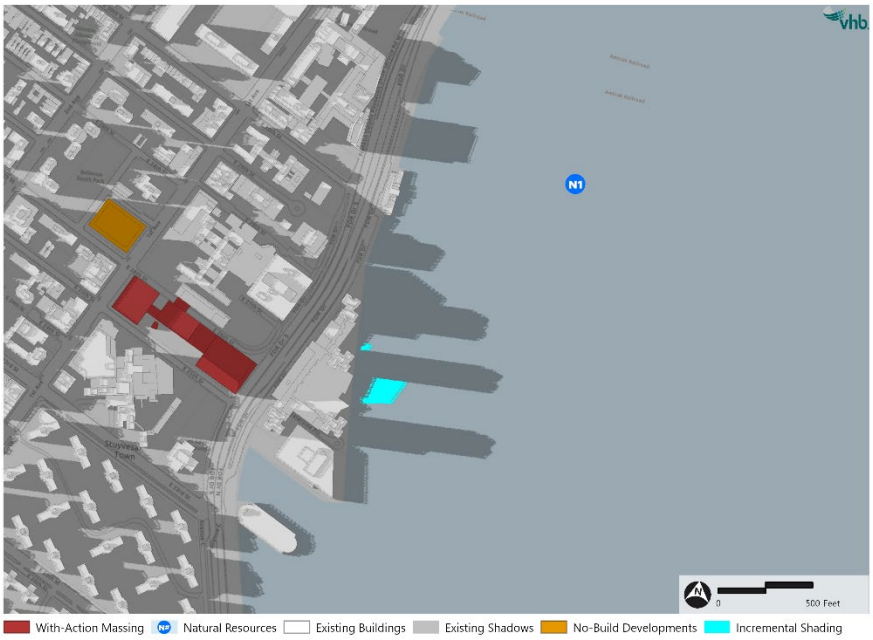


Figure 5-77 May 6 – 5:00 PM

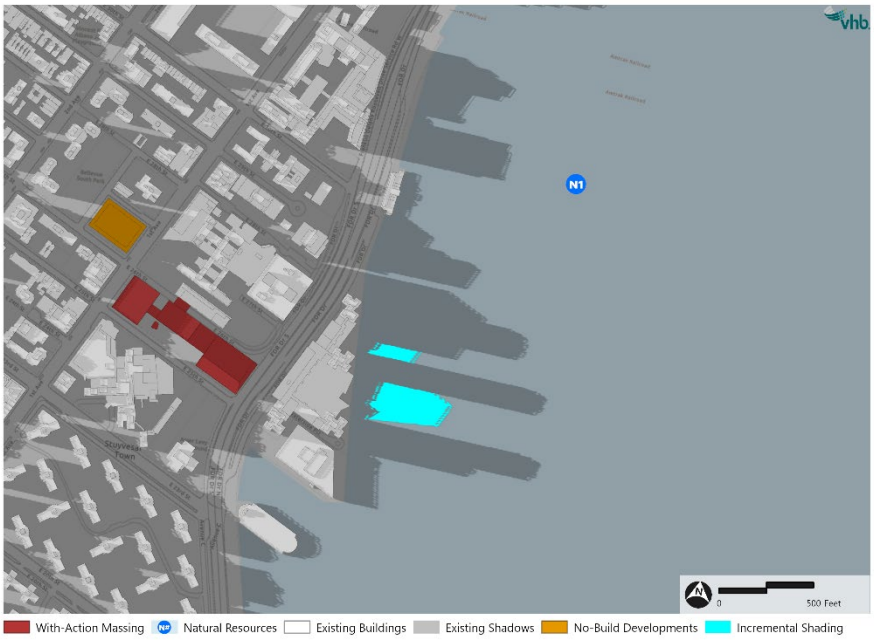


Figure 5-78 June 21 – 4:30 PM

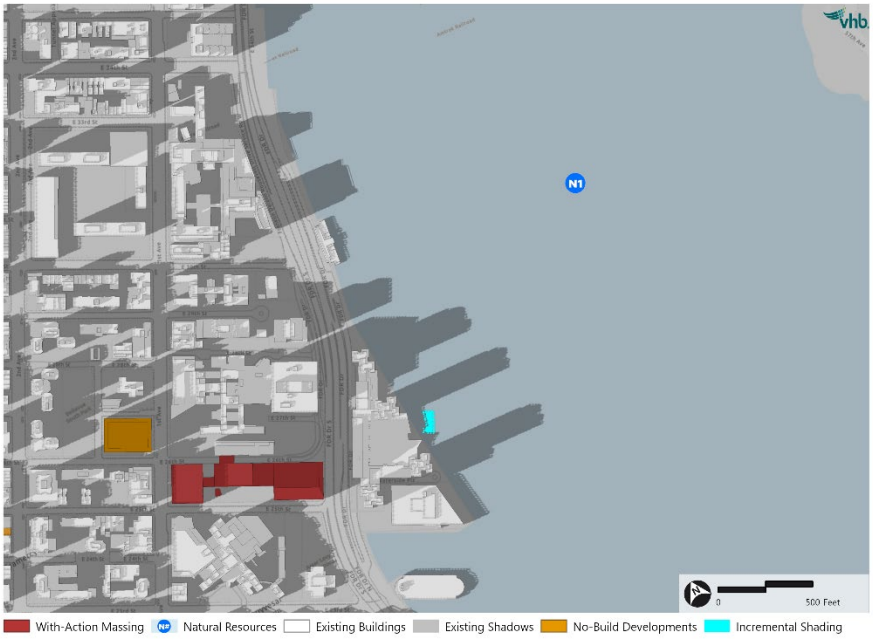


Figure 5-79 June 21 – 5:00 PM

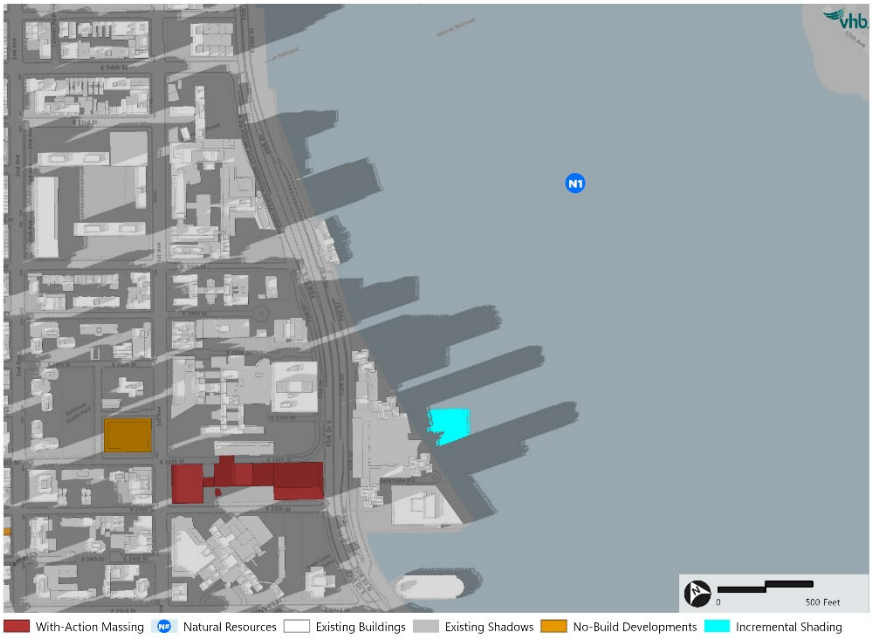


Figure 5-80 June 21 – 5:30 PM

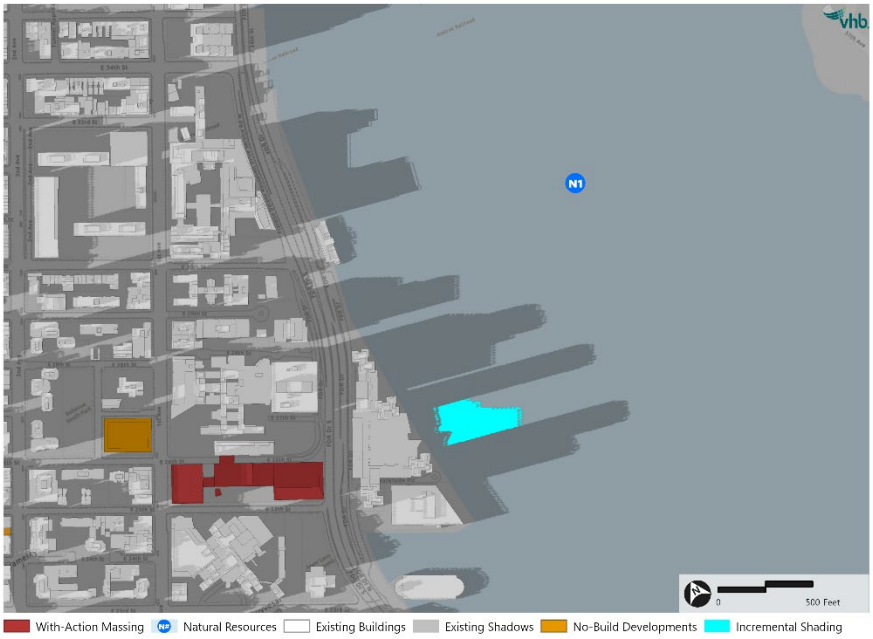


Figure 5-81 June 21 – 6:00 PM

