6 SHADOWS

6.1 Introduction

Per the 2021 *CEQR Technical Manual*, a shadow assessment is warranted when a proposed action would result in a new structure or an addition to an existing structure that is greater than 50 feet in height or is adjacent to a sunlight-sensitive resource. "Incremental shadow" is the additional, or new, shadow that would be cast on a sunlight-sensitive resource from a project-generated structure. Sunlight-sensitive resources include publicly accessible open space, historic landscapes, historic resources that rely on sunlight for its architectural and historic integrity (e.g., stained glass windows), and natural features. Shadows on features such as city streets, sidewalks, buildings, and non-publicly accessible privately owned open space – or shadows that occur within 1.5 hours of sunrise or sunset – are generally not considered significant by CEQR.

In the No-Action Condition, existing conditions would remain within the Proposed Rezoning Area. A one-story, approximately 14,000-gsf automobile mechanic training facility would remain on Projected Development Site 1, and an open parking facility with four connected one-story accessory office buildings and one garage would remain on Projected Development Site 2. Potential Development Site A would remain improved as a hotel, an open truck parking facility, and a vacant industrial building.

In the With-Action Condition, up to four 240-foot-tall (225 feet plus a 15-foot-tall bulkhead) buildings would be developed across the Proposed Rezoning Area's three development sites. The proposed buildings have been sited along Sheridan Boulevard to minimize shadow on the Bronx River while balancing the need for open space at the ground level with affordable housing above. The floor area at the bases of the buildings would be maximized, and the tower bulk would be limited to maximum width of 100 feet on the facades facing the river, creating a slimmer tower and allowing sunlight between the tower portions of the buildings.

6.2 Principal Conclusions

The Proposed Actions would not result in a significant adverse shadows impact. The Tier 1 screening found seven sunlight-sensitive open space resources and one sunlight-sensitive natural resource within the Study Area. The Tier 2 and 3 screenings ruled out significant adverse shadows impacts to three of the eight sunlight-sensitive resources. A detailed assessment was warranted for five resources: the Bronx River, Daniel Boone Playground, the blacktop at PS X811, the schoolyard at PS 66, and Starlight Park.

The Bronx River is a 23-mile-long river that runs south from Westchester County, along the eastern edge of the Proposed Rezoning Area, and empties into the East River. Adjacent to the Proposed Rezoning Area, the river is classified by the New York State Department of Environmental Conservation (NYSDEC) as "Intertidal." The river is New York City's only freshwater river and has been significantly affected by past human activity. The portion of the river that is in the Study Area contains aquatic wildlife, some vegetation and per the New York City Department of Environmental Protection (NYCDEP), an important spawning/juvenile habitat is present farther upstream from the Proposed Rezoning Area. The river is classified by NYSDEC as "Class I," which is a waterbody class whose best usages are secondary contact recreation (i.e., kayaking) and fishing. The Proposed Actions may reduce the availability of sunlight on the Bronx River in the late afternoon periods in the areas near the Proposed Rezoning Area, however, project-generated shadows would not reduce the accessibility of in-water recreational activities such as kayaking.

The portions of the Bronx River within the Study Area would largely be in sunlight throughout the mornings until the early afternoon. On the March, May, and June analysis days, incremental shadow would begin to be cast on the river in the early afternoon, and incremental shadow would span the width of the river by mid-afternoon and last through the end of the analysis period (90 minutes before sunset). The maximum coverage of incremental shadow on the Bronx River would occur at 2:53PM on the December analysis day, when approximately 134,000 square feet of incremental shadow would be cast on the river's littoral zone. This is the maximum coverage of incremental shadow across the four analysis periods, and nearby portions of the river (farther upriver between East 173rd and East 174th streets and farther downriver between Westchester Avenue and the Amtrak Bridge) would continue to be wholly in direct sunlight at this time.

Across the four analysis periods, incremental shadow would only be cast on the river's intertidal marshes in the late afternoon (after 3PM) of the June analysis period; all other incremental shadow cast on the river would be in the river's littoral zone. The Bronx River is a long, intertidal waterbody with conditions that are unfavorable for submerged aquatic vegetation near the Proposed Rezoning Area. Phytoplankton available for secondary consumers (such as fish) in this portion of the Bronx River likely would not be significantly altered in the With-Action Condition because of the availability of sunlight along other portions of the river and the river's tidal nature.

Incremental shadow ~~on the May analysis day~~ would not preclude fish or other wildlife to migrate along the Bronx River. During times of incremental shadow, fish – including alewife, blueback herring, and American eel – may experience a temporary reduction in cues from direct sunlight as they transit through areas of incremental shadow between spawning/juvenile habitats farther upstream and locations farther downstream. The incremental shadow may reduce sunlight in some locations, but the incremental shadow would not rise to the level of a significant adverse shadows impact.

The Proposed Development has been designed to minimize shadow on the Bronx River with the siting of the building along Sheridan Boulevard as stated above, and with the inclusion of sunlight-pervious materials incorporated into the design of the river overlooks. The Proposed Development would increase ~~also include new native~~the vegetation along the onsite shore public walkway to provide a greater quantity of shade-tolerant tree species and to increase the vegetation on the development sites over the existing conditions. ~~habitat for wildlife, as well as several restoration measures to lessen the effects of shading on the Bronx River. The proposed restoration measures would include provision of shade-tolerant tree species and~~The Applicant would also provide informational signage ~~near the shoreline~~along the shore public walkway to educate the public on local fish species; and provide funding ~~for marshland vegetation plantings, or other mutually agreed upon measure,~~ to improve fish ~~habitat~~ passage in the vicinity of the Project Site (in coordination with the New York City Department of Parks and Recreation [NYC Parks])~~; and pending New York State Department of Environmental Conservation (NYSDEC) approval, installation of sufficiently sized submerged reef balls or similar structures to increase habitat complexity for migratory fish and shellfish~~. Details of these proposed measures ~~are being~~have been developed in coordination with NYCDEP and NYC Parks ~~and will be finalized before the Final EIS is issued~~. These commitments will be memorialized in a Restrictive Declaration tied to Projected Development Sites 1 and 2.

Starlight Park is a 17.06-acre park generally bounded by Sheridan Boulevard, East 174th Street, the Amtrak right-of-way, and Westchester Avenue. It was recently reconstructed and expanded as part of a capital improvement project undertaken by the New York City Department of Parks and Recreation (NYC Parks). The park contains both active uses – such as a turf soccer field, basketball courts, a kayak launch, walking paths, and a playground – and passive recreational uses such as bench seating and landscaped areas.

Incremental shadow would be cast on Starlight Park on all four CEQR analysis days throughout most of the analysis periods; however, on the March, May, and June analysis days, shading on the North Subarea is limited largely to a storage area that is inaccessible to the public. On the December analysis day – representative of cold weather conditions when demand for recreation is typically lower than warm weather months – shadow extends to other areas of the North Subarea, including the stone seating area and turf field. On the December analysis day, the stone seating area would be in ~~shaded~~ shade for 1 hour and 45 minutes and the turf field would be in shadow for 42 minutes in the midafternoon. Accordingly, the Proposed Actions would not result in a significant adverse shadows impact to Starlight Park.

Project-generated shadow would be cast on Daniel Boone Playground in the early morning period across the four analysis days. Incremental shadow would be cast on the playground for 20 minutes on the December analysis day – the analysis day of shortest incremental duration – and for approximately 2 hours on the other analysis days. All incremental shadow on the playground would be confined to the early morning period, and no incremental shadow would occur on the playground after 9:24AM on any analysis day.

PS X811's blacktop would receive incremental shadow for less than 1 hour and 40 minutes in the early morning period across the four analysis days. Except for the December analysis day – when incremental shadow would occur for 1 hour and 4 minutes between 8:51AM and 9:55AM – all incremental shadow would move off of the blacktop by 9:10AM.

PS 66's schoolyard is part of the Schoolyards to Playgrounds program. Incremental shadow would be cast on the schoolyard for less than one hour during the early morning

period across the four analysis days. The incremental shadow would not affect its usability as a track and playground or completely eliminate the schoolyard's sunlight at any point during the analysis days. With the Proposed Actions, the schoolyard would continue to receive over seven hours of direct sunlight on the March, May, and June analysis days, with only shadow cast by PS 66 falling on portions of the schoolyard during this time.

6.3 Methodology

The analysis methodology follows the guidelines of the *CEQR Technical Manual*, which includes a preliminary assessment to determine whether shadows resulting from a proposed project could reach any sunlight-sensitive resource at any time of year.

The Tier 1 screening assessment identifies a study area based on the With-Action Condition building heights and the longest shadow a structure can cast, which in New York City is 4.3 times its height. If there is a sunlight-sensitive resource within the shadow study area, a Tier 2 screening assessment is warranted.

Because of the path the sun travels across the sky in the northern hemisphere, no shadow can be cast south of a proposed project site in New York City within a triangular area that is between -108 and +108 degrees from true north. If the area outside this triangular area contains a sunlight-sensitive resource, a Tier 3 screening assessment further refines the analysis by depicting the With-Action Condition shadows on four representative days of the year and shadows durations absent intervening buildings. The four days representative of the shadows conditions throughout the year are:

1. 21 December (the "December analysis day"), the winter solstice, which is shortest solar day of the year and when the sun is lowest in the sky;
2. 21 March (the "March analysis day"), the vernal equinox (which is the solar-equivalent to 21 September, the autumnal equinox);
3. 6 May (the "May analysis day"), the midpoint between the vernal equinox and summer solstice (solar-equivalent to 6 August, the midpoint between the summer solstice and autumnal equinox); and
4. 21 June (the "June analysis day"), the summer solstice, which is the longest solar day of the year and when the sky is highest in the sky.

If the Tier 3 screening analysis does not rule out the possibility that project-generated shadows could result in significant adverse shadows impacts, a detailed shadow analysis is warranted. For this project, a detailed analysis ~~is~~ was warranted for Starlight Park and the Bronx River. A detailed analysis requires a three-dimensional computer model to show shadows from both the No-Action and With-Action conditions to identify the incremental shadow that would reach a sunlight-sensitive resource within the Study Area on each of the representative analysis days.

CEQR guidelines indicate that significant adverse shadows impacts cannot occur to project-generated open space; however, a qualitative description of the shadows conditions is appropriate. The Proposed Actions would facilitate the development of new open space resources on the development sites; therefore, a qualitative description of the shadows conditions on this project-generated open space resource is provided. Consistent with the guidelines set forth in the *CEQR Technical Manual,* this shadows assessment does not account for daylight savings time.

Study Area

The Proposed Actions would facilitate the construction of four 240-foot-tall buildings across the three development sites; therefore, a Study Area with a radius of 1,032 feet – 4.3 times the maximum building height per CEQR guidelines – was established around the development sites. The Study Area is generally bound by the eastward prolongation of East 167th Street to the south, Bryant Avenue to the west, Elder Avenue to the east, and East 174th Street to the north.

Impact Criteria

Per the *CEQR Technical Manual*, the uses and features of an open space or natural resource indicate its sensitivity to shadows. Shadows occurring during the cold-weather months generally do not affect the growing season of outdoor vegetation; however, shadow effects on other uses and activities should be assessed. Therefore, shadow sensitivity is typically assessed for both (i) warm-weather-dependent features like pools, wading pools and sand boxes, or vegetation that could be affected by a loss of sunlight during the growing season; and (ii) features, such as benches, the use of which could be affected by a loss of winter sunlight. The minimum amount of sunlight typically needed for plantings and vegetation – such as grass lawns, planted annuals or areas used for a relatively substantial amount of food production – is six to eight hours of direct sunlight per day.

Per the *CEQR Technical Manual*, consideration of the inventory of available open space resources within the Open Space study area may be helpful in assessing the significance of the loss of sunlight for active or passive recreational uses. For example, if many of the parks in the study area already have shadows on similar sunlight sensitive features, the additional loss of sunlight in parks may be more critical. Further, the significance of shadows cast on an open space should be closely examined in relation to the open space's utilization rates to determine the potential for the shadows to affect the times of day the space is commonly used. This is particularly important when shadows are cast on open spaces that fall within an area without similar sunlit resources.

6.4 Preliminary Assessment

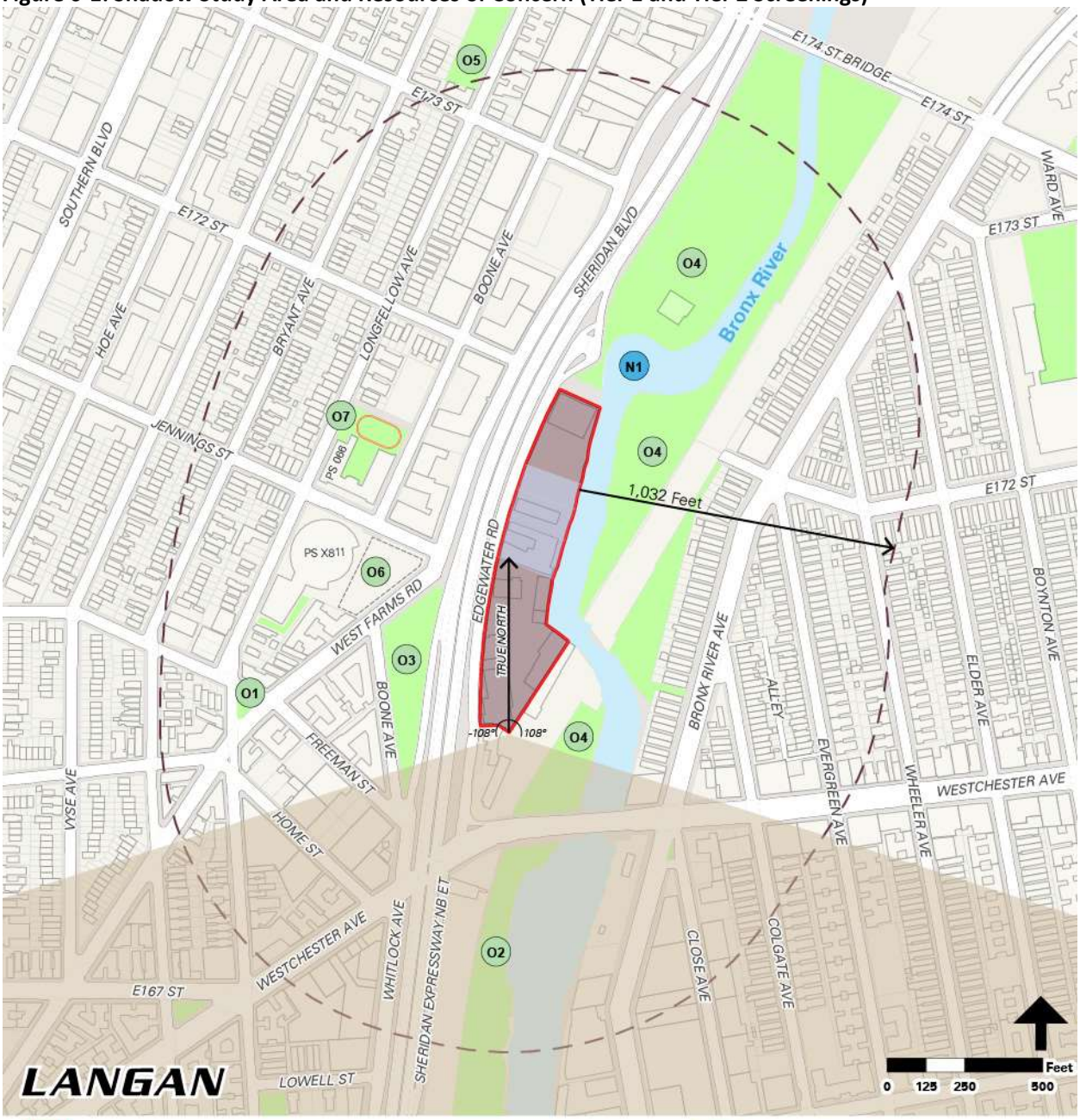
Tier 1 and Tier 2 Screening

The Tier 1 and Tier 2 screenings identify how a proposed action could affect sunlight-sensitive resources within the Study Area. Resources that are not sunlight-sensitive are excluded from the preliminary assessment. Three historic and cultural resources were identified in Chapter 7, "Historic and Cultural Resources," -- the Amtrak Northeast Corridor Line Bascule Bridge, the IRT No. 6 Subway Truss Bridge, and the Westchester Avenue Bridge. These three historic and cultural resources do not rely on sunlight for their architectural and historic integrity; therefore, no further analysis on historic and cultural resources with regards to shadows is required. However, there are eight sunlight-sensitive resources of concern within the Study Area, including open space and natural resources. The eight resources of concern in the Study Area are shown on Table 6-1 and described in Table 6-1.

Table 6-1: Resources of Concern in the Study Area

MAP ID	RESOURCE	DESCRIPTION	SUNLIGHT-SENSITIVE FEATURES
	Open Space Resources		
O1	Freeman Triangle	Triangle at the intersection of Freeman Street, Longfellow Avenue, and West Farms Road	Bench seating and vegetation
O2	Concrete Plant Park	6.28-acre neighborhood waterfront park along the Bronx River between Westchester Avenue and Bruckner Blvd	Waterfront promenade, pedestrian walking and biking path, seating, and vegetation
O3	Daniel Boone Playground	1.20-acre playground along Boone Avenue between West Farms Road and Freeman Street	Public playground, benches, and spray showers
O4	Starlight Park	17.06-acre neighborhood park generally bound by Sheridan Boulevard East 174th Street, Bronx River Avenue, and Westchester Avenue. The park was recently reconstructed and extended.	Public playground, seating areas, recreation fields (baseball and soccer), basketball courts, and vegetation
O5	Rock Garden Park	0.98-acre neighborhood park on Longfellow Avenue between East 174th and 173rd streets	Public playground, spray showers, basketball court, and bench seating
O6	PS X811 Horticulture-Gardening Grow Lab and Blacktop	0.9-acre public blacktop and 0.1-acre school garden on Longfellow Avenue between Jennings Street and Freeman Street.	Public blacktop playground, vegetation and vegetable planters
O7	PS 66 Sports Field and Courtyard	0.44-acre school playground, sports field, and courtyard on Jennings Street between Longfellow Avenue and Boone Avenue.	Public playground, running track, basketball court, soccer field and vegetated courtyard
	Natural Resources		
N1	Bronx River	Freshwater tributary of the East River that flows generally from north to south from Westchester County	Natural waterbody

Figure 6-1: Shadow Study Area and Resources of Concern (Tier 1 and Tier 2 Screenings)



The Tier 2 screening shows that project-generated shadow would not have the potential to be cast on the Concrete Plant Park, and further analysis is not warranted for this resource.

For the other resources of concern within the Study Area, the potential for significant adverse shadows impacts could not be ruled out in the Tier 1 and Tier 2 screenings, and therefore a Tier 3 screening was warranted.

Tier 3 Screening

A Tier 3 screening uses a three-dimensional modeling program to show the project-generated shadow in the absence of intervening buildings. The results of the Tier 3 screening are presented in Table 6-2 and in Figure 6-2 through Figure 6-5.

Table 6-2: Tier 3 Shadow Screening Results – Times and Durations by Analysis Day

MAP ID	ANALYSIS DAY	DECEMBER	MARCH	MAY	JUNE
	ANALYSIS PERIOD	**8:51A – 2:53P 6H 2M**	**7:36A – 4:29P 8H 53M**	**6:27A – 5:18P 10H 51M**	**5:57A – 6:01P 12H 4M**
	Open Space Resources				
O1	Freeman Triangle	**-**	-	-	**5:57A – 6:03A** 6m
O2	Concrete Plant Park	**-**	-	-	**-**
O3	Daniel Boone Playground	**8:51A – 9:11A** 0h 20m	**7:36A – 9:24A** 1h 48m	**6:27A – 8:32A** 2h 05m	**5:57A – 8:16A** 2h 19m
O4	Starlight Park	**8:51A – 2:53P** 6h 2m	**9:32A – 4:29P** 6h 57m	**9:26A – 5:18P** 7h 52m	**10:28A – 6:01P** 7h 33m
O5	Rock Garden Park	-	-	-	**-**
O6	PS X811 Blacktop and Garden	**8:51A – 9:55A** 1h 4m	**7:36A – 9:05A** 1h 29m	**6:27A – 7:54A** 1h 27m	**5:57A – 7:36A** 1h 39m
O7	PS 66 Schoolyard	**8:51A – 9:49A** 0h 58m	**7:36A – 8:26A** 0h 50m	**6:27A – 7:09A** 0h 42m	**6:01A – 6:34A** 0h 33m
	Natural Resources				
N1	Bronx River	**11:41A – 2:53P** 3h 12m	**12:25P – 4:29P** 4h 4m	**1:06P – 5:18P** 4h 12m	**1:10P – 6:01P** 5h 51m

Daylight savings time was not used.

Figure 6-2: Tier 3 Screening - December Analysis Day

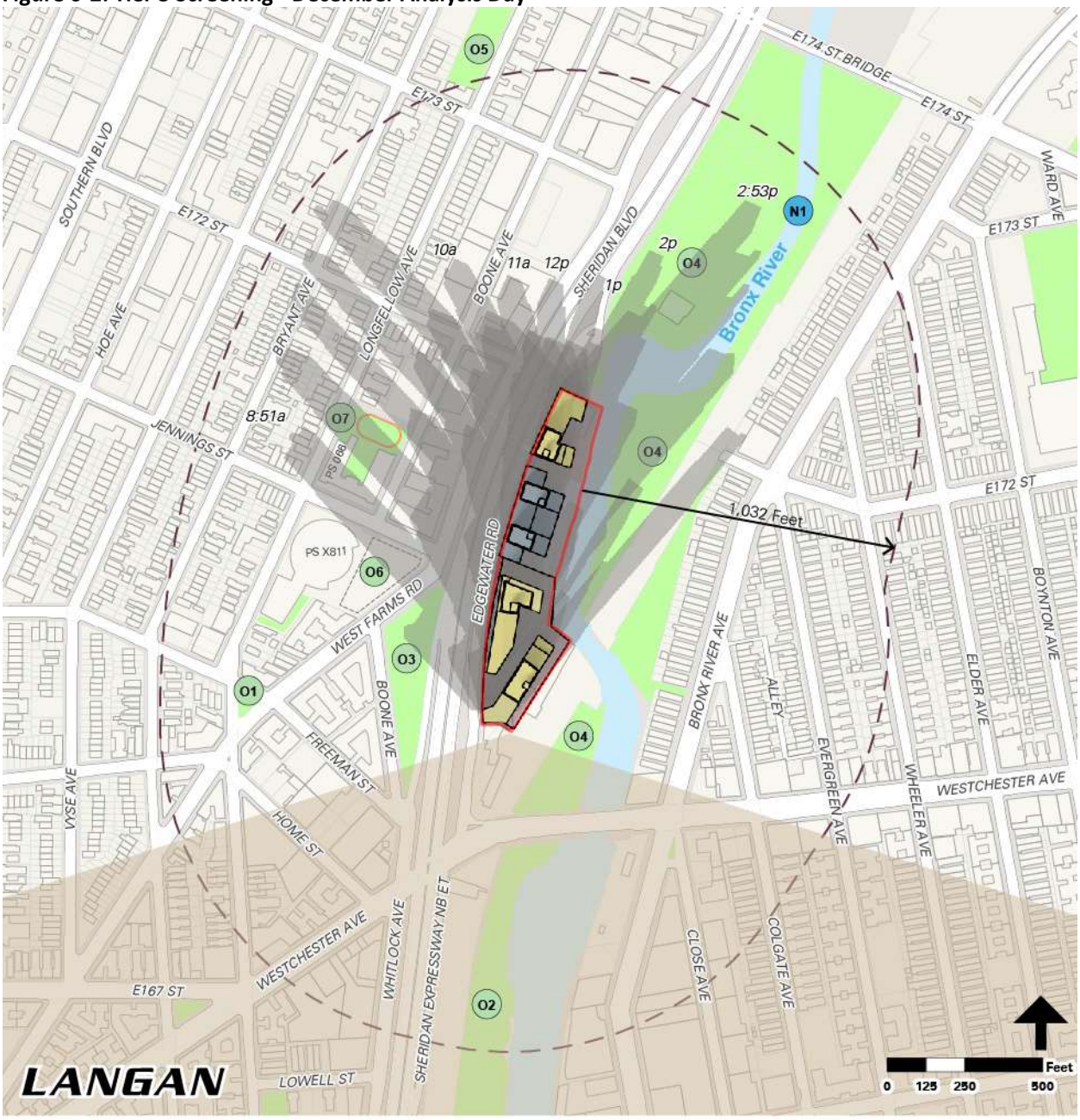


Figure 6-3: Tier 3 Screening - March Analysis Day

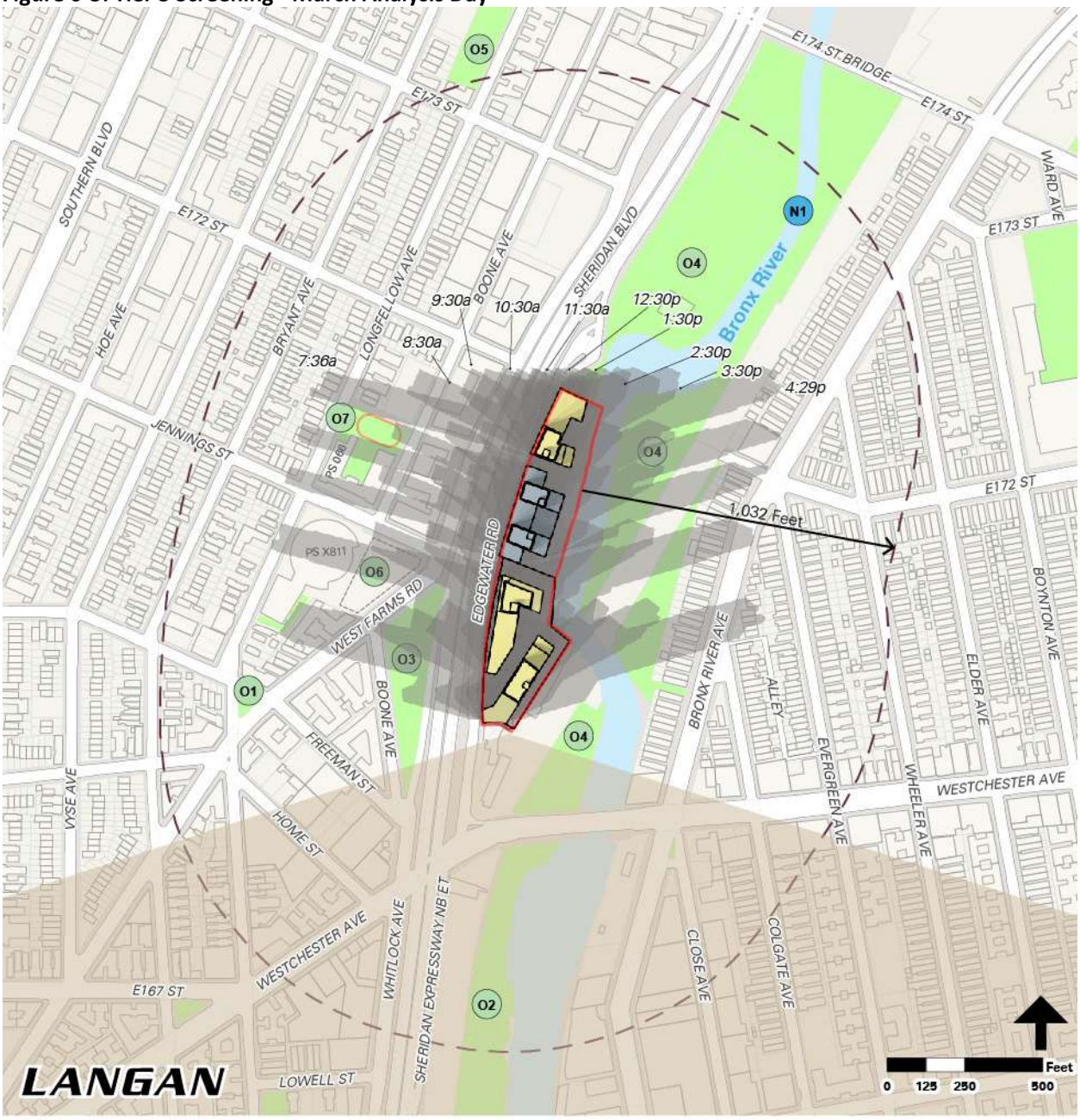


Figure 6-4: Tier 3 Screening - May Analysis Day

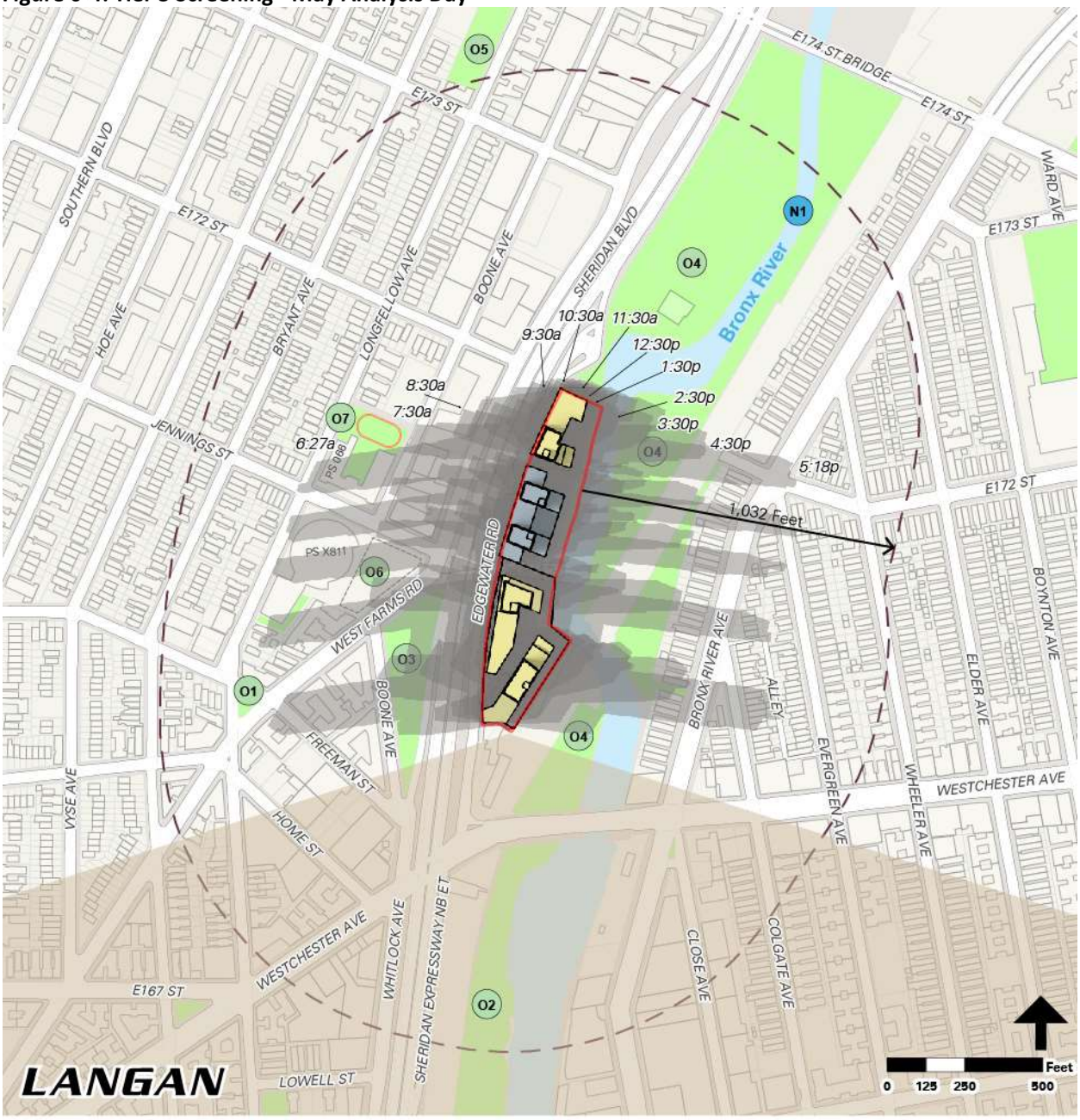
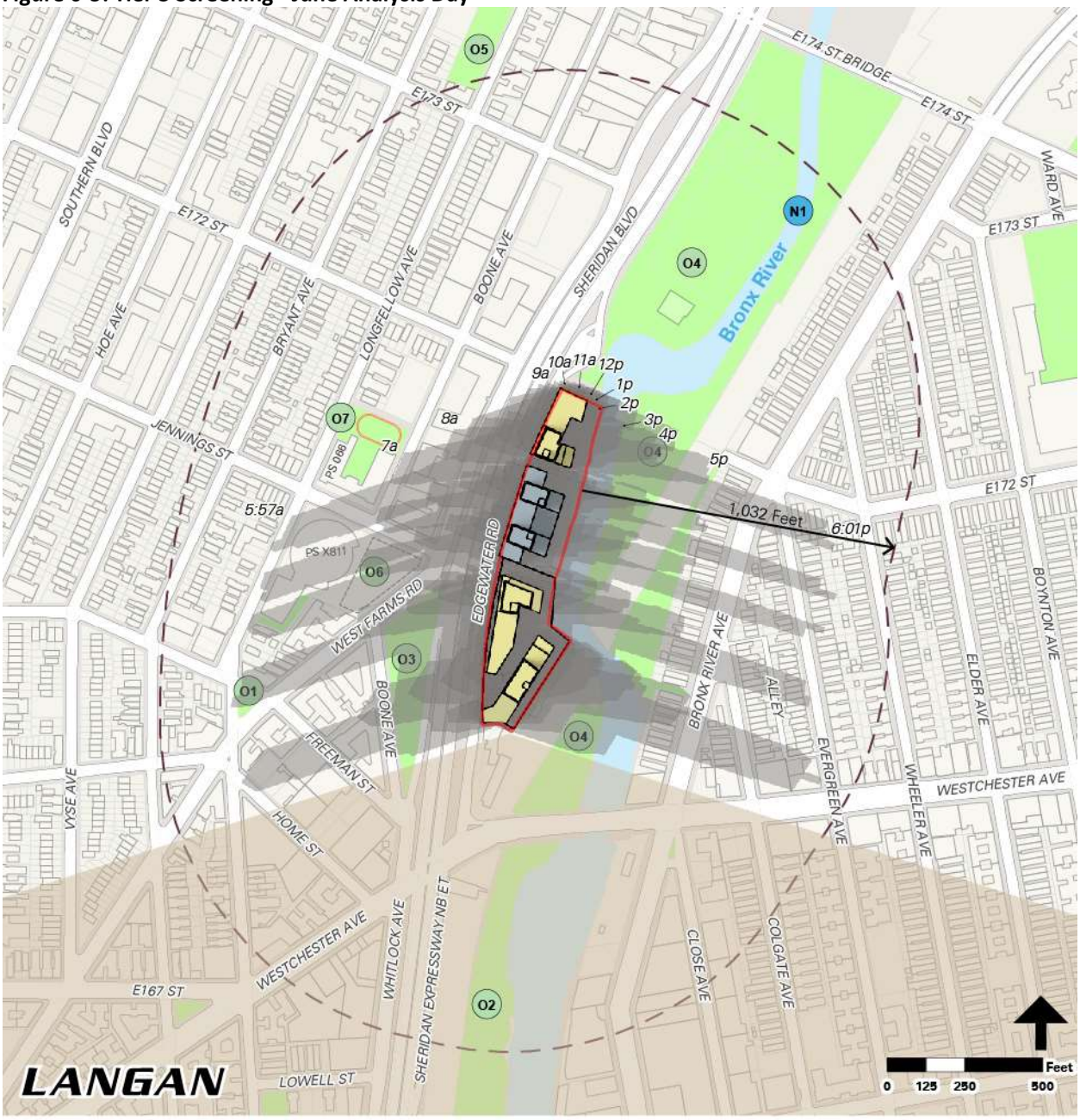


Figure 6-5: Tier 3 Screening - June Analysis Day



Open Space Resources

Freeman Triangle (O1) and Rock Garden Park (O5)

The Tier 3 screening shows project-generated shadow would be cast on Freeman Triangle for approximately six minutes during the June analysis day. The project-generated shadow would occur during the early morning for less than ten minutes only on this analysis day. Based on the guidelines of the *CEQR Technical Manual*, an incremental shadow is 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. Therefore, a detailed assessment was not warranted for this resource.

Rock Garden Park would not have project-generated shadow for any of the CEQR analysis days, and a detailed assessment was not warranted for this resource.

Daniel Boone Playground (O3)

In the absence of intervening buildings, project-generated shadow has the potential to be cast on Daniel Boone Playground for between 20 minutes and 2 hours and 19 minutes across the four analysis days. Therefore, a detailed assessment was warranted for this resource.

Starlight Park (O4)

Project-generated shadow has the potential to be cast on Starlight Park on all CEQR analysis days. In the absence of intervening buildings, project-generated shadow would be cast on Starlight Park between six and eight hours on all CEQR analysis days. Therefore, a detailed shadows analysis was warranted for this resource.

PS X811 (O6)

The Tier 3 screening shows that project-generated shadow has the potential to be cast on the blacktop and school garden at PS X811 on all four CEQR analysis days. The blacktop is accessible to the public only during the summer months, and during weekends during the school year; at other times, the primary use of the space is accessory parking for school users. The school also offers a horticulture program that includes vegetable planters for students to grow and sell vegetables at local greenmarkets during the school year. This resource is considered sunlight sensitive during the school year (September to June).

Project-generated shadow would be cast on the elements of P.S. X811 for between 50 minutes and one hour and 39 minutes across the CEQR analysis days. Therefore, a detailed assessment was warranted for this resource.

PS 66 (O7)

PS 66 is a part of the Schoolyards to Playgrounds program to improve schoolyards through capital improvements. As a part of this program, the schoolyard is open to the public during non-school hours. Throughout the year, this schoolyard offers neighborhood residents the use of playground equipment, a running track and field, and a basketball court.

Project-generated shadow has the potential to be cast on the schoolyard (running track, field, basketball court, and playground) at PS 66 on all four CEQR analysis days for up to 58 minutes in the early morning. Therefore, a detailed assessment was warranted for this resource.

Natural Resources

Bronx River (N1)

The Bronx River, the sole sunlight-sensitive natural resource in the Study Area, could receive project-generated shadow across all four CEQR analysis days for up to six hours. Accordingly, detailed analysis was warranted for this resource.

6.5 Detailed Assessment

When a Tier 3 screening analysis cannot rule out the possibility that project-generated shadows could result in significant adverse shadows impacts, a detailed shadow analysis is warranted. For this project, a detailed analysis is warranted for Daniel Boone Playground, Starlight Park, PS X811 Blacktop and Garden, PS 66 Schoolyard, and the Bronx River. A detailed analysis uses a three-dimensional computer model to show shadow in both the No-Action and With-Action conditions to identify the incremental shadow that would reach sunlight-sensitive resources on each of the representative analysis days.

Daniel Boone Playground (O3)

Daniel Boone Playground is a 1.20-acre playground along Boone Avenue between West Farms Road and Freeman Street. The park contains active recreational uses including playground equipment, spray showers, vegetation, and seating areas. As shown in Photograph 6-1, the playground is predominantly a blacktop space with vegetation near the playground's perimeter.

Photograph 6-1: Daniel Boone Playground



View south from West Farms Road near Boone Avenue.

Starlight Park (O5)

Starlight Park is a neighborhood park north of the Proposed Rezoning Area and along the east side Sheridan Boulevard between East 174th Street and East 172nd Street. It contains a playground, a turf soccer field, a basketball court, baseball fields, kayak/canoe launch, dog-friendly areas, a playground, and vegetation. For the detailed shadows assessment, the park has been separated into three subareas; as shown in Figure 6-6.

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Figure 6-6: Starlight Park Illustrative Plan



The "North Subarea," shown in Photograph 6-2, is the area north of the Proposed Rezoning Area and west of the Bronx River – the original area of Starlight Park. The "East Subarea," shown in Photograph 6-3, is the area of the park that is east of the Bronx River, and the "South Subarea," shown in Photograph 6-4, is the area south of the Proposed Rezoning Area and west of the Bronx River. The East and South subareas of Starlight Park are collectively considered Starlight Park Phase 2 – a 2.70-acre addition to the original Starlight Park that ~~is scheduled to open in fall 2022~~opened in April 2023. Phase 2 will contain bicycle and pedestrian bridges, trails, a jogging loop, and parkland. This addition will also close a gap between Starlight Park and Westchester Avenue in the South Bronx, which will provide river access to thousands of Bronx residents.

Photograph 6-2: Starlight Park's North Subarea



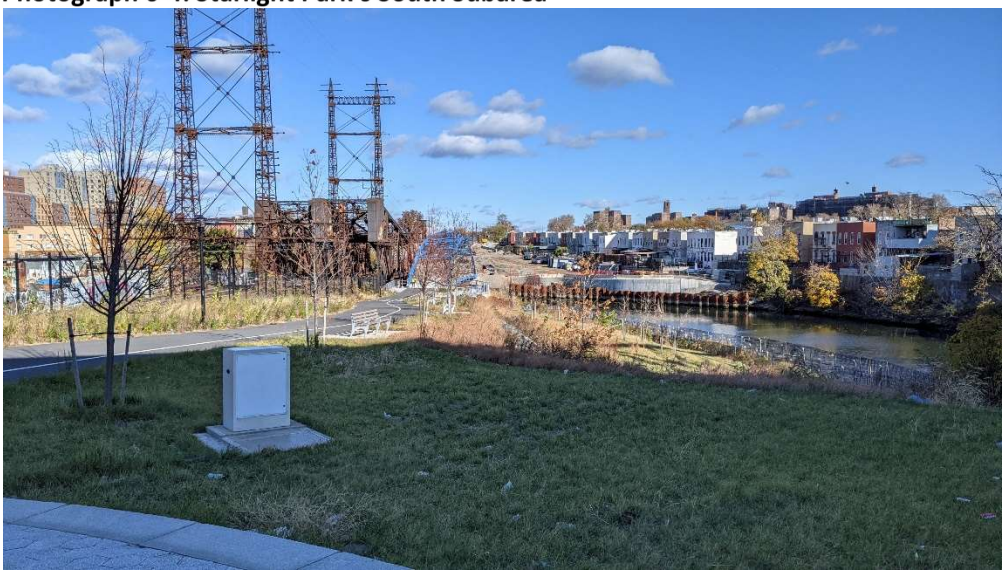
View south across turf field towards the Bronx River House and the Proposed Rezoning Area.

Photograph 6-3: Starlight Park's East Subarea



View south along the East Subarea's shoreline.

Photograph 6-4: Starlight Park's South Subarea



View north from Westchester Avenue across the South Subarea towards the Bronx River and the East Subarea.

PS X811 Blacktop and Garden (O6)

PS X811, the Academy for Career and Living Skills, is a special education school that serves children with physical and cognitive disabilities. Part of the school's curriculum includes a horticulture program that allows students to garden along the eastern and southern edges of the school. The garden includes vegetable planters for students to grow and sell vegetables at local greenmarkets during the school year. The school also contains a large parking lot (blacktop) that is used by residents outside of school hours. The blacktop, shown in Photograph 6-5, is only accessible to the public during the summer months, and on weekends during the school year; at other times, the primary use of the space is accessory parking for school users.

Photograph 6-5: PS X811 Blacktop



View west across West Farms Road to PS X811 and its blacktop, which is used as parking during school hours.

PS 66 Schoolyard (O7)

The schoolyard at PS 66 is part of the Schoolyards to Playgrounds program to improve schoolyards with capital improvements. As a part of this program, the schoolyard is open to the public outside of school hours. This schoolyard offers local residents playground equipment, a running track and field and basketball court, available year-round.

Bronx River (N1)

The Bronx River flows from the Kensico Reservoir in Westchester County through the Bronx and past the Proposed Rezoning Area before emptying to the East River. The river, shown in Photograph 6-6, runs a total of 23 miles throughout southeast New York and is the only major water resource within New York City limits that is not entirely a tidal waterbody.

Photograph 6-6: Bronx River



View from beneath the Amtrak bridge towards the Proposed Rezoning Area. Projected Development Site 2 is in the far left of the frame, and Potential Development Site A is in the frame's center.

Adjacent to the Proposed Rezoning Area, the river is classified by NYSDEC as an "Intertidal" river and "Class I" waterbody – a waterbody class whose best usages are secondary contact recreation and fishing. The river is New York City's only freshwater river, but has been significantly affected by past human activity. The river contains aquatic vegetation and wildlife ~~and vegetation~~, including alewife (Alosa pseudoharengus), blueback herring (Alosa aestivalis), and American eel (Anguilla rostrata). Per DEP, important alewife and blueback herring spawning/juvenile habitat in locations farther upstream from the Study Area was the subject of 2018 NYSDEC restoration efforts. These species and others may depend on light cues to avoid hazards such as predation[1]. They ~~also~~ depend on food sources – such as phytoplankton, algae, or aquatic vegetation – that also depend on light and temperature conditions. However, as described in Chapter 9, "Natural Resources," the lack of surrounding wetlands renders the adjacent portions of the river unfavorable to support aquatic vegetation.

[1] Sabal, M., Workman, M., Merz, J., & Palkovacs, E. 2021. Shade affects magnitude and tactics of juvenile Chinook salmon antipredator behavior in the migration corridor. Oecologia. 197. 10.1007/s00442-021-05008-4.

The river's primary producers that depend on sunlight include phytoplankton, submerged aquatic vegetation, and benthic macroalgae. As described in Chapter 9, "Natural Resources," the portion of the river adjacent to the Proposed Rezoning Area is unfavorable to support submerged aquatic vegetation because of the lack of surrounding wetlands. Phytoplankton are microscopic plants that depend on sunlight for photosynthesis, and are a source of sustenance for fish and other primary consumers. Phytoplankton within the river are carried through areas of shade and sunlight by prevailing tides and currents throughout the day by the movement of the Bronx River.

The river is also used for recreational activities such as kayaking near the Proposed Rezoning Area. Incremental shadow would not preclude the use of the river for in-water recreation. During times of incremental shadow, users would temporarily experience shadow as they move along the river.

Incremental Shadow by Analysis Day

Table 6-3 shows the durations of incremental shadow on the sunlight sensitive resources under a detailed analysis.

Table 6-3: Detailed Assessment Shadows Duration by Resource

Resource	December	March	May	June
ANALYSIS PERIOD	**8:51A – 2:53P** **6H 2M**	**7:36A – 4:29P** **8H 53M**	**6:27A – 5:18P** **10H 51M**	**5:57A – 6:01P** **12H 4M**
O3 - Daniel Boone Playground	**8:51A – 9:11A** 0h 20m	**7:36A – 9:24A** 1h 48m	**6:27A – 8:32A** 2h 05m	**5:57A – 8:16A** 2h 19m
O4 - Starlight Park	**8:51A – 2:53P** 6h 2m	**9:32A – 4:29P** 6h 57m	**9:26A – 5:18P** 7h 52m	**10:28A – 6:01P** 7h 33m
Starlight Park (North)	*8:51A – 2:53P* *6h 2m*	*9:32A – 4:24P* *6h 52m*	*9:26A – 4:30P* *7h 4m*	*10:28A – 4:42P* *6h 14m*
Stone Seating Area	*1:08P – 2:53P* *1h 45m*	-	-	-
Turf Field	*2:11P – 2:53P* *0h 42m*	-	-	-
Starlight Park (East)	*1:34P-2:53P* *1h 19m*	*1:58P – 4:29P* *0h 31m*	*2:39P-5:18P* *2h 39m*	*2:41P – 6:01P* *2h 20m*
Starlight Park (South)	-	-	*3:06P – 5:18P* *2h 12m*	*3:23P – 6:01P* *2h 38m*
O6 - PS X811 Blacktop and Garden	**8:51A – 9:55A** 1h 4m	**7:36A – 9:05A** 1h 29m	**6:27A – 7:54A** 1h 27m	**5:57A – 7:36A** 1h 39m
O7 - PS 66 Schoolyard	**8:51A – 9:49A** 0h 58m	**7:36A – 8:26A** 0h 50m	**6:27A – 7:09A** 0h 42m	**6:01A – 6:34A** 0h 33m
N1- Bronx River	**11:41A – 2:53P** 3h 12m	**12:25P – 4:29P** 4h 4m	**1:06P – 5:18P** 4h 12m	**1:10P – 6:01P** 4h 51m

December Analysis Day

The December analysis day is representative of shadow conditions around the winter solstice, the coldest time of the year, and the time of year outside the peak demand for most passive recreational uses. Most vegetation is also dormant during this representative period, and fish migration is limited. The detailed assessment provided in Figure 6-7 through Figure 6-13 shows the times of incremental shadow on the sunlight sensitive resources throughout the analysis day.

Figure 6-7: December Analysis Day - 8:51 AM



Figure 6-8: December Analysis Day – 10:00 AM



Figure 6-9: December Analysis Day – 11:00 AM



Figure 6-10: December Analysis Day- 12:00 PM



Figure 6-11: December Analysis Day – 1:00 PM

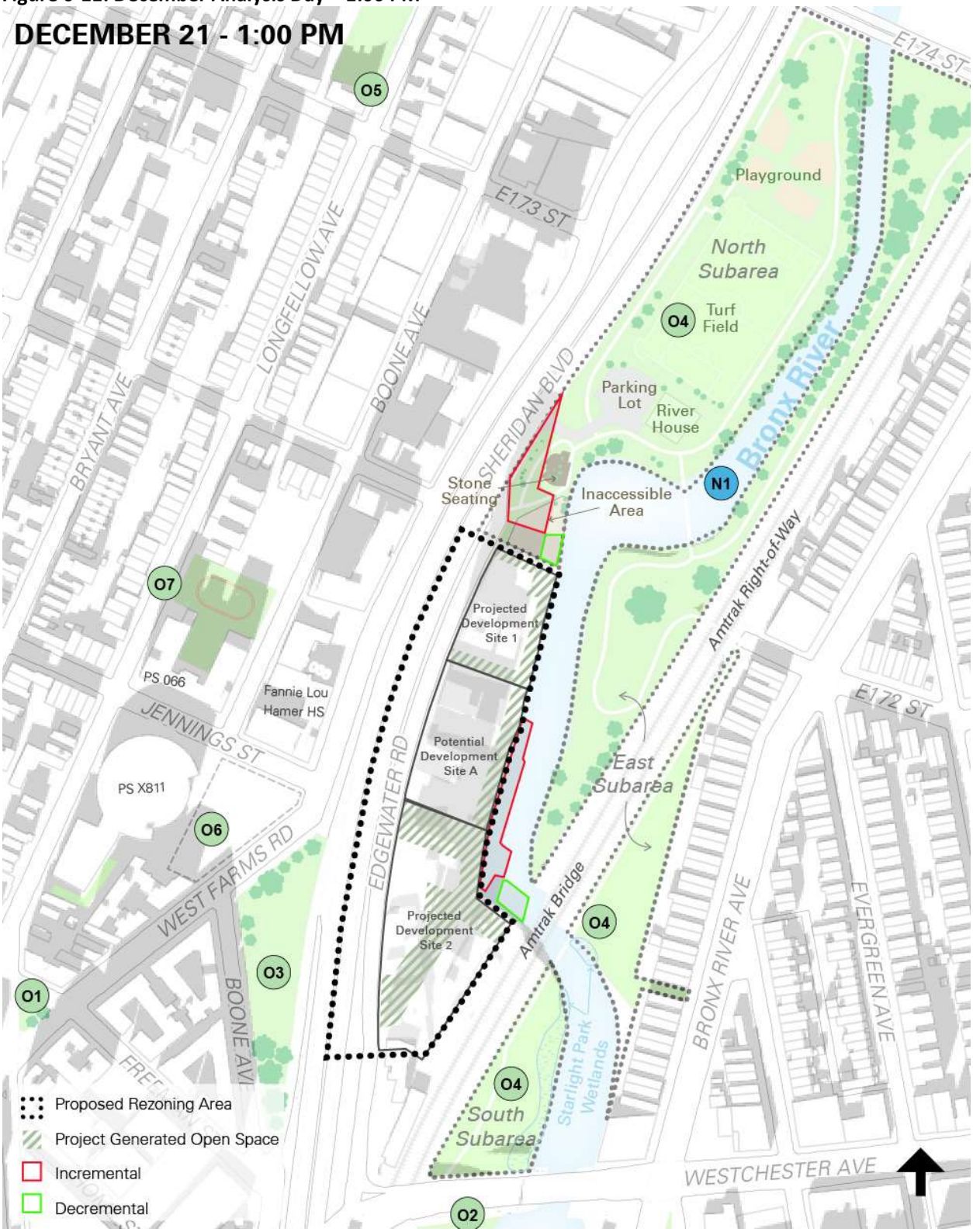


Figure 6-12: December Analysis Day – 2:00 PM

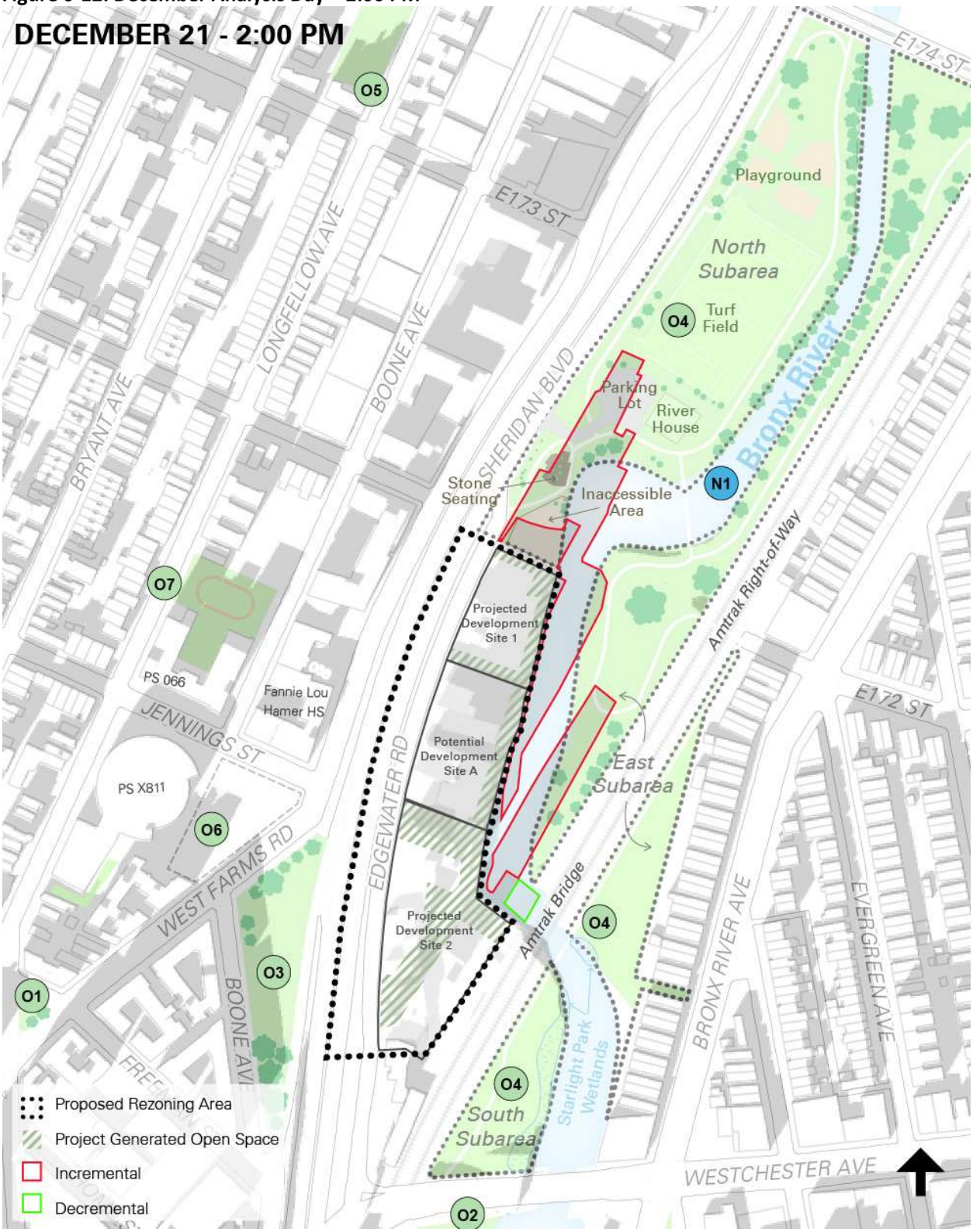


Figure 6-13: December Analysis Day – 2:53 PM



At 8:51AM – the start of the analysis day – Figure 6-7 shows incremental shadow would be cast on the northernmost edge of Daniel Boone Playground, portions of PS X811's blacktop, portions of PS 66's schoolyard, and a publicly inaccessible storage area within Starlight Park's North Subarea. After 9:11AM, incremental shadow would move wholly off Daniel Boone Playground for the remainder of the analysis day. After 9:49AM, PS 66's schoolyard would not receive incremental shadow for the remainder of the analysis day. Incremental shadow would move wholly off PS X811's blacktop after 9:55AM for the remainder of the analysis day.

By 10AM, Figure 6-8 shows incremental shadow would be cast on the southwest corner of Starlight Park. There would also be a decrease in shadow ("decremental shadow") on the publicly inaccessible storage area within Starlight Park's North Subarea; this decremental shadow would result from the demolition of the existing building on Projected Development Site 1, which is built close to the waterfront.

By 11AM, Figure 6-9 shows both incremental and decremental shadow would continue to shade portions of the inaccessible storage area within Starlight Park's North Subarea. No incremental shadow would be cast on the Bronx River.

By 12PM, Figure 6-10 shows incremental shadow would be cast on the western edge of the Bronx River. Incremental shadow would continue to increase on the southern edge of Starlight Park's North Subarea that contains a publicly inaccessible storage area. Decremental shadow would also be cast on Starlight Park's North Subarea and the western edge of the Bronx River. By 1PM, Figure 6-11 shows incremental shadow would approach the western edge of the stone seating area. Incremental shadow would shade more of the rivers' western edge.

By 2PM, Figure 6-12 shows incremental shadow would span across a portion of the Bronx River adjacent to the Proposed Rezoning Area. Incremental shadow would be cast on Starlight Park's North Subarea seating area, parking lot, and other areas south of the turf field. Incremental shadow would cover portions of Starlight Park's East Subarea as well.

At 2:53PM – the end of the December analysis day – Figure 6-13 shows that almost all of the adjacent Bronx River would be in shadow between the Amtrak bridge and the pedestrian bridge near the River House. Much of the southern part of Starlight Park's North Subarea would be shaded, including the southern portion of the turf field. The northwest portion of the East Subarea would also be shaded by incremental shadow.

December Analysis Day Shading by Resource

The Proposed Actions would result in incremental shadow for portions of the December analysis period across the five sunlight-sensitive resources that warranted detailed assessment. Per the *CEQR Technical Manual*, shadows occurring during the cold-weather months do not affect the growing season of outdoor vegetation. Therefore, project-generated shadow would not result in a significant adverse shadows impact to vegetation.

Daniel Boone Playground (O3)

Daniel Boone Playground would receive incremental shadow for 20 minutes between 8:51AM and 9:11AM during the December analysis day. The playground would be wholly in direct sunlight for nearly four hours until approximately 1PM, when shadows from existing buildings would begin to shade the western portion of the playground. Up to 20 minutes of incremental shadow on the northern edge of the park would not significantly affect the usability of the playground equipment.

Starlight Park (O4) and the Bronx River (N1)

Starlight Park's North Subarea would remain in direct sunlight for the majority of the morning during the December analysis day, while the publicly inaccessible storage area would be partially shaded during this time. The North Subarea's seating area and turf field would only receive incremental shadow towards the end of the analysis period. For the final hour of the December analysis period, much of the Bronx River and Starlight Park would be in shadow between the Amtrak bridge and the pedestrian bridge connecting the North and East subareas. While the areas of the river near the western bank would be shaded, the incremental shadow would cause the entirety of this portion of the river to be shaded.

The December analysis day is representative of the cold-weather months, when demand for open spaces is generally lowest, when vegetation is dormant, and outside of the river's migration, spawning, and juvenile growing periods. Demand for in-water recreation is also lowest during this time. Accordingly, the Proposed Actions would not result in a significant adverse shadows impact on the December analysis day.

PS X811 (O6)

PS X811's garden would not receive project-generated shadow. The blacktop would receive incremental shadow for approximately 1 hour and 4 minutes during the December analysis day. While the blacktop can be used after school hours and on the weekends, the primary use of the space is a parking lot during the school year. On the December analysis day, incremental shadow would occur on the blacktop until 9:55AM, when incremental shadow would move wholly off the blacktop for the remainder of the analysis day. The blacktop is used as a parking lot on school days and would not be wholly shaded from incremental shadow during the analysis period. During times of incremental shadow, other open nearby open spaces such as Daniel Boone Playground and Starlight Park would have spaces that are wholly in direct sunlight.

PS 66 (O7)

The schoolyard at PS 66 would receive incremental shadow for 58 minutes on the December analysis day and would not be wholly shaded by incremental shadow. Incremental shadow would occur on portions of the schoolyard until 9:49AM, which is during school hours but before lunch recess. No incremental shadow would be cast on the schoolyard after school hours. The incremental shadow would not affect the usability of the schoolyard as a track and playground and would not completely eliminate sunlight on the resource during the December analysis day. During times of incremental shadow on the schoolyard's field and track, the walking trails and turf field in Starlight Park would be in direct sunlight, thereby providing comparable open space options.

March Analysis Day

At 7:36AM – the start of the analysis period – incremental shadow would occur on Daniel Boone Playground, PS X811's blacktop, and PS 66' schoolyard. Shadow would be cast on Daniel Boone Playground until 9:24AM, on the blacktop at PS X811 until 9:55AM, and the schoolyard at PS 66 until 9:49AM. On the March analysis day, incremental shadow would occur starting at 9:32AM on Starlight Park's North Subarea and at 12:25PM on the Bronx River. Incremental shadow on both the park and the river would be cast until 4:29PM, the end of the analysis day. Figure 6-14 through Figure 6-22 show the detailed shadow assessment on the March analysis day from 7:36AM.

Figure 6-14: March Analysis Day – 7:36 AM

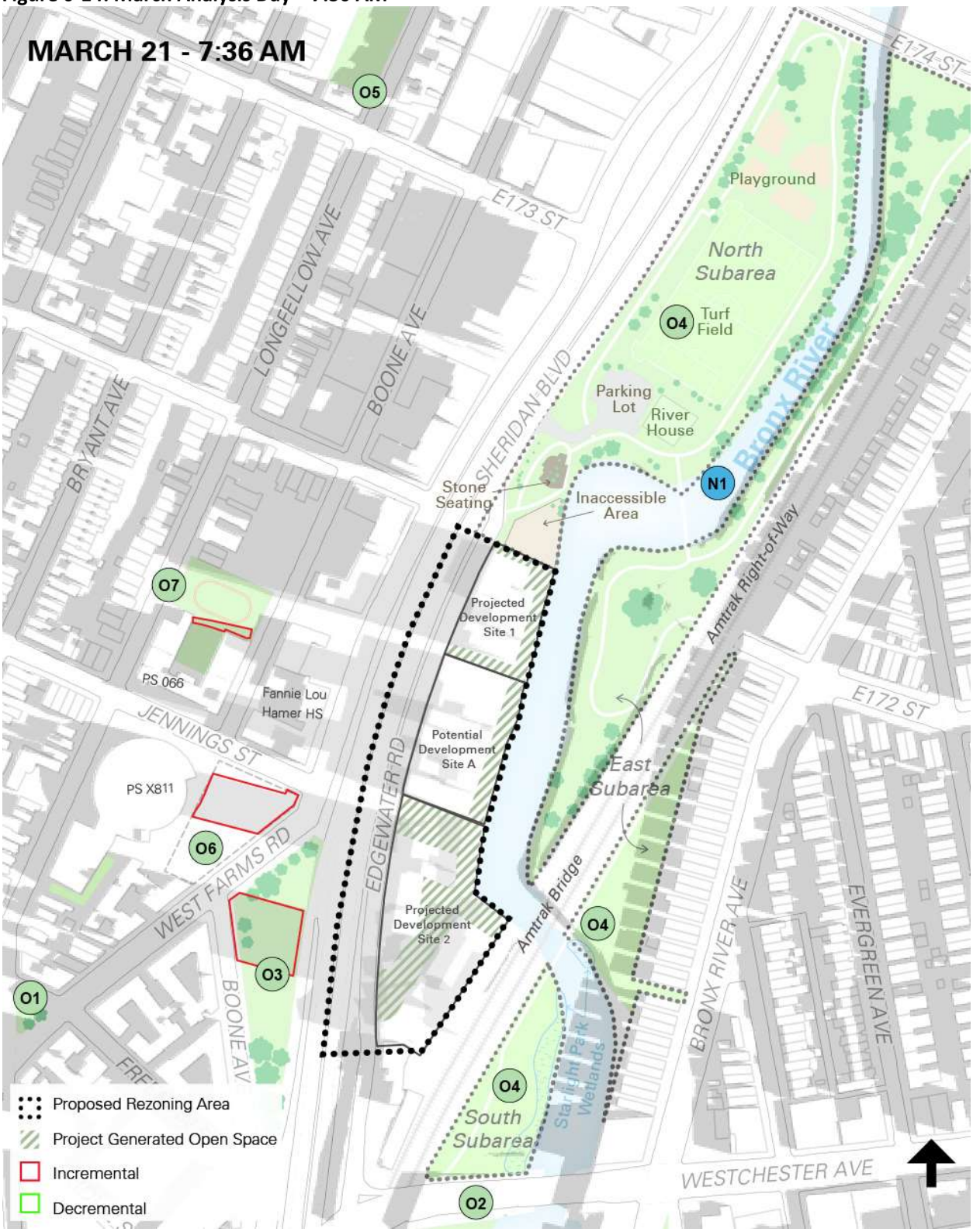


Figure 6-15: March Analysis Day – 9:00 AM



Figure 6-16: March Analysis Day – 10:00 AM

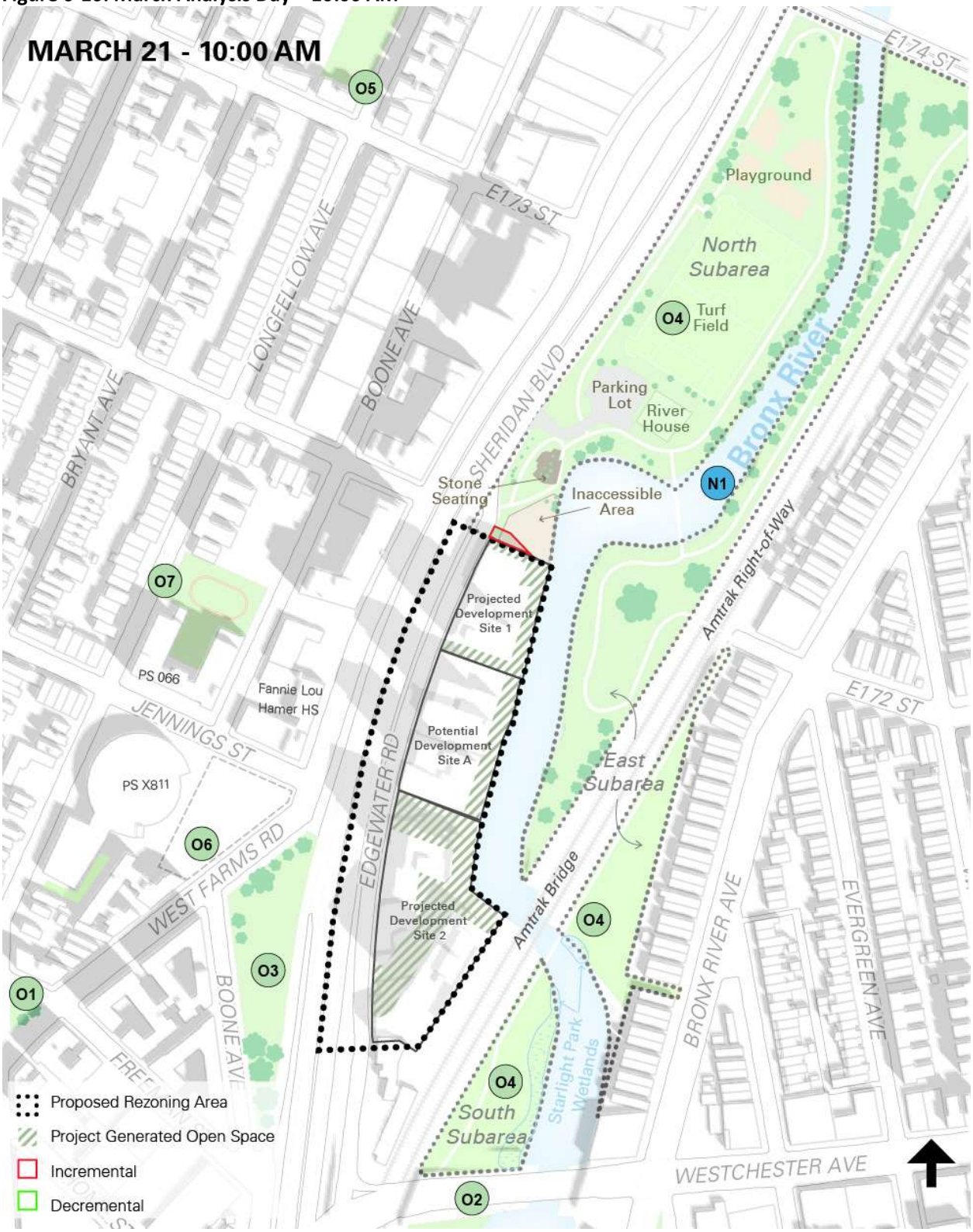


Figure 6-17: March Analysis Day – 11:00 AM

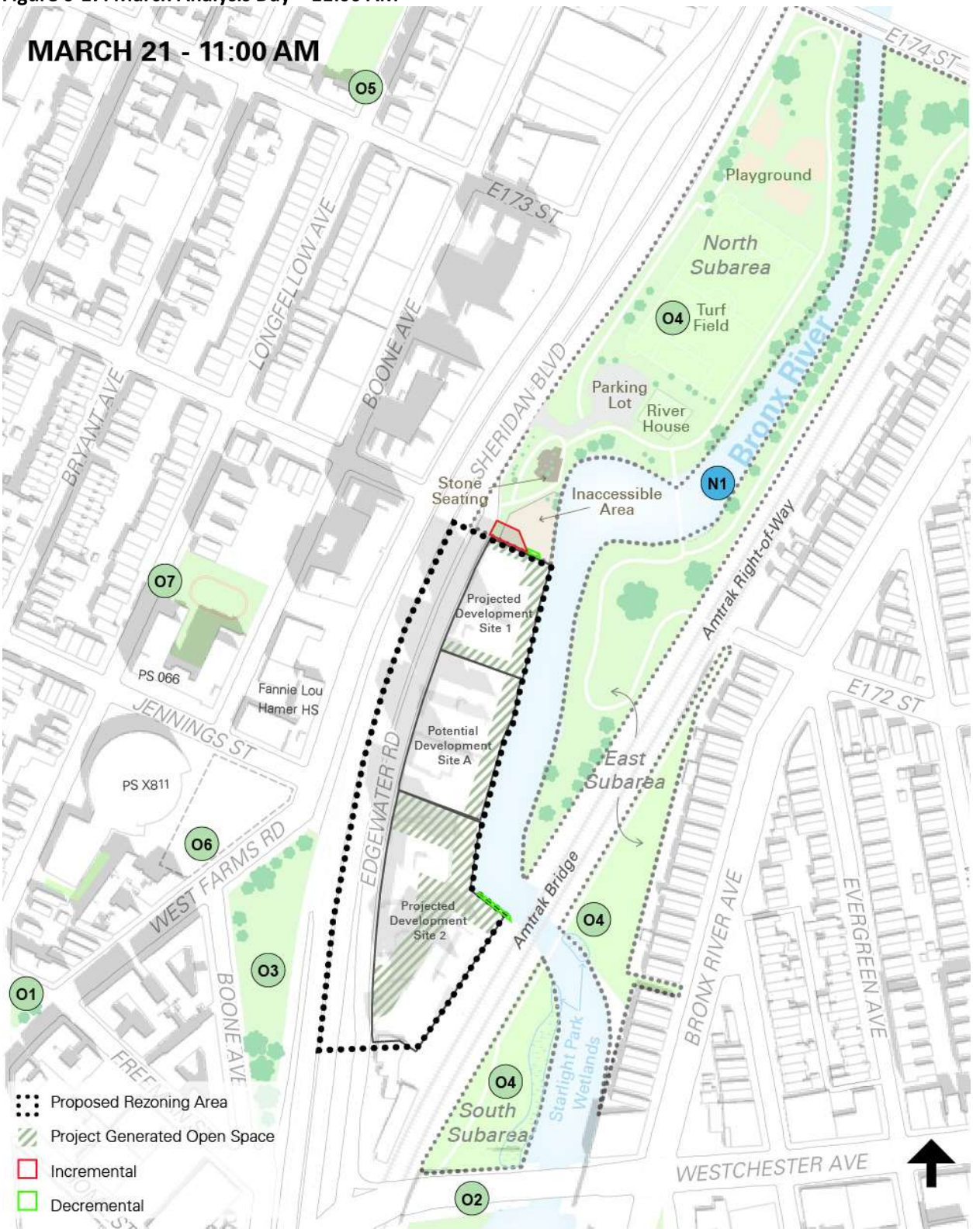


Figure 6-18: March Analysis Day – 12:00 PM

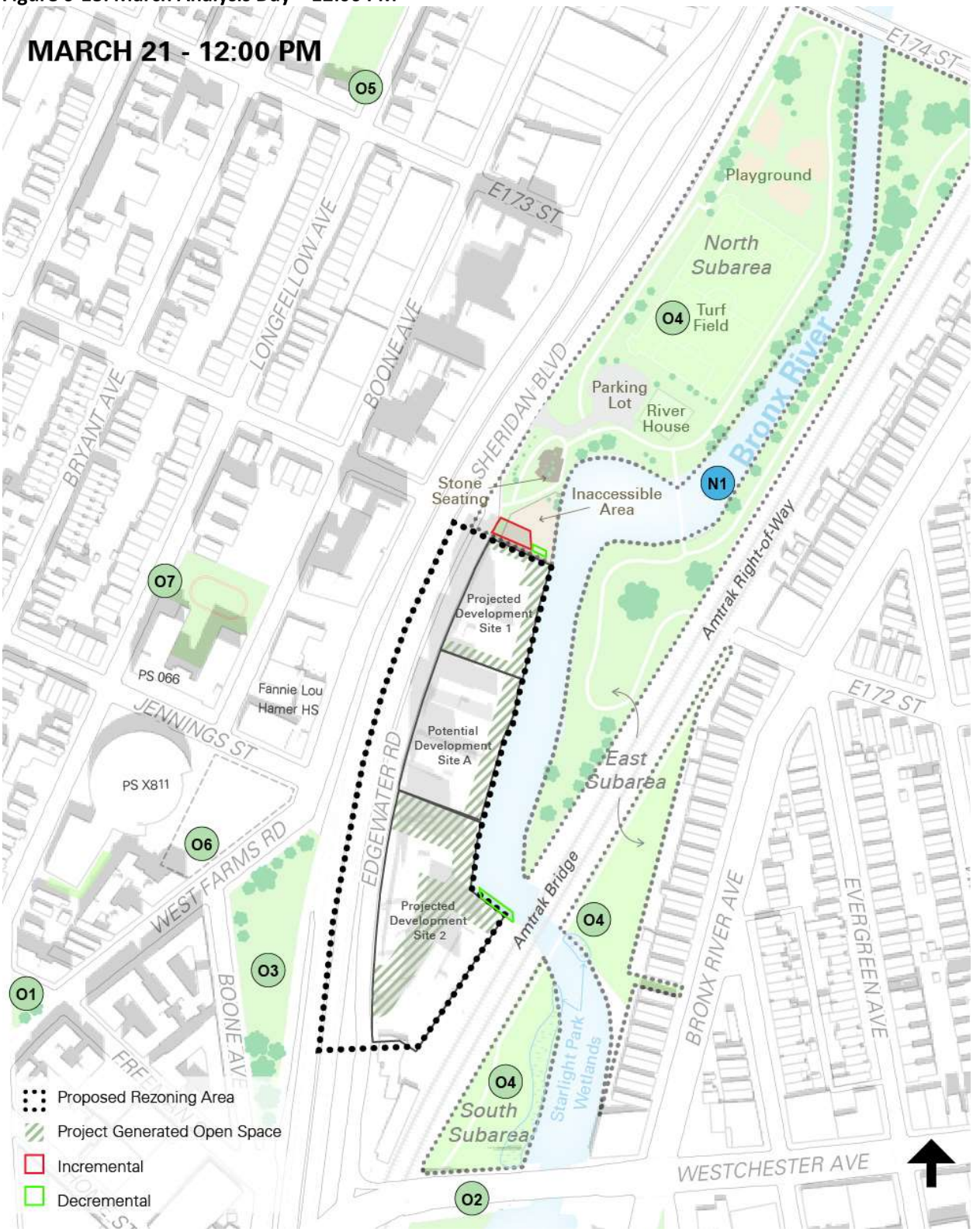


Figure 6-19: March Analysis Day – 1:00 PM

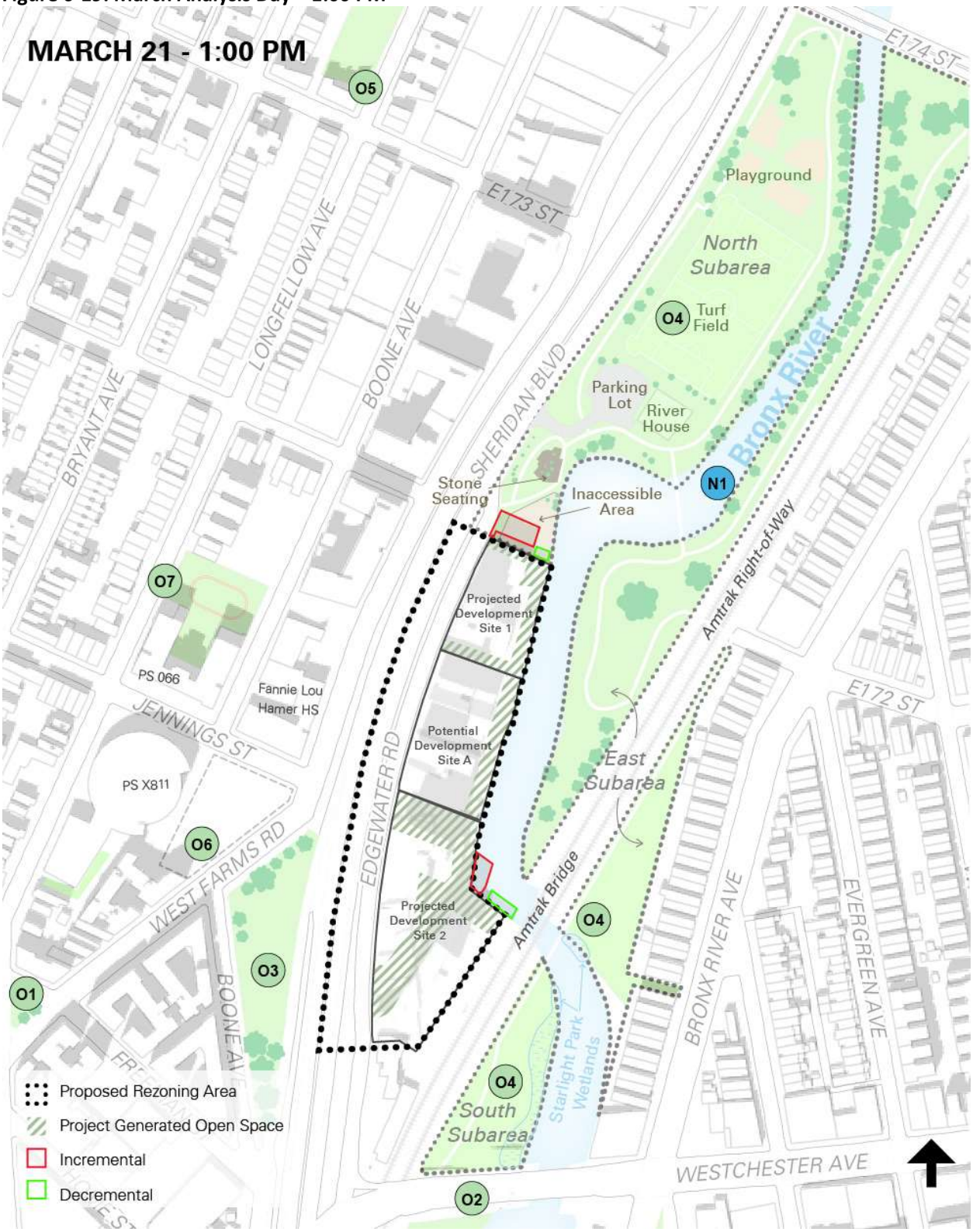


Figure 6-20: March Analysis Day –2:00 PM

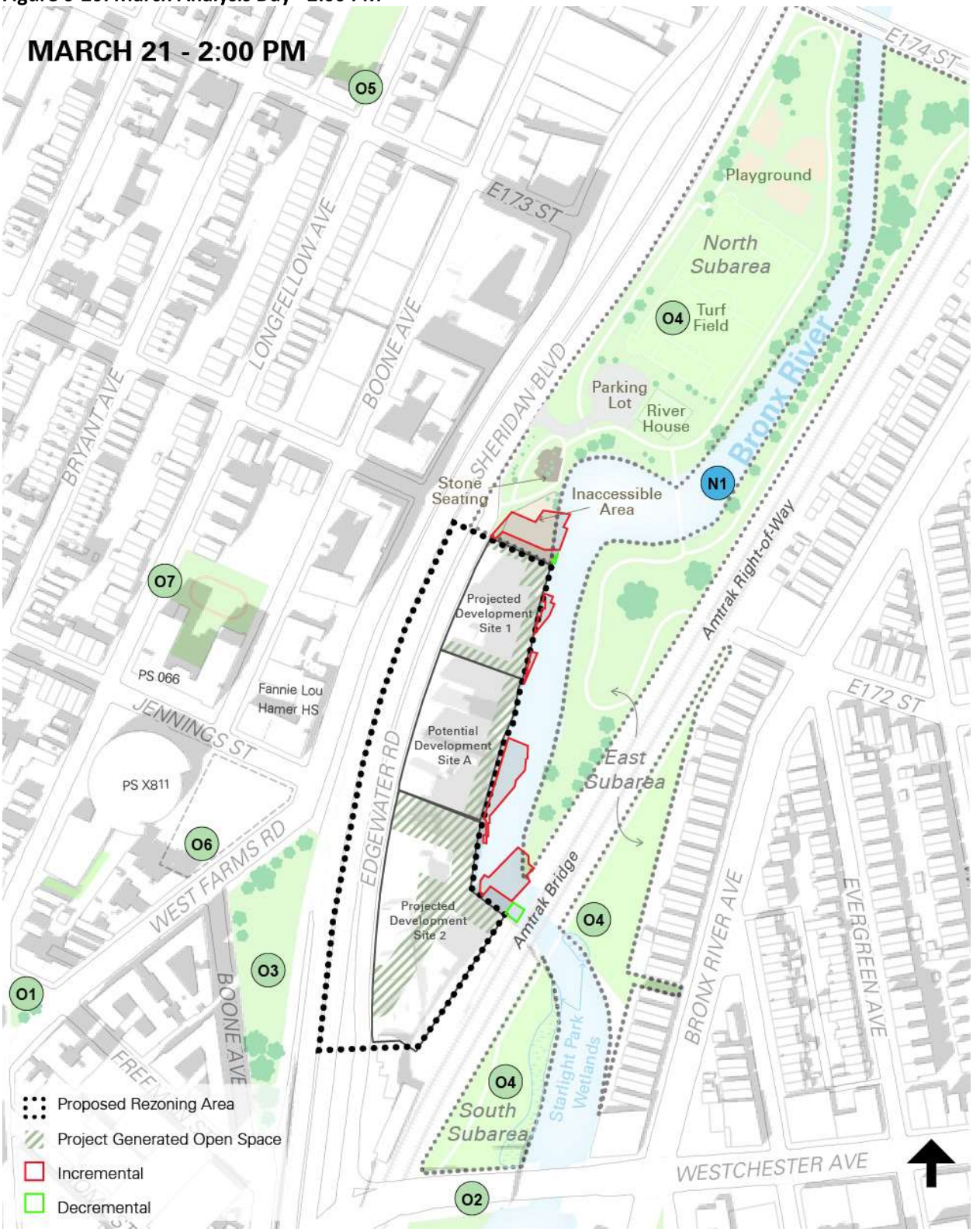


Figure 6-21: March Analysis Day – 3:00 PM

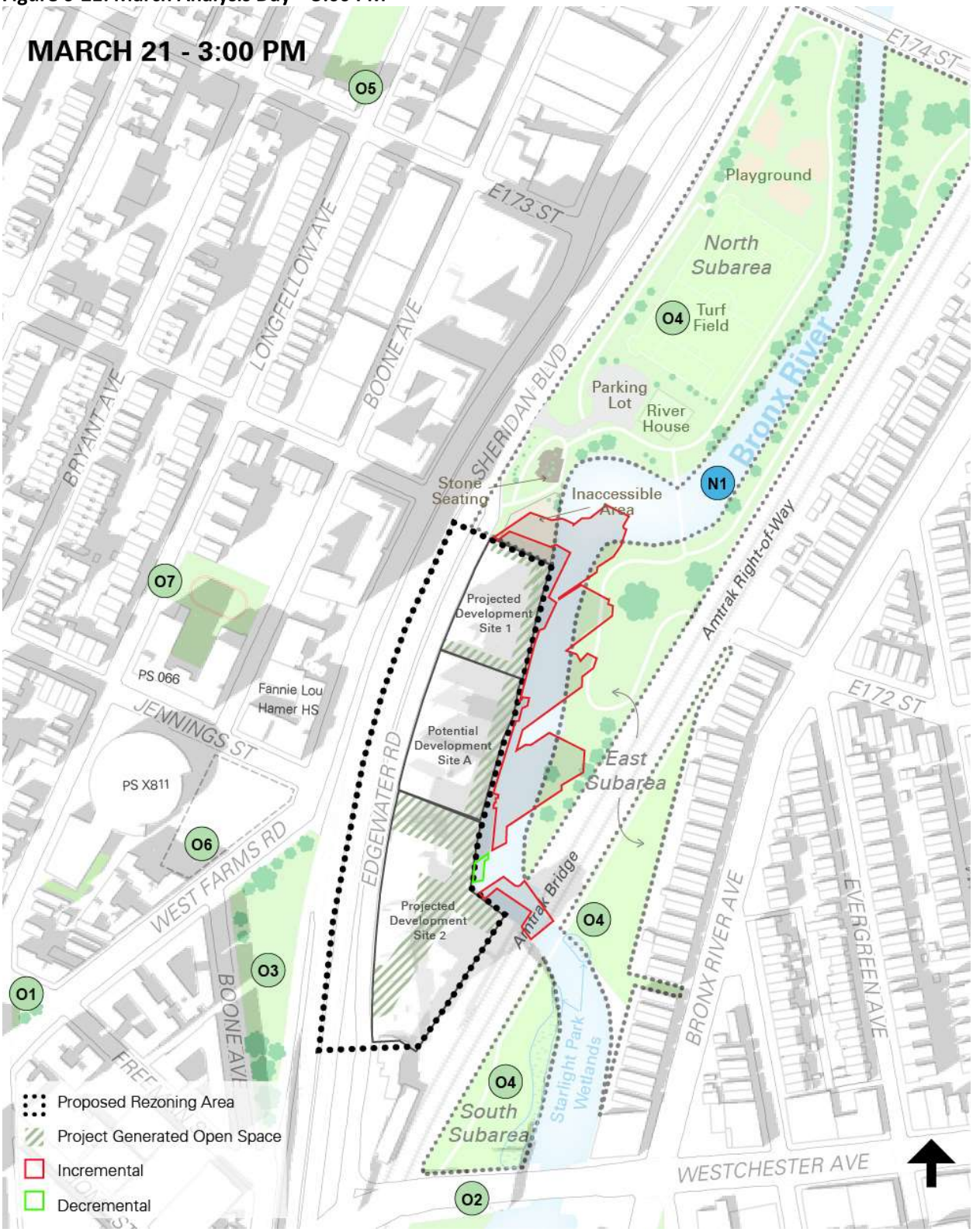


Figure 6-22: March Analysis Day – 4:29 PM



The March analysis day (solar-equivalent of September 21) is representative of conditions in early spring and late autumn, when both direct sunlight and areas of shade would likely be in demand depending on weather conditions (generally cold in March and warm in September).

Figure 6-14 shows that Starlight Park and the portion of the Bronx River between the Amtrak bridge and East 174th Street would be wholly in direct sunlight at 7:36AM, the start of the analysis period. Daniel Boone Playground would receive incremental shadow over the central area of the park, while the northern and southern ends of the park would continue to be in direct sunlight. The northern portion of PS X811's blacktop would be shaded by incremental shadow. Only the very southern portion of PS 66's schoolyard would be shaded, and the track would continue to be wholly in direct sunlight. Incremental shadow would move off PS 66's schoolyard after 8:26AM.

By 9AM, Figure 6-15 shows that Starlight Park and the portion of the Bronx River between the Amtrak bridge and East 174th Street would continue to be wholly in direct sunlight. Only the very northeast portion of PS X811's blacktop would be shaded, all of which would be from incremental shadow. A small portion of Daniel Boone Playground would continue to be covered in shadow at this time.

Incremental shadow would move wholly off PS X811's blacktop after 9:05AM and wholly off Daniel Boone Playground at 9:24AM. Incremental shadow would begin to be cast on the southwestern portion of Starlight Park's North Subarea at 9:32AM.

By 10AM, Figure 6-16 that shows incremental shadow would be cast along the southern edge of Starlight Park's North Subarea, in an area that is predominately used for storage and is inaccessible to the public. The turf field, playground, stone seating area, and River House would continue to be completely in direct sunlight.

By 11AM, Figure 6-17 shows that additional incremental shadow would be cast along the southern edge of Starlight Park's North Subarea. The incremental shadow would continue to be predominately cast in the park's inaccessible storage area. The remainder of Starlight Park would be wholly in direct sunlight.

By 12PM, Figure 6-18 shows that additional incremental shadow would continue to be cast in the storage area of Starlight Park's North Subarea. The remainder of the park would be wholly in direct sunlight. Decremental shadow would be cast along the Bronx River between Projected Development Site 2 and the Amtrak right-of-way.

By 1PM, Figure 6-19 shows that additional incremental shadow would be cast in Starlight Park's inaccessible storage area. The remainder of the park would be wholly in direct sunlight. Incremental shadow would begin to be cast on the western edge of the Bronx River at 12:25PM near the river's bend in front of Projected Development Site 2. Along the Bronx River, additional decremental shadow would be cast between Projected Development Site 2 and the Amtrak right-of-way.

By 2PM, Figure 6-20 shows that incremental shadow would begin to be cast on the western edges of the Bronx River by Projected Development Site 1 and Potential Development Site A. Shadow from Projected Development Site 2 would extend across the width of the Bronx River and on to the western edge of Starlight Park's East Subarea. Additional incremental shadow would also be cast in Starlight Park's inaccessible storage area; no shadow would be cast on Starlight Park outside of this area. Shadows from existing buildings would begin to be cast on the western edge of Daniel Boone Playground a few minutes before 3PM.

By 3PM, Figure 6-21 shows that incremental shadow from all three development sites would extend across the width of the Bronx River and into Starlight Park's East Subarea. No shadow would be cast outside of the incremental shadow that would be cast on the park's inaccessible storage area.

At 4:29PM – the end of the March analysis day – Figure 6-22 shows almost all of the adjacent Bronx River would be in shadow between the Amtrak bridge and the northern edge of the Proposed Rezoning Area. Incremental shadow would no longer be cast on Starlight Park's North Subarea. While much of Starlight Park's East Subarea and wetlands would be in incremental shadow, other portions of Starlight Park would continue to remain in direct sunlight, including most of the park's turf, playground, and basketball court, and waterfront walking paths.

March Analysis Day Shading by Resource

Daniel Boone Playground (O3)

The detailed analysis shows that on the March analysis day, Daniel Boone Playground would receive incremental shadow for 1 hour and 48 minutes beginning at the start of the analysis day. Incremental shadow would be cast on the playground until 9:24AM. Incremental shadow would not be cast on the playground after 9:24AM, and the resource would remain wholly in direct sunlight for more than 5 hours, from 9:24AM until nearly 3PM. While this playground would receive incremental shadow in the morning hours, Starlight Park's playground would continue to be in direct sunlight throughout most of the analysis day.

PS X811 (O6)

PS X811's blacktop would receive incremental shadow for approximately 1 hour and 29 minutes during the start of the March analysis period. Incremental shadow would not be cast on the school's garden during any portion of the analysis day. While the blacktop can be used after school hours and on the weekends, the primary use of the space is a parking lot on school days. Except for the blacktop's very southern portions – which would continue to receive shadow from existing buildings – the blacktop would largely be in direct sunlight from 9:00AM until after 3:00PM. Occurring in the early morning period, the incremental shadow would not affect the blacktop's primary use, nor preclude the use of the space for play on the weekends or after school.

PS 66 (O7)

PS 66 would receive incremental shadow on portions of its schoolyard for approximately 50 minutes at the start of the March analysis day. Incremental shadow would move wholly off the schoolyard after 9:05AM. Before 9:05AM, walking trails, basketball courts, and playground equipment would continue to be wholly in sunlight in Starlight Park. At no point would incremental shadow cause the schoolyard to be wholly shaded.

Starlight Park (O4) and Bronx River (N1)

Incremental shadow would be cast on the Bronx River for a duration of 4 hours and 4 minutes, from 12:25PM to 4:29PM, the end of the analysis period on the March analysis day. The portion of the river between the Amtrak bridge and East 174th Street would be wholly in direct sunlight until 12:25PM, when incremental shadow would begin to be cast on the river from Projected Development Site 2. Shadows would then move eastward across the river, and incremental shadow from Projected Development Site 2 would span

the full width of the Bronx River before 2PM. Incremental shadow from all three development sites would span the width of the Bronx River before 3PM. By the end of the analysis day, nearly all of the river would be shaded between the Amtrak bridge and the northern edge of the Proposed Rezoning Area. While incremental shadow may span the width of the Bronx River in the late afternoon of the March analysis day, the portion of the river between the Amtrak bridge and East 174th Street would largely remain wholly in direct sunlight throughout the morning and early afternoon.

Incremental shadow on the March analysis day would not preclude fish migration along the Bronx River. During times of incremental shadow, fish – including alewife, blueback herring, and American eel – may experience a temporary reduction in cues from direct sunlight as they transit through areas of incremental shadow between spawning/juvenile habitats farther upstream and locations farther downstream.

The area of the Bronx River adjacent to the Proposed Rezoning Area is conservatively classified NYSDEC as a littoral zone. The littoral zone does not have a depth of more than six feet at mean low water and sunlight can easily penetrate through to sediments on the streambed. Where the river depth exceeds six feet, the potential for sunlight to reach the streambed is limited, thereby limiting the potential for in-river vegetation. The depth of the Bronx River within the Study Area was not surveyed for this project, and the NYSDEC-mapped littoral zone was assumed to have a depth of less than six feet for conservative analysis purposes. The incremental shadow cast on the Bronx River would not preclude in-water recreation but may result in some areas of the river being shaded during the late afternoon period as in-water recreational users travel through the area.

On the March analysis day, incremental shadow on Starlight Park would be cast for 6 hours and 57 minutes from 9:32AM to 4:29PM, the end of the analysis day. However, the incremental shadow on Starlight Park's North Subarea would almost entirely be confined to an inaccessible storage area. Incremental shadow would begin to be cast on the park's East Subarea before 2PM. No incremental shadow would be cast on the park's more sunlight sensitive elements such as the turf field, seating area, basketball court, or playground. At no point during the March analysis day would shadow be cast on the South Subarea. Accordingly, there would be no significant adverse shadows impact to any of the sunlight sensitive resources on the March analysis day.

May Analysis Day

Incremental shadow would be cast on Daniel Boone Playground, PS X811's blacktop, and PS 66's schoolyard beginning at 6:27AM, the beginning of the analysis day. Incremental shadow would move wholly off Daniel Boone Playground after 8:32AM, PS X811's blacktop after 7:54AM, and PS 66's schoolyard after 7:09AM. On the May analysis day, incremental shadow would occur by 9:26AM on portions of Starlight Park and 1:06PM on the Bronx River. Incremental shadow on Starlight Park and the river would be cast until 5:18PM, the end of the analysis day. Figure 6-23 through Figure 6-33 show the detailed shadow assessment on the May analysis day from 6:27AM.

Figure 6-23: May Analysis Day – 6:27 AM



Figure 6-24: May Analysis Day – 7:30 AM



Figure 6-25: May Analysis Day – 8:30 AM



Figure 6-26: May Analysis Day – 10:00 AM



Figure 6-27: May Analysis Day – 11:00 AM



Figure 6-28: May Analysis Day – 12:00 PM



Figure 6-29: May Analysis Day – 1:00 PM



Figure 6-30: May Analysis Day – 2:00 PM



Figure 6-31: May Analysis Day – 3:00 PM

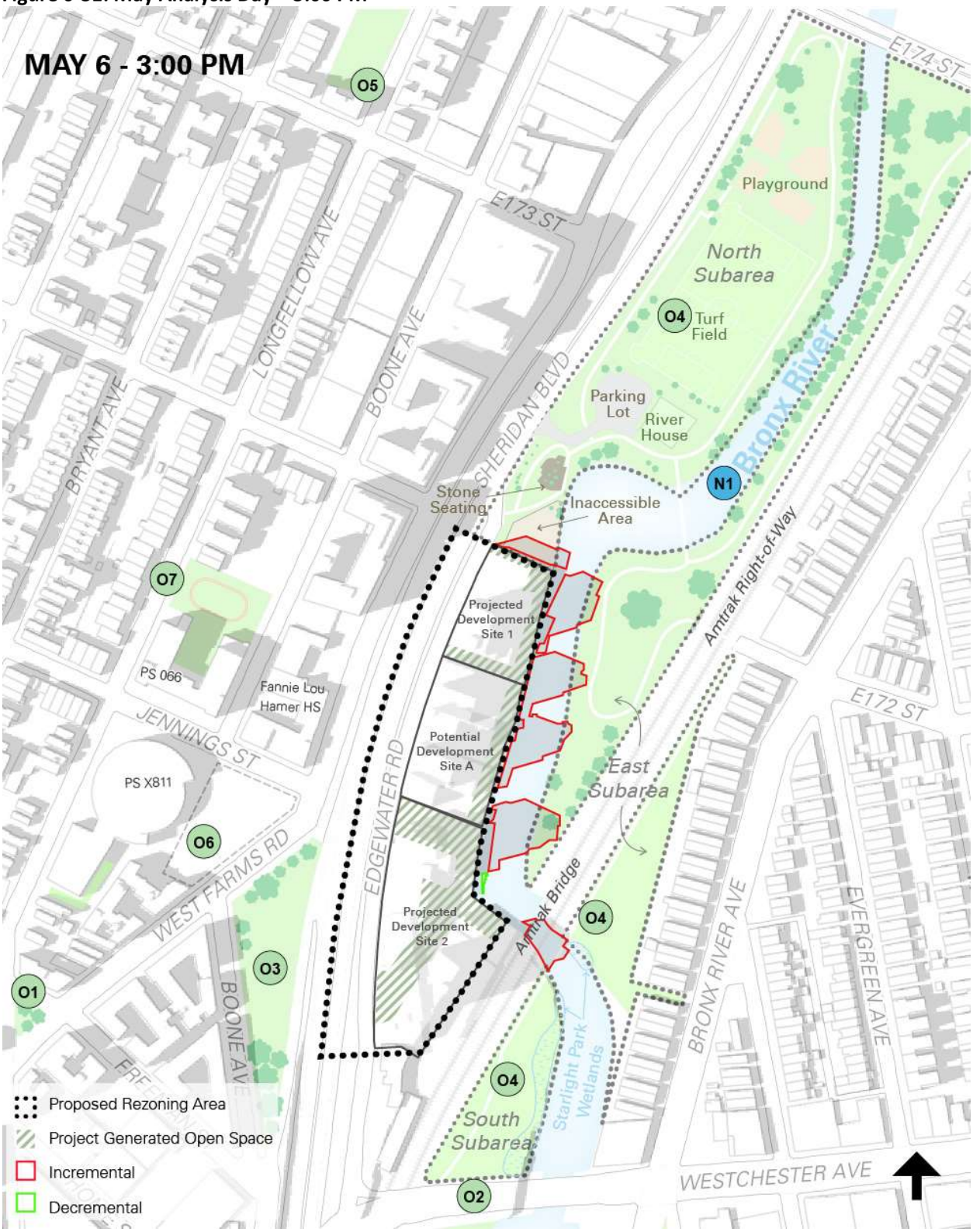


Figure 6-32: May Analysis Day – 4:00 PM



Figure 6-33: May Analysis Day – 5:18 PM



The May analysis day is the mid-~~day~~ point between the vernal equinox and the summer solstice and is the solar equivalent to August 6, the midpoint between the summer solstice and the autumnal equinox. The conditions during this analysis day are representative of warm weather conditions.

Figure 6-23 – shows the beginning of the analysis period where portions of the blacktop at PS X811 and the schoolyard at PS 66 would receive incremental shadow but would be inaccessible to the public while school is in session. The northern and southern ends of Daniel Boone Playground would receive incremental shadow, while the center of the park, where the playground equipment is located, would be wholly in sunlight. Starlight Park and the Bronx River would also be wholly in sunlight.

By 7:30AM, Figure 6-24 shows that only a small portion of the blacktop at PS X811 would receive incremental shadow and the schoolyard at PS 66 would not receive any incremental shadow. Both resources would be inaccessible to the public while school is in session. Daniel Boone Playground would continue to receive incremental shadow at its northern and southern ends, but the center of the park, where the playground equipment is located, would be wholly in sunlight. Starlight Park and the Bronx River would also continue to be wholly in sunlight.

By 8:30AM, Figure 6-25 shows that only a small portion at the north corner of Daniel Boone Playground would receive incremental shadow. All other sunlight sensitive resources would be wholly in direct sunlight.

Figure 6-26 shows that Starlight Park and the area of the Bronx River between the Amtrak bridge and East 174th Street would be wholly in direct sunlight until 9:26AM, when incremental shadow would begin to be cast at the very southern edge of Starlight Park's North Subarea containing a storage area that is not accessible to the public. No incremental shadow would be cast on Daniel Boone Playground, the blacktop at PS X811 or the schoolyard at PS 66 for the remainder of the day.

Through 1PM, Figure 6-27, Figure 6-28 and Figure 6-29 show that incremental shadow would continue to be cast on the southern fringe of Starlight Park's North Subarea, largely in the park's storage area. During this time, the portion of the Bronx River in the Study Area would be in direct sunlight except for a portion of the river covered by decremental shadow.

By 2PM, Figure 6-30 shows that incremental and decremental shadow would be cast along the western edge of the Bronx River beginning at 1:06PM.

By 3PM, Figure 6-31 shows that incremental shadow would span across the width of the Bronx River and into portions of Starlight Park's East Subarea. Starlight Park's North Subarea would also be shaded on its southern edge in the publicly inaccessible storage area; other than this area, the entirety of the North Subarea would continue to be in direct sunlight.

By 4PM, Figure 6-32 shows that incremental shadow would cover more of the Bronx River and extend across the park's East Subarea to the Amtrak right-of-way. Absent the Proposed Actions, shadow from buildings on the west side of Sheridan Boulevard would begin to be cast on the western fringe of the park's North Subarea, but would not be cast on the park's more sunlight-sensitive elements such as the playground or turf soccer field. Decremental shadow would cover portions of the western edge of the Bronx River as well.

At 5:18PM – the end of the May analysis day – Figure 6-33 shows that the west shore of the Bronx River would be shadowed absent the Proposed Actions. Most of the Bronx River

between Westchester Avenue and the prolongation of East 172nd Street would be shaded, some of the shading would be caused by incremental shadows. While Starlight Park's North Subarea would not be shaded from incremental shadow, portions of the park's turf and seating areas would be shaded by buildings that are outside of the Proposed Rezoning Area. Incremental shadow would be cast across much of the East Subarea's portions that are south of East 172nd Street. The northern portion of the park's South Subarea would be shaded by incremental shadow, including the Starlight Park wetlands that are to the east and south of the Amtrak bridge. The majority of the park's walking paths north of East 172nd Street would continue to be in direct sunlight.

May Analysis Day Shading by Resource

The May analysis day (halfway between the summer solstice and summer equinox) is representative of conditions in late spring and late summer, when both direct sunlight and areas of shade would likely be in demand depending on weather conditions (generally cool in May and warm in August).

Daniel Boone Playground (O3)

Daniel Boone Playground would receive incremental shadow for 2 hours and 5 minutes during the May analysis day and would be wholly in direct sunlight until approximately 2PM, when shadows from existing buildings would begin to be cast on the western edge of the playground. The early morning incremental shadow would be cast on the northern and southern ends of the park, while the central area would be in direct sunlight. Shadow would move entirely off the playground after 8:32AM. While this playground would receive incremental shadow in the early morning, the playground and turf field at Starlight Park would continue to be in direct sunlight and available for use during the times of incremental shadow on Daniel Boone Playground.

PS X811 (O6)

PS X811's blacktop would receive incremental shadow for approximately 1 hour and 27 minutes beginning at the start of the May analysis day. The school's garden would not receive incremental shadow during any portion of the analysis day. Incremental shadow would move wholly off the blacktop after 7:54AM. With incremental shadow being confined to before 8AM and the blacktop used as a parking lot during school days, incremental shadow would have a nominal effect on the usability of the blacktop.

PS 66 (O7)

The schoolyard at PS 66 would receive incremental shadow for approximately 42 minutes beginning at 6:27AM, the start of the May analysis period. Incremental shadow would be cast on the southeast portion of the schoolyard until 7:09AM. With incremental shadow confined to the edge of the schoolyard and in the early morning period, incremental shadow would have a nominal effect on the usability of the schoolyard. While incremental shadow would be cast during the early morning hours, Starlight Park would continue to be in direct sunlight during the times of incremental shadow on PS 66's schoolyard during the May analysis day.

Starlight Park (O4) and Bronx River (N1)

Incremental shadow would be cast on Starlight Park's North Subarea from 9:26AM to 4:30PM but would be confined to the park's inaccessible storage area. No incremental shadow would be cast on the park's more sunlight sensitive elements such as the turf

field, seating area, basketball court, or playground. These elements would be wholly in direct sunlight for more than 9 hours on the May analysis day, from the start of the analysis period until after 4PM. The incremental shadow would not affect the usability or enjoyment of Starlight Park during the May analysis day.

The portion of the Bronx River between the Amtrak bridge and East 174th Street would be wholly in direct sunlight from the start of the May analysis period until 1:06PM, when incremental shadow would begin to be cast on the river. Incremental shadow would move east throughout the day across the river and would span the river and begin to cast shade on Starlight Park's East Subarea by 2:39PM. Incremental shadow would continue to cover more area of the East Subarea throughout the late afternoon period. At the end of the analysis day, much of the East Subarea that is south of the prolongation of East 172nd Street would be shaded by incremental shadow. The incremental shadow would shade portions of the Bronx River but would not preclude in-water recreation. In-water recreational users would experience temporary incremental shadow as they move along the river only in the late afternoon portions of the day.

Incremental shadow on the May analysis day would not preclude fish migration along the Bronx River. During times of incremental shadow, fish – including alewife, blueback herring, and American eel – may experience a temporary reduction in cues from direct sunlight as they transit through areas of incremental shadow between spawning/juvenile habitats farther upstream and locations farther downstream.

While incremental shadow would cover a portion of the Bronx River in the afternoon, incremental shadow would not result in a significant adverse impact on the May analysis day because much of the Bronx River would be in direct sunlight between the start of the analysis period at 6:27AM to 1:06PM. Additionally, most of Starlight Park would be in direct sunlight from the start of the analysis day to 2:39PM (East Subarea) and 3:06PM (South Subarea). Incremental shadow on the North Subarea would largely fall on the inaccessible storage area and would not affect the seating area or turf field on the May analysis day. Much of Starlight Park and the Bronx River would also be in direct sunlight for more than six hours on the May analysis day; therefore, incremental shadow would not result in a significant adverse impact on the May analysis day.

June Analysis Day

On the June analysis day, incremental shadow would be cast on Daniel Boone Playground and PS X811's blacktop beginning at 5:57AM, the beginning of the June analysis period. Incremental shadow would shade PS66's schoolyard and Daniel Boone Playground beginning around 6:00AM. Incremental shadow would move off PS66's schoolyard after 6:34AM, off Daniel Boone Playground after 8:16AM, and off PS X811's blacktop after 7:36AM. On the June analysis day, incremental shadow would begin to be cast by 10:28AM on portions of Starlight Park, and by 1:10PM on the Bronx River. Incremental shadow on both the park and the river would be cast until 6:01PM, the end of the analysis day.

Figure 6-34 through Figure 6-46 show the detailed shadow assessment on the June analysis day from 5:57AM.

Figure 6-34: June Analysis Day – 5:57 AM



Figure 6-35: June Analysis Day – 7:00 AM



Figure 6-36: June Analysis Day – 8:00 AM



Figure 6-37: June Analysis Day – 9:00 AM

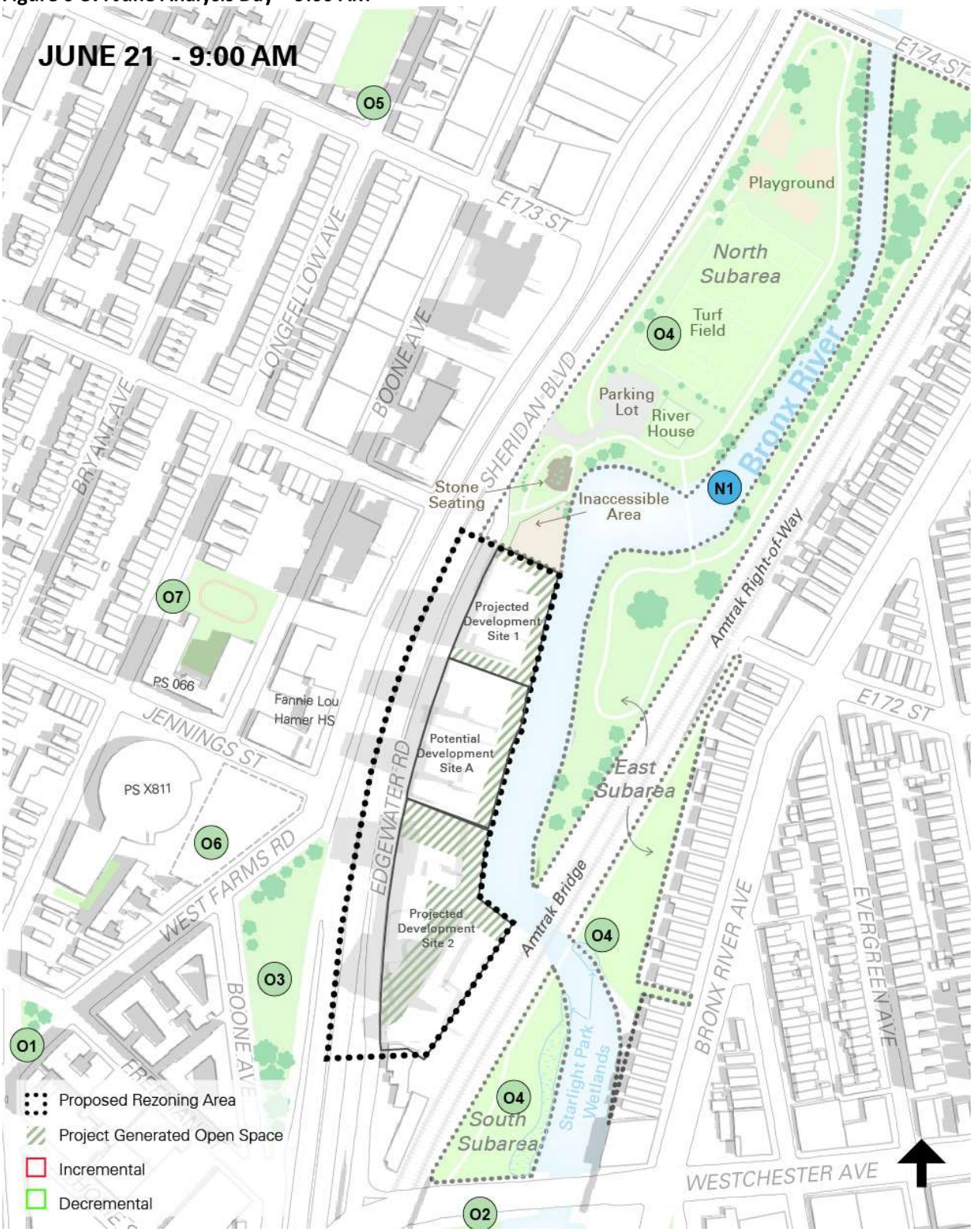


Figure 6-38 June Analysis Day – 10: 00 AM

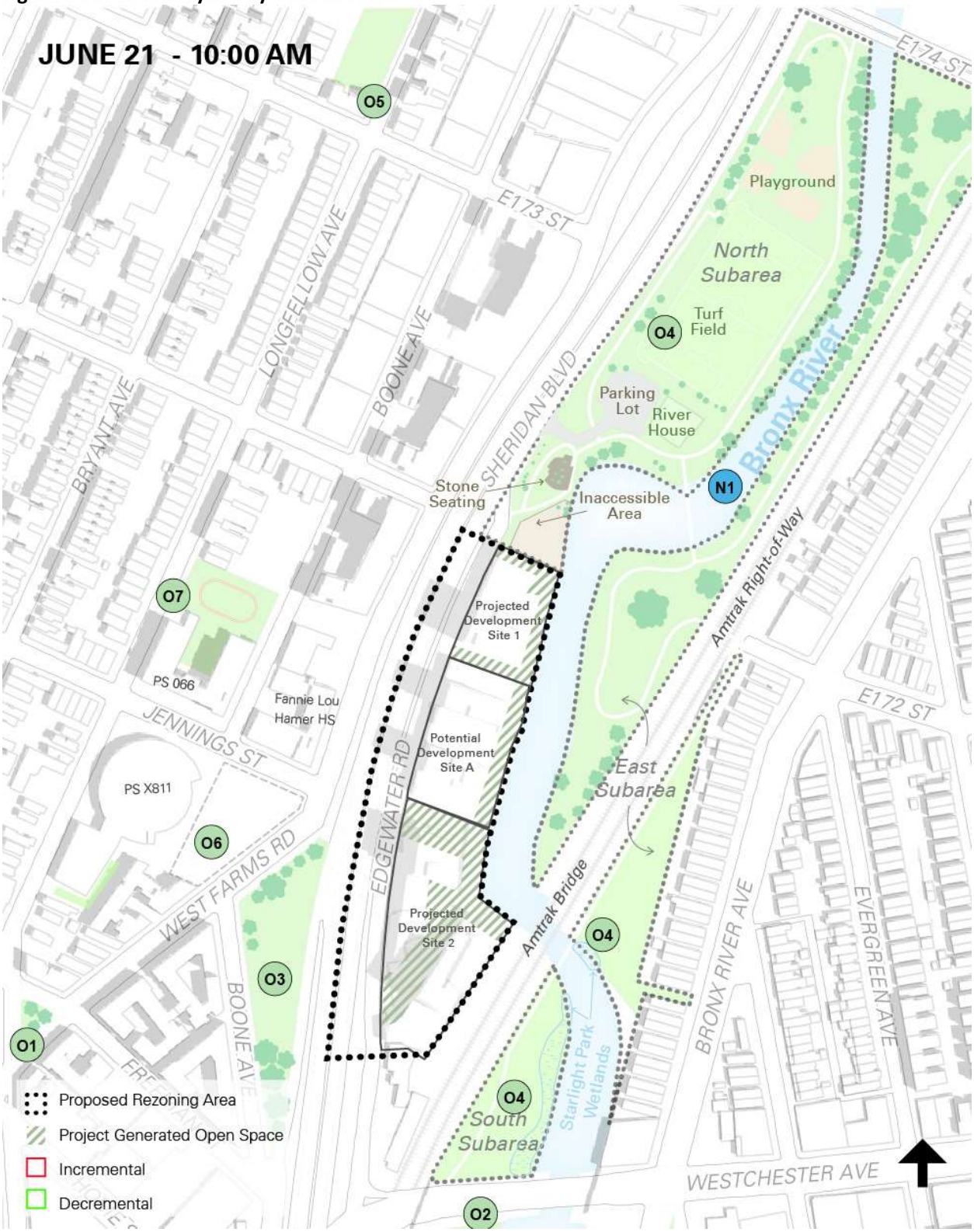


Figure 6-39: June Analysis Day – 11:00 AM



Figure 6-40: June Analysis Day – 12:00 PM



Figure 6-41: June Analysis Day – 1:00 PM



Figure 6-42: June Analysis Day – 2:00 PM



Figure 6-43: June Analysis Day – 3:00 PM

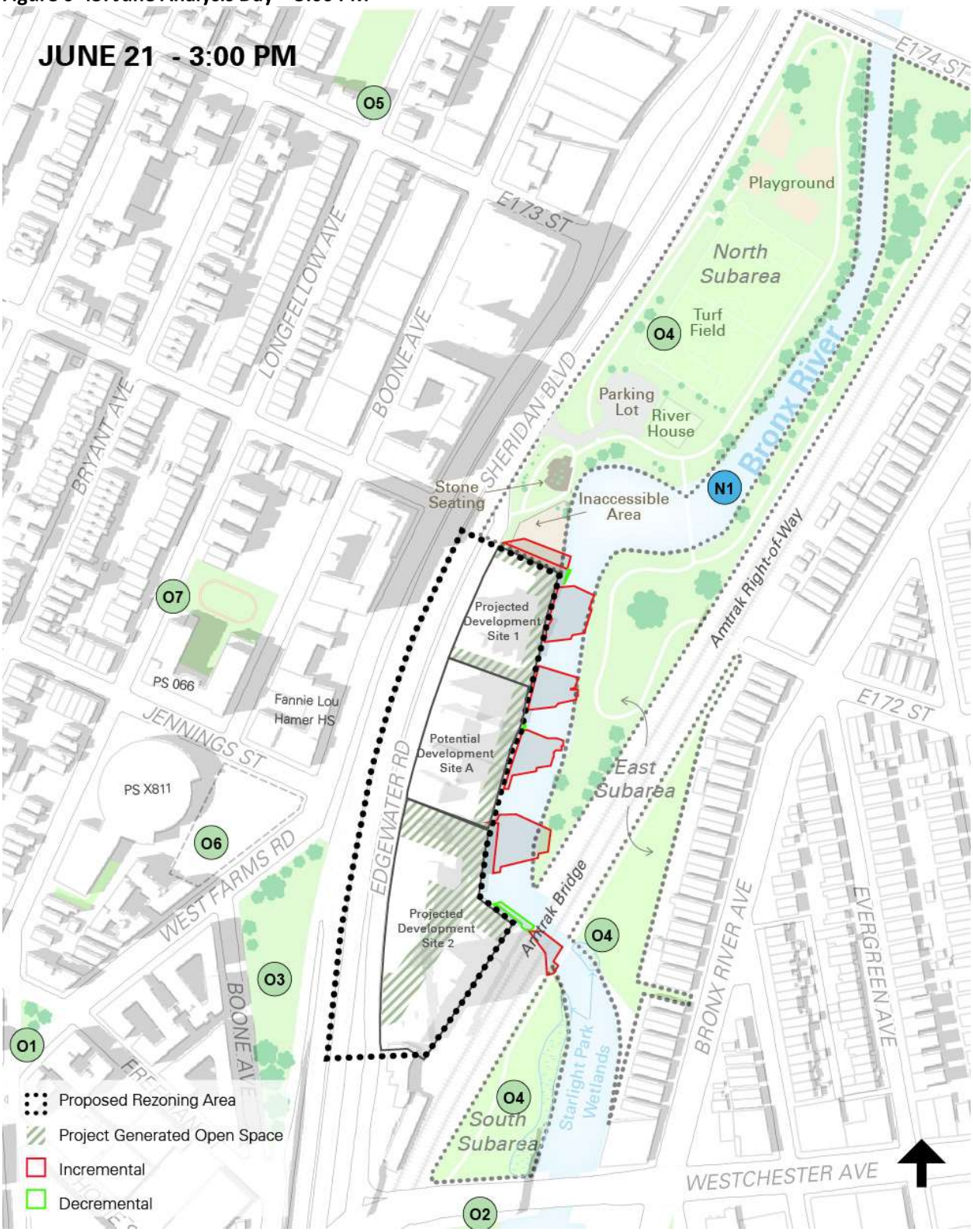


Figure 6-44: June Analysis Day – 4:00 PM

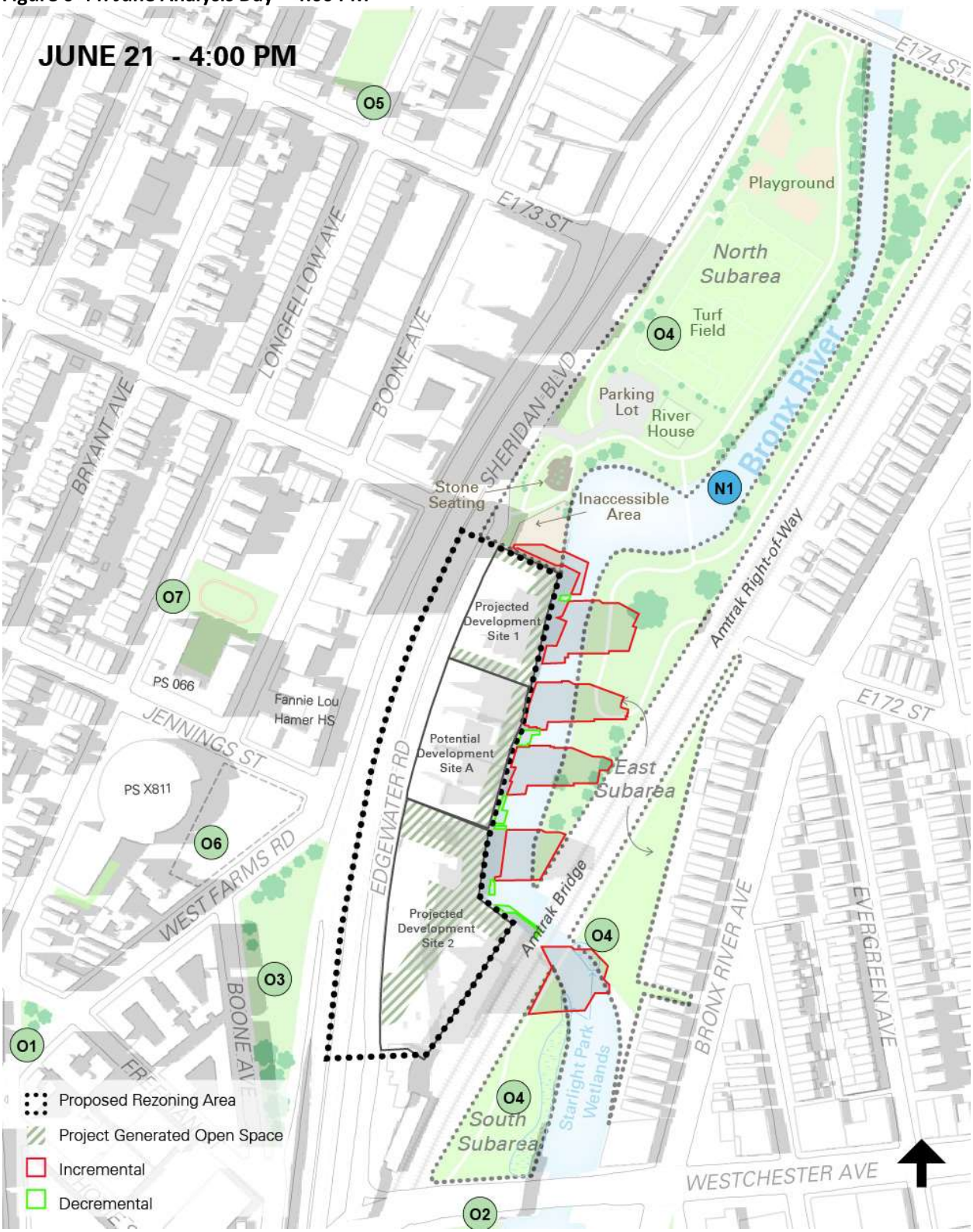


Figure 6-45: June Analysis Day – 5:00 PM



Figure 6-46: June Analysis Day – 6:01 PM



The June analysis day – the summer solstice – is the longest solar day of the year. The conditions during this analysis day are representative of warm weather conditions, and both direct sunlight and shaded areas would likely be in highest demand depending on specific weather conditions.

Figure 6-34 shows that Starlight Park and the area of the Bronx River between the Amtrak bridge and East 174th Street would be wholly in direct sunlight by 5:57AM. Nearly all of the blacktop at PS X811 would be covered in incremental shadow, but none of the schoolyard at PS 66 would receive incremental shadow at that time. The northern and southern portions of Daniel Boone Playground would be covered by incremental shadow while the center of the park, where the playground equipment is located, would be fully in sunlight.

By 7:00AM, Figure 6-35 shows that Starlight Park and the area of the Bronx River between the Amtrak bridge and East 174th Street would continue to be wholly in direct sunlight. A small portion of the blacktop at PS X811 would be covered in incremental shadow at this time. The schoolyard at PS 66 would receive incremental shadow for roughly 33 minutes and would be fully in direct sunlight by 6:34AM until the end of the analysis day. The northern and southern portions of Daniel Boone Playground would be covered by incremental shadow while the center of the park, where the playground equipment is located, would be fully in sunlight.

By 8:00AM, Figure 6-36 shows that Starlight Park and the area of the Bronx River between the Amtrak bridge and East 174th Street would continue to be wholly in direct sunlight. The blacktop at PS X811 would be fully in direct sunlight by this time until the end of the analysis day. Small portions of Daniel Boone Playground would be covered by incremental shadow while the playground equipment would continue to be fully in sunlight.

Figure 6-37 through Figure 6-39 shows that Starlight Park and the area of the Bronx River between the Amtrak bridge and East 174th Street would be wholly in direct sunlight until 10:28AM, when incremental shadow would begin to be cast at the very southern edge of Starlight Park North's Subarea.

Through 1PM, Figure 6-40 and Figure 6-41 shows that incremental shadow would be cast on the southern fringe of Starlight Park North's Subarea, largely in the park's publicly inaccessible storage area. During this time, the portion of the Bronx River in the Study Area would wholly be in direct sunlight. All areas of the river and Starlight Park will have received at least six hours of direct sunlight by 1PM on the June analysis day.

By 2PM, Figure 6-42 shows that incremental shadow would be cast along the western edge of the Bronx River by Projected Development Site 2. This incremental shadow would occur beginning at 1:06PM. Incremental shadow would continue to be cast in Starlight Park's storage area in the North Subarea by Projected Development Site 1.

By 3PM, Figure 6-43 shows that incremental shadow would span across the width of the Bronx River and into portions of Starlight Park's East Subarea. Starlight Park's North Subarea would also be shaded with incremental shadow on the inaccessible storage area.

By 4PM, Figure 6-44 shows that incremental shadow would cover more of the Bronx River and extend across the park's East Subarea to the Amtrak right-of-way. Incremental shadow would also span across Starlight Park's South Subarea on its northern edge, including the Starlight Park wetlands.

Figure 6-45 shows that absent the Proposed Actions, shadow would fall on the southern edge of Starlight Park's North Subarea including portions of the turf field, parking lot, stone seating area, and the inaccessible storage area. Most the Bronx River between Westchester Avenue and the prolongation of East 172nd Street would be shaded, some of which would be from incremental shadow. Incremental shadow would cover much of Starlight Park's East Subarea and continue to span across the South Subarea's northern edge.

At 6:01PM – the end of the June analysis day – Figure 6-46 shows that the west shore of the Bronx River and Starlight Park's North Subarea with turf and seating areas would be shaded absent the Proposed Actions. Most of the Bronx River between the Westchester Avenue and the prolongation of East 172nd Street would be shaded, some of which would be caused by incremental shadow. Incremental shadow would cover much of Starlight Park's East Subarea and continue to span across the South Subarea's northern edge, including the Starlight Park wetlands.

June Analysis Day Shading by Resource

The June analysis day (the summer solstice) is the longest solar day of the year, when both direct sunlight and areas of shade would likely be in highest demand depending on weather conditions.

Daniel Boone Playground (O3)

Daniel Boone Playground would receive incremental shadow for approximately 2 hours and 19 minutes during the June analysis day. Incremental shadow would be cast on the northern and southern ends of the park, while the central area would be in direct sunlight. Shadow would move wholly off Daniel Boone Playground after 8:16AM, when the playground would be wholly in direct sunlight. The playground would then be wholly in direct sunlight for approximately 6 hours, before shadows from existing buildings would begin to be cast on the playground's western edge. While this playground would receive incremental shadow in the early morning, Starlight Park's playground and turf field would continue to be wholly in direct sunlight in the early morning period and available for use.

PS X811 (O6)

PS X811's blacktop would receive incremental shadow for approximately 1 hour and 39 minutes from 5:57AM – the beginning at the start of the June analysis day – until 7:36AM. Incremental shadow would not be cast on the school's garden during any portion of the analysis day. At 7AM, incremental shadow would be confined to the blacktop's northeast corner. Incremental shadow would move wholly off the school's blacktop until 7:36AM. The blacktop would remain wholly in direct sunlight for approximately 7 hours. Beginning after 2PM, shadow from PS X811's school would be cast shade on the blacktop, and the blacktop would be fully shaded at 6:01PM, the end of the analysis period.

PS 66 (O7)

The schoolyard at PS 66 would receive incremental shadow for 33 minutes between 6:01AM and 6:34AM on the June analysis day. During times of incremental shadow on PS 66, Starlight Park's walking/running paths, turf field, and playground would continue to be direct sunlight and available for use. With incremental shadow occurring only before 7AM and for 33 minutes, incremental shadow would have a nominal effect on PS66's schoolyard.

Starlight Park (O4) and Bronx River (N1)

Incremental shadow would be cast on Starlight Park's North Subarea from 10:28AM until 4:42PM but would be confined to the park's inaccessible storage area. No incremental shadow would be cast on the park's more sunlight sensitive elements such as the turf field, seating area, basketball court, or playground at any point during this analysis day. These elements would be wholly in direct sunlight for more than 10 hours on the June analysis day, from the start of the analysis period until after 4PM, when shadows from existing buildings would begin to cast shadows on the western edge of the North Subarea. The incremental shadow would not affect the usability or enjoyment of Starlight Park during the June analysis day.

The portion of the Bronx River between the Amtrak bridge and East 174th Street would be wholly in direct sunlight from the start of the June analysis period until 1:10PM, when incremental shadow would begin to be cast on the river. Incremental shadow would move east throughout the day across the river and would span the river and begin to cast shade on Starlight Park's East Subarea by 2:41PM. Incremental shadow would continue to cover more area of the East Subarea throughout the late afternoon period. At the end of the analysis day, much of the East Subarea that is south of the prolongation of East 172nd Street would be shaded by incremental shadow; however, pockets of direct sunlight would continue to be available in discrete areas. The portion of Starlight Park's North Subarea that is north of the prolongation of East 173rd Street would be wholly in direct sunlight throughout the entire June analysis day, including the whole playground area and northern portions of the turf field.

At the end of the analysis day, the portion of the Bronx River between the Amtrak bridge and East 174th Street would largely be shaded, but would continue to have pockets of direct sunlight near the river's eastern shoreline in discrete locations; much of the shadow at the end of the analysis period would occur from existing buildings (see Figure 6-46). In-water recreational users would temporarily experience incremental shadow in the late afternoon portions of the day, incremental shadow would not wholly shade the river at any point during in the analysis day. Thus, incremental shadow would not preclude in-water recreation or the use and enjoyment of the river during this time.

Incremental shadow on the June analysis day would not preclude fish migration along the Bronx River. During times of incremental shadow, fish – including alewife, blueback herring, and American eel – may experience a temporary reduction in cues from direct sunlight as they transit through areas of incremental shadow between spawning/juvenile habitats farther upstream and locations farther downstream.

While incremental shadow would cover a portion of the Bronx River in the afternoon, incremental shadow would not result in a significant adverse impact on the June analysis day because much of this portion of the Bronx River would be in direct sunlight for more than 7 hours between the start of the analysis period at 5:57AM to 1:10PM. Additionally, most of Starlight Park would be in direct sunlight from the start of the analysis day through the mid-afternoon, with incremental shadow not beginning until 2:41PM on the East Subarea and until 3:23PM on the South Subarea. Incremental shadow on the North Subarea would largely fall on the inaccessible storage area and would not affect the seating area or turf field on the June analysis day. Much of Starlight Park and the Bronx River would continue to be in direct sunlight for more than six hours on the June analysis day; therefore, incremental shadow would not result in a significant adverse impact on the June analysis day.

Detailed Analysis Conclusion

The Proposed Actions would not result in a significant adverse shadows impact. The Tier 2 and 3 screenings ruled out significant adverse shadows impacts to three of the eight sunlight-sensitive resources. However, a detailed assessment was warranted for five resources: the Bronx River, Daniel Boone Playground, the blacktop at PS X811, the schoolyard at PS 66, and Starlight Park.

Bronx River

The Bronx River is a 23-mile-long river that runs south from Westchester County through the Bronx and along the eastern edge of the Proposed Rezoning Area and empties into the East River. The portion of the river that is in the Study Area contains aquatic wildlife, some vegetation, and, per NYCDEP, is an important spawning/juvenile habitat is present farther upstream from the Proposed Rezoning Area. The river is classified by NYSDEC as "Class I," which is a waterbody class whose best usages are secondary contact recreation (i.e., kayaking) and fishing. The Proposed Actions may reduce the availability of sunlight in the late afternoon periods in the areas near the Proposed Rezoning Area, however, project-generated shadows would not preclude in-water recreational activities such as kayaking.

The portions of the Bronx River within the Study Area would largely be in sunlight throughout the mornings until the early afternoon. On the March, May, and June analysis days, incremental shadow would begin to be cast on the river in the early afternoon, and incremental shadow would span the width of the river by midafternoon and last through the end of the analysis period (90 minutes before sunset). Per CEQR, six hours of direct sunlight is the minimum amount of sunlight typically needed for plantings and vegetation.

The maximum coverage of incremental shadow on the Bronx River would occur at 2:53PM on the December analysis day, when the sun is lowest in the sky and shadows are longest, approximately 134,000 square feet of incremental shadow would be cast on the river (see Figure 6-13). This is the maximum coverage of incremental shadow across the four analysis periods, and adjacent portions of the river (farther upriver between East 173rd and East 174th streets and farther downriver between Westchester Avenue and the Amtrak Bridge) would continue to be wholly in direct sunlight at this time. Across the four analysis periods, incremental shadow would only be cast on the river's intertidal marshes in the late afternoon (after 3PM) of the June analysis period; all other incremental shadow cast on the river would be cast in the river's littoral zone.

Incremental shadow would not preclude fish migration along the Bronx River. During times of incremental shadow, fish – including alewife, blueback herring, and American eel – may experience a temporary reduction in cues from direct sunlight as they transit through areas of incremental shadow between spawning/juvenile habitats farther upstream and locations farther downstream.

The Proposed Development is designed to minimize shadow. The proposed buildings have been sited along Sheridan Boulevard to minimize shadow on the Bronx River while balancing the need for open space at the ground level with affordable housing above. The floor area at the bases of the buildings would be maximized, and the tower bulk would be limited to maximum width of 100 feet on the facades facing the river, creating a slimmer tower and allowing sunlight between the tower portions of the buildings. Overlooks along the river would be constructed with sunlight-pervious materials, such as metal bar grating, to minimize shading of the river.

The Proposed Actions would introduce new landscape along the proposed shore public walkway, including more vegetation along and near the waterfront that would offer new habitat opportunities for wildlife, such as birds and insects. Specifically, the proposed open spaces would contain native canopy and ornamental tree species, and low-lying plants and shrubs. Overall, the Proposed Actions would significantly increase the vegetative diversity on the development sites and remove existing invasive species.

As discussed in Chapter 9, "Natural Resources," the Bronx River is New York City's only freshwater river and several species of fish were identified approximately 0.8 miles upstream of the Proposed Rezoning Area in a study performed between 2001 and 2005: Bay anchovy (*Anchoa mitchilli*); fourspine stickleback (*Apeltes quadracus*); Atlantic menhaden (*Brevoortia tyrannus*); mummichog (*Fundulus heteroclitus*); naked goby (*Gobiosoma bosc*); Atlantic silverside (*Menidia menidia*); Atlantic tomcod (*Microgadus tomcod*); Atlantic striped bass (*Morone saxatilis*); winter flounder (*Pseudopleuronectes americanus*); and cunner (*Tautogolabrus adspersus*).[2] This study also identified American eel (*Anguilla rostrata*) in the river. Monitoring performed by NYC Parks in the spring and early summer of 2018 also found river herring (collectively referring to alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*)) to be actively passing through the river approximately 0.9 miles upstream of the Proposed Rezoning Area[3].

Several of these aquatic species, including the blueback herring and alewife, travel through the Bronx River to spawn upstream of the Proposed Rezoning Area. NYCDEP has undertaken efforts to restore river herring spawning within the Bronx River farther upstream from the Proposed Rezoning Area. Blueback herring and alewife are not classified by NYSDEC or the United States Fish and Wildlife Service (USFWS) as a protected species; however, within New York City, these fish species are known to spawn only within the Bronx River. American eel have also been known to migrate through the Bronx River. This species is not considered threatened or endangered but is classified by NYSDEC as a "high priority species of greatest conservation need," and is therefore a "protected species" per CEQR.

The Proposed Actions would not prevent fish migration or introduce new physical barriers for fish along the Bronx River. However, some fish species depend on a range of sensory cues to avoid predation, one of which is sunlight. The 23-mile-long Bronx River currently receives shadows from existing vegetation, buildings, bridges, and other structures near the water's edge. The Proposed Actions would increase shadow on the river near the Proposed Rezoning Area.

The Proposed Actions would increase shading on the river ranging from 3 hours 12 minutes in December to 4 hours and 51 minutes in June (the peak growing season). During times of incremental shadow on the Bronx River, fish would experience gaps in areas of direct sunlight near the Proposed Rezoning Area, reducing the ability of the fish to avoid predation. To offset the effects of project-generated shadow, the Proposed Actions would incorporate restoration measures to lessen the effects of prolonged shading on the areas adjacent to the Proposed Rezoning Area, while improving other important ecosystem functions nearby. These commitments would be considered Project Components Related to the Environment (PCRE) to be memorialized in a Restrictive Declaration tied to the

[2] Rachlin, J. W., Warkentine, B. E., & Pappantoniou, A. 2007. An Evaluation of the Ichthyofauna of the Bronx River, a Resilient Urban Waterway. Northeastern Naturalist, 14(4). 531–544. http://www.jstor.org/stable/25177064
[3] Warns, D. 2018. Bronx River Alewife Post-Stocking Monitoring. NYC Parks.

projected development sites. The following PCREs would be included as part of the Proposed Development:

- Increase the amount of vegetation along the onsite ~~public~~ shore public walkway near the shoreline to the reasonable satisfaction of NYC Parks to provide a greater quantity of shade-tolerant tree species;
- ~~Provide~~ Provide informational signage along the ~~public~~ shore public walkway to the reasonable satisfaction of NYC Parks to educate the public on the presence of migratory American eel, blueback herring, and alewife species present, and the ongoing restoration of the Bronx River; and
- ~~Install sufficiently sized submerged reef balls or similar structures, subject to NYSDEC approval, for enhanced benthic habitat in the Bronx River to increase the habitat complexity for migratory fish and shellfish; and~~
- Coordinate with NYC Parks to provide funding ~~on the funding for marshland vegetation plantings, or other measure mutually agreed to by the Applicant and NYC Parks,~~ to improve fish ~~habitat~~ passage over the Starlight Park weir for migratory American eel and river herring to pass over the weir at low tide in the vicinity of the Project Site.

These proposed measures ~~are being~~have been developed in coordination with NYCDEP and NYC Parks~~ and Recreation and will be finalized before the Final EIS is issued~~. Implementation of the above restoration measures as part of the Proposed Development would preclude the potential for significant adverse impacts on natural resources due to incremental shading.

December Analysis Day

The December analysis period lasts for 6 hours and 2 minutes between 8:51AM and 2:53PM. December is outside both the vegetation-growing season and the peak of fish migration. Incremental shadow would begin to be cast on the river at 11:41AM, and incremental shadow would not reach the river's east bank until after 1PM (see Figure 6-10 and Figure 6-11).

The river would receive fewer than 6 hours of direct sunlight in most locations within the Study Area on the December analysis day. However, the portion of the river between the Amtrak Bridge and Westchester Avenue (including the intertidal marsh areas at the edge of Starlight Park) would be in direct sunlight for more than 6 hours, allowing vegetation in this area to receive at least 6 hours of sunlight outside of the growing season.

As shown in Figure 6-7 through Figure 6-11, approximately 90 percent of the Bronx River within the Study Area would be in direct sunlight for more than four hours (approximately 60 percent of the analysis period's duration) of the December analysis day. The greatest coverage would occur at the very end of the analysis period.~~.~~

March, May, and June Analysis Days

The March, May, and June analysis days are representative of the conditions during the vegetative growing season, peak fish migration, and the fish spawning and juvenile growing periods. The river's fish may depend on primary producers such as phytoplankton for sustenance. As described in Chapter 9, "Natural Resources," the area of the Bronx River near the Proposed Rezoning Area is unfavorable for submerged aquatic vegetation.

The movement of the river's phytoplankton is largely governed by prevailing tides and currents. The river adjacent to the Proposed Rezoning Area is tidal, and the changing tide moves phytoplankton and other natural elements quickly through the area.

On the March, May, and June analysis days, direct sunlight would be available for more than 6 hours on the majority of the river's portions that are in the Study Area (see Figure 6-14 through Figure 6-20 for the March analysis day, Figure 6-23 through Figure 6-30 for the May analysis day, and Figure 6-34 through Figure 6-42 for the June analysis day). Phytoplankton available for primary consumers (such as fish) in this portion of the Bronx River likely would not be significantly altered in the With-Action Condition because of the availability of sunlight along other portions of the river and the river's tidal nature. Therefore, project-generated shadows would not have the potential to significantly affect the availability of sustenance for the river's primary consumers (including fish). The incremental shadow would reduce sunlight in some locations along the Bronx River, but the loss of direct sunlight from incremental shadow would not rise to the level of a significant adverse shadows impact.

Daniel Boone Playground

Daniel Boone Playground is a 1.20-acre playground that contains benches, playground equipment, vegetation, and spray showers. Project-generated shadow would be cast onto Daniel Boone Playground in the early morning on all four analysis days. Incremental shadow would be cast on the playground for 20 minutes on the December analysis day – the analysis day of shortest incremental duration – and for approximately 2 hours on the other analysis days. All incremental shadow on the playground would be confined to the early morning period, and no incremental shadow would occur on the playground after 9:24AM on any analysis day. Accordingly, the Proposed Actions would not result in a significant shadows impact to the Daniel Boone Playground.

PS X811

The school garden at PS X811 would not receive incremental shadow on any analysis day and would not be affected by shadows generated by the Proposed Actions. PS X811's blacktop would receive incremental shadow for less than 1 hour and 40 minutes in the early morning period across the four analysis days. Except for the December analysis day – when incremental shadow would occur for 1 hour and 4 minutes between 8:51AM and 9:55AM – all incremental shadow would move off of the blacktop 9:10AM. Accordingly, the Proposed Actions would not result in a significant shadows impact to the school garden and blacktop at PS X811.

PS 66

The schoolyard at PS 66 is part of the Schoolyards to Playgrounds program that offers capital investments to schoolyards to increase their public accessibility during non-school hours. Incremental shadow would be cast on the schoolyard for less than one hour during the early morning period across the four analysis days. The incremental shadow would not affect its usability as a track and playground or completely eliminate the schoolyard's sunlight at any point during the analysis days. With the Proposed Actions, the schoolyard would continue to receive direct sunlight for over seven hours on the March, May, and June analysis days, with only shadow cast by PS 66 falling on portions of the schoolyard during this time.

Starlight Park

Starlight Park is a 17.06-acre park generally bounded by Sheridan Boulevard, East 174th Street, the Amtrak right-of-way, and Westchester Avenue. It was recently reconstructed and expanded as part of a capital improvement project undertaken by the New York City Department of Parks and Recreation (NYC Parks). The park contains both active uses – such as a turf soccer field, basketball courts, a kayak launch, walking paths, and a playground – and passive recreational uses such as bench seating and landscaped areas.

Incremental shadow would be cast on Starlight Park on all four CEQR analysis days throughout most of the analysis periods; however, on the March, May, and June analysis days, shading on the North Subarea is limited largely to a storage area that is inaccessible to the public. On the December analysis day – representative of cold weather conditions when demand for recreation is typically lower than warm weather months – shadow extends to other areas of the North Subarea, including the stone seating area and turf field. On the December analysis day, the stone seating area would be in shaded for 1 hour and 45 minutes and the turf field would be in shadow for 42 minutes in the midafternoon. During the times when incremental shadow would be cast on the seating areas, alternative seating options would be available within the park. The detailed shadow analysis indicates that all areas of Starlight Park would continue to receive at least six hours of direct sunlight across the March, May, and June analysis days, indicating that the park's vegetation will continue to receive sufficient amounts of sunlight during the growing season. Accordingly, the Proposed Actions would not result in a significant adverse shadows impact to Starlight Park.

6.6 Project-Generated Open Space

The Proposed Actions would create new publicly accessible open space in the Proposed Rezoning Area. The new open space will comprise shore public walkways, an upland connections, visual corridors, and additional open spaces. Shadows on project-generated open space are generally not considered significant under CEQR; however, when project-generated open space is included as part of the qualitative open space analysis, a discussion of how shadows would affect the new space is typically warranted.

As conceptually designed, the project-generated open space would include an amphitheater, bench-seating, walking paths, landscaping, lighting, trash bins, and a variety of vegetation (including trees and low-lying plantings such as flowers and shrubs). Because of the height and positioning of the surrounding buildings, the proposed new open spaces would receive direct sunlight during the morning (when the sun is in the east) on all four analysis days. Shadow cast by project-generated buildings would shade the proposed waterfront open space in the early-to-late afternoon on all four analysis days. Because the buildings would front the western edge of the waterfront open space, the shore public walkway would be shaded throughout much of the afternoon on all analysis days. The conceptual design of the open space includes tree species tolerant of the shadow conditions that would occur in the With-Action Condition.

The proposed upland connections would generally be oriented east-west along Projected Development Site 2's northern lot line between Sheridan Boulevard and the Bronx Riverbetween the project-generated buildings. These upland connections would therefore be expected to be shaded throughout much of the four analysis days. The Proposed Actions would not preclude the use of shade-tolerant vegetative species along

the upland corridors. Benches along the upland connections would likely be shaded during the mid-afternoon periods and could provide shaded seating options during warmer days.