6

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 that are 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.

As described in **Chapter 1, Project Description**, the Proposed Actions would facilitate the development of 12 new buildings including an above-grade accessory parking garage and Performing Arts Center (PAC), With the exception of the PAC, all of the new buildings would have heights greater than 50 feet (see **Figure 6-1**). Maximum building heights range from an

approximately 87-foot-tall parking garage to an approximately 161-foot-tall mixed-use building (176 feet tall including a 15-foot bulkhead). The approximate maximum height of each individual building, with bulkhead, is listed in **Table 6-1** below. Four of the proposed buildings (Buildings 7/8 and 9/10) would front on Louisiana Avenue on the west side of the Project Area; four (Buildings 1, 3, 5, and 6) would front on Flatlands Avenue on the north side of the Project Area; and two buildings (Buildings 1 and 2) would front on Pennsylvania Avenue. Building 1 would be located at the corner of Flatlands Avenue and Pennsylvania Avenue and would have frontage on both Flatlands and Pennsylvania Avenues. The proposed parking garage would be located along a proposed interior roadway on the south side of the Project Area, adjacent to Building 9/10. Building 4 would also be located along the proposed interior roadways. The ten proposed mixed-use buildings would incorporate a series of setbacks before reaching their maximum height, as depicted in **Figure 6-1** below.

Figure 6-1 With-Action Site Axonometric with Proposed Land Uses



Source: Practice for Architecture and Urbanism (PAU)

Table 6-1 Proposed Project Building Height

	Building										
	1	2	3	4	5	6	7	8	9	10	Parking Garage
Height (ft)	161	140	150	129	153	155	134	134	133	133	87
Height w/ Bulkhead (ft)	176	155	165	144	168	170	149	149	148	148	127

Principal Conclusions

A preliminary shadows assessment conducted for the Proposed Project determined that in the With-Action condition, project-generated shadows could reach two sunlight sensitive resources: Breukelen Ballfields and the Fresh Creek Nature Preserve. The assessment shows that shading that could occur on Fresh Creek Nature Preserve on the June 21st analysis day would be de minimis and does not warrant further analysis. Breukelen Ballfields could receive shading on three analysis days, but the shading would be of short duration and in the early morning, and therefore is not anticipated to affect the vegetation or public use of the park. Therefore, there would be no significant adverse impacts from the Proposed Project with respect to shadows as a result of the Proposed Actions.

Methodology

According to the *2021 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. The representative analysis 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).

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: [1]

[1] According to the *2021 CEQR Technical Manual*, City streets, sidewalks, and private open spaces (such as private residential front and back yards, stoops, and vacant lots) are not considered to be sunlight-sensitive resources.

- 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, 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.

Preliminary Assessment

The preliminary screening assessment consists of three tiers of analysis:

- **Tier 1 Screening:** The first tier determines a simple radius around the proposed buildings 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 sunlight-sensitive resource.

Detailed Assessment

If the Tier 3 screening indicates that, in the absence of intervening buildings, shadows from a proposed project would reach a sunlight-sensitive resource on any of the representative analysis days, a detailed shadow analysis would be warranted. Because existing buildings (or No-Action buildings) may already cast shadows on a sunlight-sensitive resource, a proposed project may not result in additional (incremental) shadows upon that resource. The detailed shadow analysis models a baseline condition (future No-Action) that is compared to the future condition resulting from a proposed project (future With-Action) to illustrate the shadows cast by the No-Action development and distinguish the additional (incremental) shadow cast by the project. The detailed shadows analysis uses a combination of Geographic Information Systems (GIS) 3D modeling and Sketchup, a 3D modeling software, as well as GIS data provided publicly.

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 generally occurs 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

Tier 1 and 2 Screening

As described above and in **Chapter 1, Project Description**, the Proposed Actions would facilitate the construction of 12 new buildings, including an accessory parking garage and the PAC. With the exception of the PAC, all of the buildings would exceed 50 feet in height. The ten mixed-use buildings would range in maximum height from approximately 129 to 161 feet (144 to 176 feet including a 15-foot bulkhead). The proposed parking garage would be approximately 87 feet tall.

For conservative analysis purposes, the maximum shadow screening radius was drawn around the Project Area based on the height of the tallest proposed building (Building 1), which would be located at the corner of Pennsylvania Avenue and Flatlands Avenue. The resulting maximum shadow screening radius is 756.8 feet, which is the height of the tallest building (176 feet including bulkhead) multiplied by 4.3. The area that cannot be shaded by the Proposed Project was drawn from the southernmost point of the Project Area.

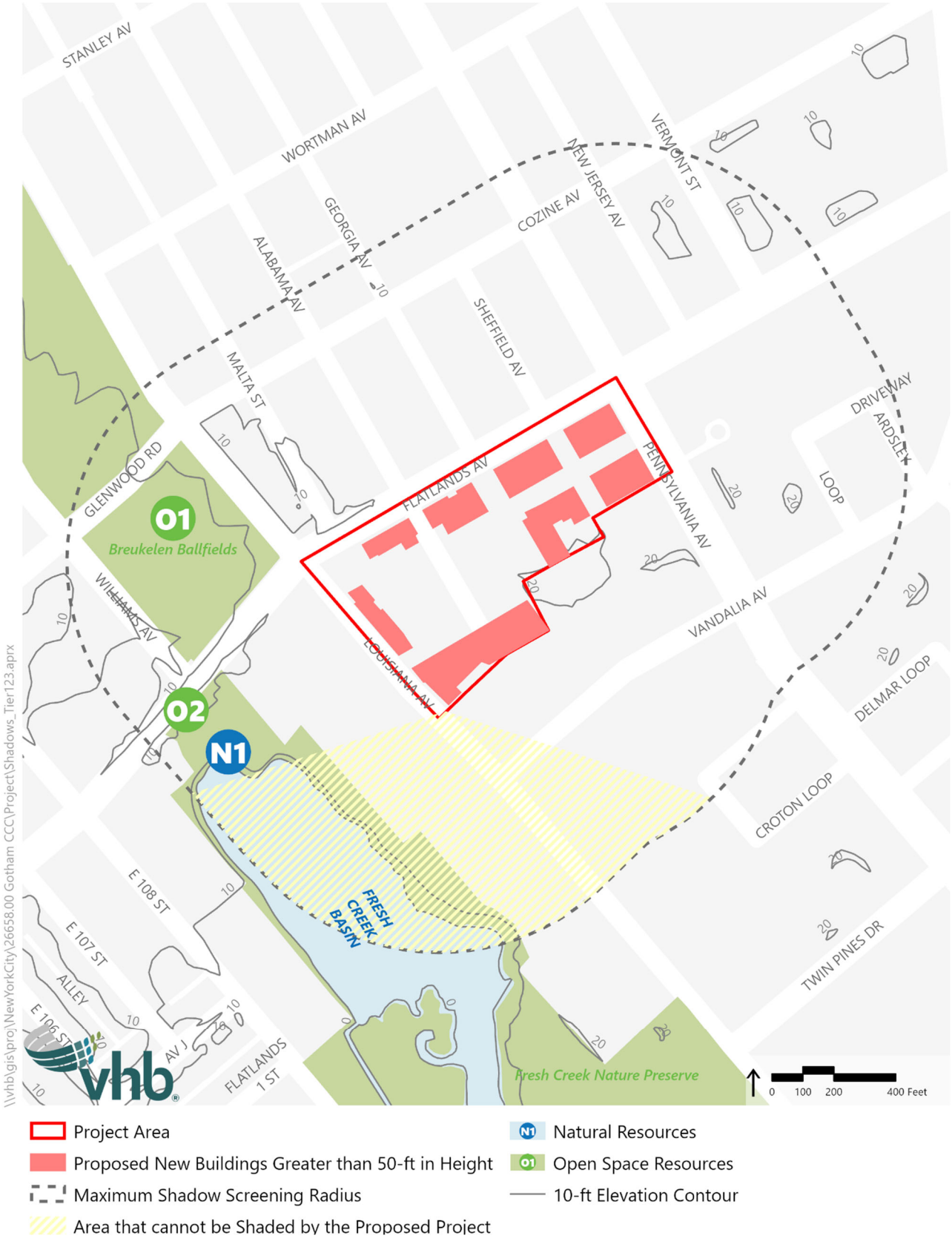
The Tier 1 and 2 screening assessment determined that there are two open space resources and one natural resource within the maximum shadow screening radius drawn from the Project Area. Breukelen Ballfields (O1) is a 16.16-acre park located diagonally across Flatlands Avenue and Louisiana Avenue from the Project Area. Fresh Creek Nature Preserve (O2) comprises the waterfront of Fresh Creek Basin (N1), which are both located southeast of the Project Area. These three resources were therefore advanced to a Tier 3 screening assessment, which is provided in the next section. **Table 6-2** lists and **Figure 6-2** shows the potential sunlight-sensitive resources identified in the Tier 1 and Tier 2 screening assessment.

Table 6-2 Sunlight-Sensitive Resources in the Study Area

Map ID	Resource Name	Potential Resource Summary	Sunlight-Sensitive Elements
Open Space/Historic Resources			
O1	Breukelen Ballfields	16.16-acre park with five baseball fields, handball courts and playgrounds	Active recreation and vegetation
O2	Fresh Creek Nature Preserve	77.04-acre nature preserve with walking paths	Vegetation, wetlands
Natural Resources			
N1	Fresh Creek Basin	Waterbody that extends from Jamaica Bay inland to Flatlands Avenue	Surface waterbody, wetlands

Source: NYC Department of Parks and Recreation open space database, NYC Capital Planning Platform POPS map, New York Cultural Resource Information System, NYC Landmarks Preservation Commission map.

Figure 6-2 Tier 1 and Tier 2 Screening



Tier 3 Screening Assessment

In accordance with the *2021 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 (ArcGIS Pro). The model was geolocated, and the surrounding terrain was imported into the model to account for how topography affects shadow length. 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 6-3** through **Figure 6-6** below show the Tier 3 screening results.

As shown, the Tier 3 screening indicates that in the absence of intervening structures, the Proposed Project could cast shadows on Breukelen Ballfields (O1) on the March 21/September 21, May 6/August 6, and June 21 analysis days. There would be incremental shading on the northeastern edge of the Fresh Creek Nature Preserve (O2) on the June 21 analysis day (see **Figure 6-6**); however, the shading would not extend very far into this resource. There would be no shading as a result of the Proposed Project on Fresh Creek Basin (N1). Therefore, no further analysis of the potential effects of shading as a result of the Proposed Actions is required for Fresh Creek Nature Preserve (O2) and Fresh Creek Basin (N1). Further discussion of the Tier 3 shadows that would be cast on Breukelen Ballfields (O1) is provided below.

Figure 6-3 Tier 3 Screening December 21 Analysis Day

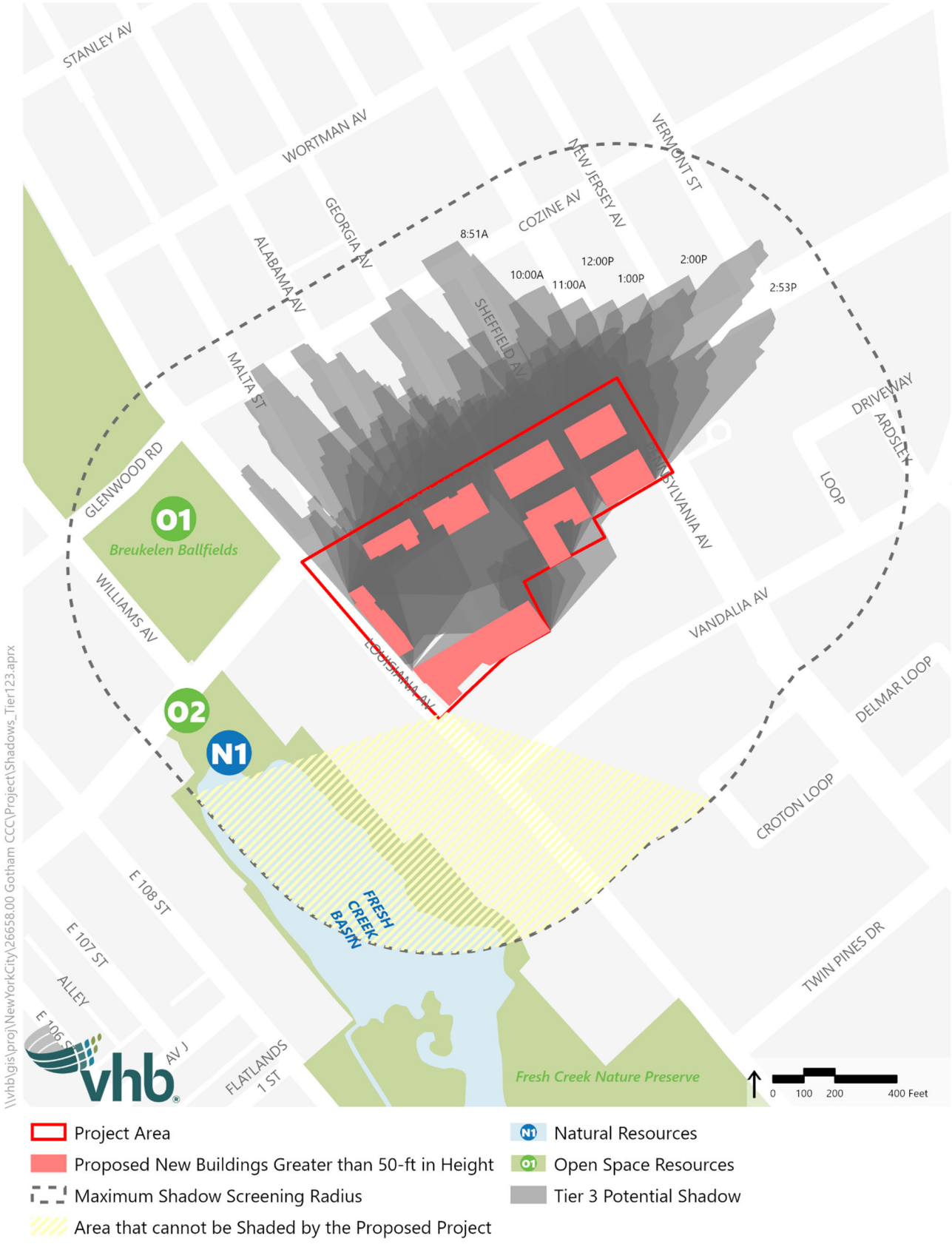


Figure 6-4 Tier 3 Screening March 21/September 21 Analysis Day

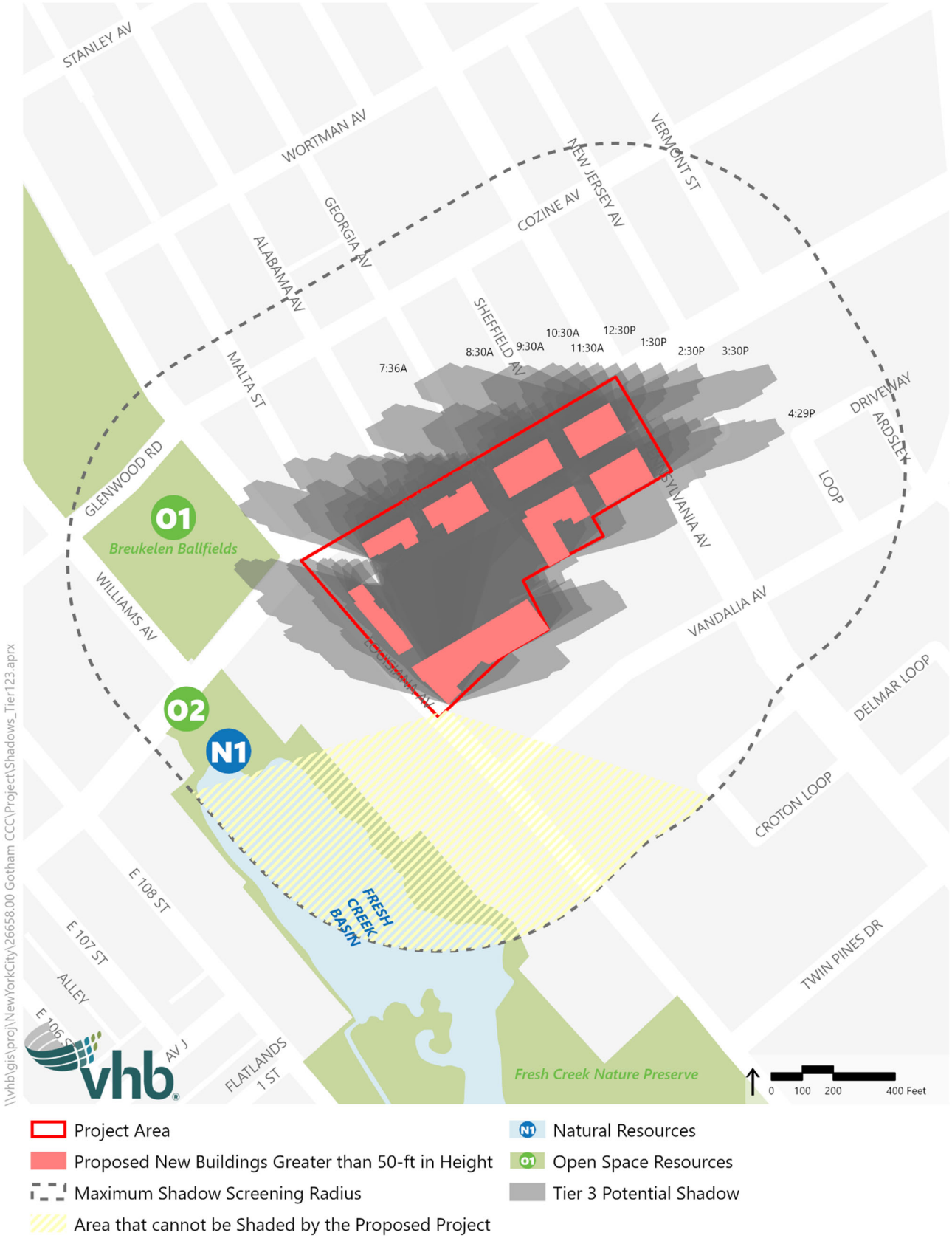


Figure 6-5 Tier 3 Screening May 6/August 6 Analysis Day

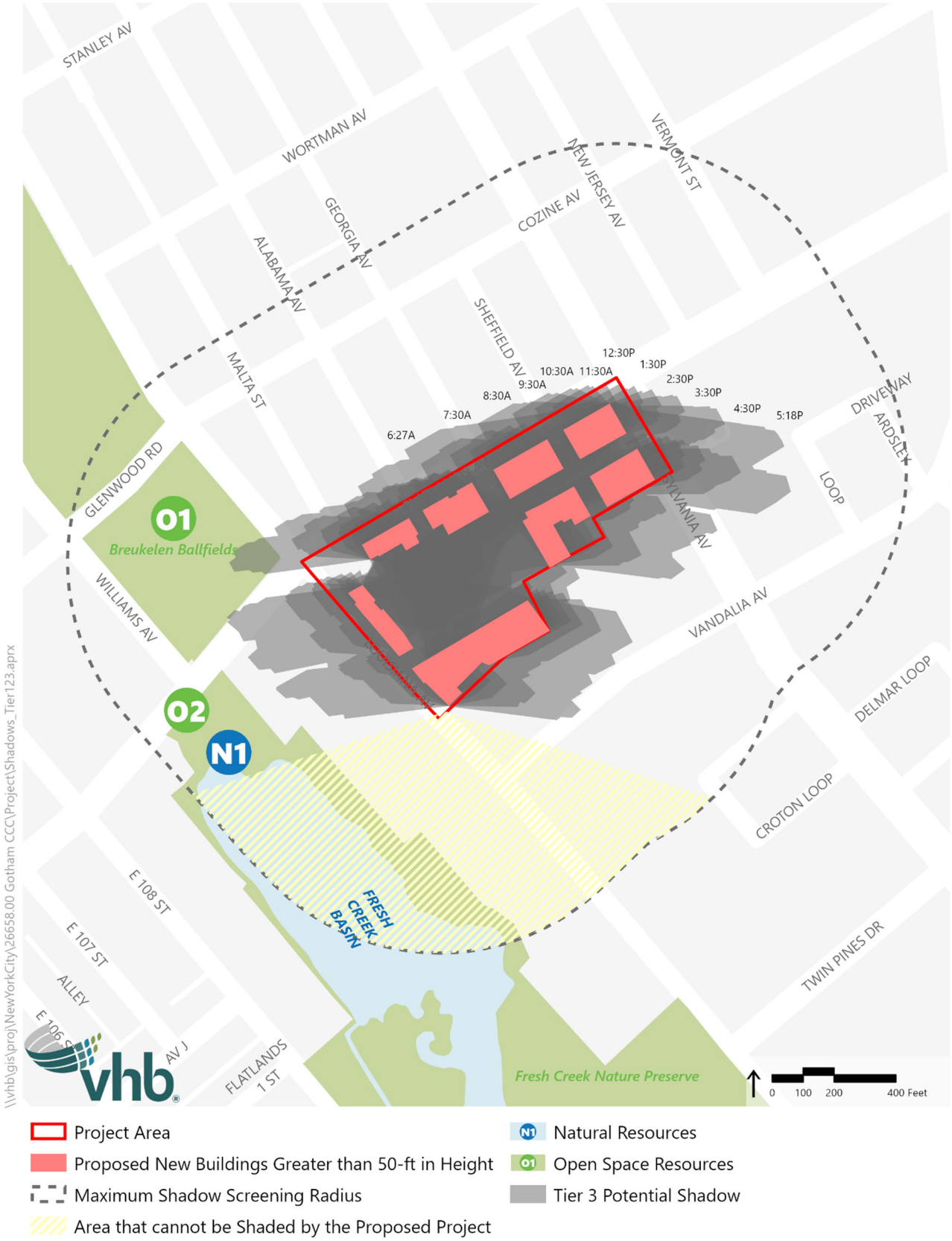


Figure 6-6 Tier 3 Screening June 21 Analysis Day



Breukelen Ballfields (O1)

Breukelen Ballfields is a 16.16-acre park located on the block bounded by Stanley Avenue to the north, Williams Avenue to the west, Louisiana Avenue to the east, and Flatlands Avenue to the south. The park is located diagonally to the northwest across Flatlands Avenue and Louisiana Avenue from the northwestern corner of the Project Area. The portion of the park located within the Study Area on the block south of Glenwood Road contains three baseball fields and shared walking and cycling paths. There are two sets of benches and bleacher seating for two adjoining baseball fields that are located mid-block along Louisiana Avenue between Flatlands Avenue and Glenwood Road, and another set of benches and bleacher seating for the third field at the park's southwest corner. Park entrances are provided at the same locations. The Louisiana Avenue and Flatlands Avenue boundaries of the park are lined with chain link fencing and a row of mature deciduous trees, and there is no access into the park from this area.

The potential for shading by the Proposed Project on this open space resource, as a result of the Proposed Actions, could not be ruled out by the Tier 1 and 2 analyses. Therefore, the analysis was advanced to Tier 3. As shown in **Figure 6-4** through **Figure 6-6**, the Tier 3 analysis shows that there could be shading on Breukelen Ballfields on the March 21/September 21, May 6/August 6, and June 21 analysis days. Without accounting for existing buildings, on the March 21/September 21 analysis day, Breukelen Ballfields could receive a maximum of approximately 39 minutes of shading from the start of the analysis period. On the May 6/August 6 analysis day, the resource could receive a maximum of approximately 39 minutes of shading from the start of the analysis period. On the June 21 analysis day, the resource could receive a maximum of approximately 59 minutes of shading, also from the start of the analysis period. In each case, the period during which the park could receive shading from the Proposed Project is less than 60 minutes and occurs in the early morning when usage of the park typically would be low. The park would experience no incremental shading after 8:10 AM on the March 21/September 21 analysis day. Breukelen Ballfields would continue to receive nearly unobstructed sunlight throughout the duration of each analysis period, and the health of vegetation in the park would be unaffected.

The portion of the park that could receive shading is in the southeast corner, which is a grass outfield for one of the three baseball fields, separated from the sidewalk by a chain link fence and bordered by a row of mature deciduous trees with no access into the park from this area (see **Photo 6-1**). The portion of the park that could receive Tier 3 shading is small relative to its total size and any park user could easily avoid the shaded area if they desired. The potential shadow would not reach any of the park entrances, bleachers, or other seating areas. The area of Breukelen Ballfields shaded by the Proposed Project would likely be shaded already by the existing trees during the affected analysis days during late spring, summer, and early fall. Shadow on the trees themselves would be limited to less than 60 minutes and therefore would not affect their ability to thrive.

The Tier 3 shading described here represents the maximum possible shadow that would be cast by the Proposed Project in the absence of intervening structures. Since there are limited intervening structures between the Project Area and the resource, a detailed analysis would not provide more information about the amount of shading Breukelen Ballfields could receive and, therefore, is not warranted. Existing structures adjacent to the park that stand between it and the Project Area are only approximately one to three stories tall and do not

cast significant shade on the resource, nor would the existing buildings and the existing shadows cast by those buildings significantly intersect with shading from the Proposed Project. Because of the medium density nature of the neighborhood surrounding the ballfields, this open space resource would continue to be largely in sunlight for the rest of the analysis periods. Therefore, no negative shadow impacts to Breukelen Ballfields are anticipated as a result of the Proposed Actions, and no further analysis is required.

Photo 6-1 Southeast Corner of Breukelen Ballfields



Conclusion

According to the Tier 3 analysis described above and summarized below in **Table 6-3**, there would be no shading as a result of the Proposed Project on Fresh Creek Basin (N1). The Tier 3 analysis shows that shading that could occur on Fresh Creek Nature Preserve (O2) on the June 21 analysis day would be *de minimis* and does not warrant further analysis. Breukelen Ballfields could receive shading as a result of the Proposed Project on the March 21/September 21, May 6/August 6, and June 21 analysis days. However, the period that the resource could receive shading is less than 60 minutes from the beginning of the analysis period and in the early morning in each case. The park would continue to receive near-completely unobstructed sunlight throughout the duration of each analysis period, and

vegetation within the park would be unaffected by this limited amount of incremental shading. Furthermore, the area of the park that could receive shading is in the grass outfield of one of the three baseball fields in the southeastern corner of the park that is already shaded by mature deciduous trees that line the Flatlands Avenue and Louisiana Avenue boundaries of the park. The portion of the outfield that would be shaded is small and does not contain any seating/passive open space or high-traffic areas such as park entrances. In addition, there are few intervening structures between the Project Area and Breukelen Ballfields, and existing buildings adjacent to the park are only one to three stories in height—meaning a detailed analysis would not provide further information about the size and/or duration of the potential shading on this resource. Therefore, there would be no significant adverse impacts from the Proposed Project with respect to shadows as a result of the Proposed Actions, and no further analysis is required.

Table 6-3 Tier 1 through 3 Shadows Screening Results

Map ID	Resource Name	Tier 1-3 Screening Results
Open Space Resources		
O1	Breukelen Ballfields	Screened at Tier 3
O2	Fresh Creek Nature Preserve	Screened at Tier 3
Natural Resources		
N1	Fresh Creek Basin	Screened at Tier 3