

**A. INTRODUCTION**

This chapter examines alternatives to the proposed project and includes in the analysis those alternatives required under *CEQR* as well as alternatives that evolved during the impact analyses performed for the proposed project. This alternatives analysis presents reasonable options for reducing or eliminating project impacts, while substantively meeting project goals and objectives; demonstrating a reasonable range of options to the proposed action; and comparing potential impacts under alternative approaches for meeting project objectives. The range of alternatives to be considered was determined by the nature, goals, and objectives of the specific action and its potential impacts, as disclosed by the technical impact assessments for each of the three watersheds.

The purpose of this analysis is to compare conditions under the proposed project with these alternatives. In addition to the required alternatives under *CEQR/SEQRA* (e.g., the “No Action” Alternative), the alternatives examined in this chapter include alternative approaches for stormwater management. Specifically, the following four alternatives are examined in this chapter:

- No Action Alternative, which assumes none of the three proposed amended drainage plans for the Mid-Island area of Staten Island are approved and no capital projects move forward;
- Conventional Piped Sewer System Alternative, which assumes full implementation of the current drainage plan (the Potter Plan);
- An amended drainage plan with modified designs for BMPs NC-6 and NC-11 that eliminates upstream extended detention at these two proposed BMPs; and
- An amended drainage plan that includes green infrastructure techniques or supplemental stormwater management design features that would reduce the size of BMPs NC-6 and NC-11 or other BMPs.

**B. NO ACTION ALTERNATIVE****DESCRIPTION**

The No Action Alternative assumes that none of the proposed projects are approved and no infrastructure improvements or BMPs are installed. Under this alternative, the proposed amended drainage plan to reduce street flooding through a comprehensive system of pipes, BMPs and wetlands would not be implemented in the three Mid-Island watersheds.

**LAND USE, ZONING AND PUBLIC POLICY**

The No Action Alternative would not result in any changes to land use at proposed BMPs or outfall locations. Open space would continue to be managed as parkland under the jurisdiction of

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DPR or NYSDEC. Bluebelt properties would continue to be City-owned vacant land managed by DEP and would remain unused for drainage purposes, thus the wetlands would not be improved. Adjacent to the proposed BMP sites, residential and commercial uses would remain unchanged under the No Action Alternative. Similar to the proposed project, this alternative would not result in potential significant adverse land use impacts.

Under this No Action Alternative, no streets would need to be demapped and no other authorizations or certifications from the City Planning Commission (CPC) for clearing and grading activities in the Special South Richmond Development District (SSRDD) or the Staten Island Special Natural Area District (SNAD) would be needed. The proposed project would comply with these approvals and would not be in conflict with the City's zoning regulations.

In addition, under this alternative, consistency with the policies of the City's Waterfront Revitalization Program (WRP) would be achieved. However, the goals advanced by the three proposed amended drainage plans—such as improved water quality and reduced flooding and erosion—would be foregone. The No Action Alternative would not result in potential significant adverse public policy impacts.

### **OPEN SPACE**

Under the No Action Alternative, several proposed BMPs (OB-1, OB-2, NC-1 through NC-5, NC-6, NC-11, SBE-1A and SBE-1C) and the Lower Bay outfalls would not be installed on City and State parkland. Additionally, under this alternative, tree clearing at the proposed BMPs sites would not occur. Under the proposed project this clearing is expected to be limited with the exception of the proposed BMP NC-6: Boundary Avenue and proposed BMP NC-11: Last Chance Pond sites. Under the No Action Alternative, stream banks would continue to erode without the proposed velocity attenuators and stabilization techniques under the proposed project and downstream sedimentation and surface water quality degradation would continue. In addition, there would be no wetland expansion or enhancements in natural area parklands or Bluebelt properties under the No Action Alternative. In the lower watershed, without a formal and expanded maintenance program as is proposed with this Bluebelt project, *Phragmites* or common reed would continue to dominate the landscape and brush fires would remain an issue for the proposed BMP sites and adjacent properties. At some sites (e.g., OB-1), trash and debris would remain uncollected which may affect public access, use and views along existing open spaces. Diversification of habitat and wildlife species, and ongoing maintenance associated with the proposed action would also not occur under this alternative.

### **HISTORIC AND CULTURAL RESOURCES**

Under the proposed project, there would be no impacts on historic architectural resources and additional field investigations, testing and data recovery at potentially archaeologically sensitive sites would be completed. These types of investigations are common for this area of Staten Island and all work would be performed in accordance with a reviews and approvals by the New York City Landmarks Preservation Commission (LPC) and the New York State Historic Preservation Officer (SHPO), as necessary. Under the No Action Alternative, these lands would remain undisturbed and there would be no potential impact on archeological resources. Thus, the additional archaeological work of the proposed project would not be necessary under this alternative. Therefore, neither the proposed project nor this alternative would have potential significant adverse impacts on archaeological resources.

## **URBAN DESIGN AND VISUAL CHARACTER**

Under the No Action condition, the larger extended detention wetland BMPs in the three lower watersheds (e.g., OB-1, OB-2, NC-6, NC-11, SBE-1A, SBE-1B) would remain as primarily large stands of common reed marshes that provide no unique or valuable visual landscapes or views. With the proposed project, the dense common reed that currently limits public views into these wetlands would be removed and views from local streets into the landscaping of the proposed BMPs would be opened. The proposed BMPs are designed to provide diverse plantings and the Bluebelt program provides ongoing maintenance to ensure plant diversity, establishment, and growth. Thus, under the No Action condition, this benefit would not occur.

Certain proposed BMPs require the removal of larger stands of woodlands and trees, including some mature woodlands on parklands, including BMPs NC-6 and NC-11 in the New Creek watershed. Although different visually from the existing wooded sites, the proposed planting program would create natural, diverse wetland landscapes at these sites with expanded open water and emergent wetlands. In addition, the proposed project would maintain wooded borders at these sites and preserve large trees for the purposes of minimizing changes in the visual context as viewed from the local public streets and private views from nearby residences. The proposed BMP designs would also protect existing trees on Bluebelt property and the adjacent public streets to the greatest extent possible. DEP would also coordinate with DPR and NYSDEC on the final design for all BMPs proposed to be located in City or state parkland. Therefore, under both the proposed project and No Action Alternative, views along tree lined public streets and from private properties would remain largely unchanged. While there would be visual resource impacts as the proposed BMP landscaping becomes established, these impacts would be temporary and not significant. In contrast, the No Action Alternative would not provide any comprehensive wetland and visual resource enhancements for the local community and park users.

The proposed project would also require the raising of some local street grades which would not occur under this No Action Alternative. However, the street raisings associated with the proposed project would not result in any significant adverse impacts on urban design or visual character.

## **NATURAL RESOURCES**

### *SURFACE AND GROUNDWATER HYDROLOGY*

Under the proposed amended drainage plans, pipes and hydraulic structures would be installed to provide a comprehensive stormwater management system. The primary objective of the amended drainage plans is to reduce flooding throughout each watershed and to control unmanaged runoff. Under the No Action Alternative, the same volume of stormwater would be generated in the Mid-Island watersheds as under existing conditions, but there would not be the comprehensive stormwater collection system or the BMPs with velocity attenuators, outlet stilling basins, and extended detention wetlands that would better manage stormwater flows. Rather, under the No Action Alternative, street runoff would remain uncontrolled and stream banks would continue to erode without the proposed BMPs and associated bank stabilization techniques.

No potential significant adverse impacts to hydrology would occur under the proposed project. Conversely, under this No Action Alternative, the benefits of the proposed project on local

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surface water hydrology, including reduced local street and property flooding, would not be realized.

### *WATER QUALITY*

The proposed BMPs would reduce sediment and other pollutant loadings thereby providing water quality benefits in stream channels and receiving waterbodies, including the Lower Bay. Under the No Action Alternative, uncontrolled and unfiltered stormwater runoff would continue to flow into streams and wetlands throughout the watershed. This alternative would therefore continue to contribute to degraded local water quality, erosion, and sedimentation impacts on wetlands. Thus, the water quality benefits of the proposed project would be foregone under this alternative.

### *WETLANDS*

Under the No Action Alternative, the net increase in wetland acreage that would result from the proposed project would not be achieved. In addition, the removal of fill and regrading of existing wetlands would be foregone, as would the benefits associated with these activities, including increased open water habitat and expanded native plantings. The No Action Alternative would not impact tidal wetlands. Under the proposed project, any potential temporary or permanent wetland impacts from the proposed outfalls would be addressed with a compensatory wetland replacement plan as part of the proposed project and coordinated with NYSDEC such that no adverse impacts would occur.

### *VEGETATION AND TREES*

Under the proposed project, removal of woodland stands and tree loss is generally limited with the exception of BMPs NC-6: Boundary Avenue and NC-11: Last Chance Pond in the New Creek watershed. Under the proposed project, trees and woodlands would be cleared to create or expand and diversify wetlands (e.g., open water and emergent marsh). This clearing would occur within the interior of smaller wooded sites, in the uplands and within wet woods. In addition, the proposed project would include a tree replacement plan that would be implemented for the removal of trees (this plan would be based on final site surveys and the proposed BMP designs). In addition, the final design of these two BMPs would be based on additional data to be gathered as part of the final design (e.g., site topography, survey of trees, natural resources investigations, opportunities for plant rescue), that would be used to further minimize impacts to habitats. In the No Action scenario, this clearing and the need for tree replacement would not occur under the. these sites would not be provided with stormwater management or the diverse habitats of the proposed BMPs, nor would the BMP sites be disturbed by clearing and grading (see also the alternative below, “Alternative Drainage Plan Design: Elimination of Upstream Detention at BMPs NC-6 and NC-11”).

### *WILDLIFE*

The proposed project would benefit wildlife including avian and water-dependent species through expanded wetlands and improved habitats associated with the proposed BMPs. Under the No Action Alternative, this benefit would not occur. While the proposed BMPs may potentially disturb sites of protected wildlife or plant species, mitigation measures would be implemented to avoid potential impacts.

The proposed project would also provide a greater variety of aquatic habitats, including extended shorelines and deep pools, that would benefit fish, aquatic wildlife, and wading birds that may feed upon these resources. Under the No Action Alternative this benefit would not occur. Rather, aquatic habitats would be expected to further decline due to continued uncontrolled runoff and the associated erosion, sedimentation and water quality impacts. This alternative would also not have any BMP impacts on fish passage along the lower watershed streams, but it is assumed the existing streams of the lower Mid-Island watersheds would remain tide gate controlled through the existing outfalls. The proposed project includes mitigation measures that would avoid BMP impacts on fish passage.

The proposed project would also reduce the potential for brush fires and provide firebreaks against brushfires that currently occur and affect wildlife habitat. This benefit would also be foregone under the No Action Alternative.

#### *TIDAL WETLANDS*

This alternative would not have impacts on tidal wetlands. The proposed project would have impacts on tidal wetlands due to the proposed outfalls. However, the proposed project includes a tidal wetland restoration plan that would fully mitigate these impacts.

#### **HAZARDOUS MATERIALS**

Under this No Action Alternative, areas determined to have the potential to contain hazardous materials would not be disturbed. Under the proposed project, these locations would be tested in accordance with DEP protocols prior to construction. All testing would be approved by DEP and performed in accordance with a DEP-approved Health and Safety Plan. If contaminated materials are found, they would be removed and disposed of in accordance with all City, State, and Federal regulations. In addition, the proposed project would handle contaminated groundwater in accordance with all regulations. Implementation of these measures as part of the proposed project would fully address any potential for significant adverse impacts due to hazardous materials. Thus, while no potentially contaminated areas would be disturbed under the No Action Alternative, any potential impacts under the proposed project would be avoided.

#### **CONSTRUCTION IMPACTS**

Under the proposed project, there would be phased construction activity with multiple capital projects to be implemented throughout the three watersheds. Erosion and sediment control, noise and air quality controls, and protection of wetlands and adjacent areas would be included as part of the proposed project to avoid construction period impacts. Under the No Action Alternative, no construction would occur, the sites of the proposed BMPs would remain undisturbed and there would not be any construction period impacts. However, with the proposed project, all construction controls would be in place to minimize or avoid construction-period impacts such that no significant impacts would occur.

## **C. CONVENTIONAL PIPED STORM SEWER SYSTEM (THE POTTER PLAN ALTERNATIVE)**

### **DESCRIPTION**

This alternative compares impacts under the proposed project to those with a conventional piped storm sewer system, assuming it was installed in accordance with the current drainage plan for the Mid-Island area from the 1960s. That plan, drafted by Alexander Potter and referred to as the “Potter Plan,” calls for storm and sanitary sewers in all streets, and the piping of streams and watercourses. The Potter Plan was designed without regard to existing natural resources. This conventional drainage plan design would directly impact natural resources by draining and filling wetlands and eliminating the associated wildlife habitat on a large scale throughout each of the Mid-Island watersheds. Given current regulatory controls at the City, State, and Federal levels intended to protect wetlands and watercourses, it is unlikely that such a proposal would move forward. However, this alternative is presented for comparison with the proposed project.

### **LAND USE, ZONING, AND PUBLIC POLICY**

While the Potter Plan would relieve flooding and erosion through stream connections and subsurface pipes, it would do so by substantially diminishing the remaining wetlands and woodlands, due to the installation of infrastructure in all mapped streets. Without the loss of these natural features, drainage would also be altered and adjacent lots could be cleared and developed for residential or commercial uses. Therefore, this alternative could also reduce additional wetlands as a secondary impact in the Mid-Island watersheds with added residential and commercial development. The Potter Plan alternative would be inconsistent with zoning and public policy because the special districts that comprise the Mid-Island area and the WRP both encourage the protection of natural resources, open space and water quality. In contrast, the proposed amended drainage plans are consistent with these policies. The proposed project would build upon DEP’s Bluebelt Program by preserving and restoring wetlands and watercourses for the conveyance of stormwater and natural resource values.

### **OPEN SPACE**

Completion of the street grid under the Potter Plan would be expected to alter the watershed open spaces given the extent of mapped streets and infrastructure that would be constructed. This alternative would not enhance and preserve natural features such as wetlands, but would pipe stormwater through parkland, without the drainage, velocity control, or filtering benefits of BMPs. Thus, impacts on woodlands and trees would occur as mapped streets are built-out—the extent of impact would depend on the length of mapped streets through designated open spaces.

The proposed project generally has limited impacts on trees in open spaces with the exception of BMPs NC-6: Boundary Avenue and NC-11: Last Chance Pond. The proposed project would also would preserve and restore existing wetlands and watercourses in existing natural areas and open spaces while reducing flooding and erosion in the watershed. While the proposed project would require construction of stormwater facilities in certain natural area parks, all BMPs would be integrated into the existing ecological setting to the greatest extent possible. Moreover, the proposed project would add hundreds of acres of protected wetlands in the watersheds, thereby supporting and enhancing existing protected natural area open spaces.

## **HISTORIC AND CULTURAL RESOURCES**

Under the proposed project, there would be no impacts on historic architectural resources. However, there would be limited potential impacts to archaeological resources at several locations under the proposed project. Under the Potter Plan Alternative, more extensive subsurface disturbance would occur as compared to the proposed project with the potential for more extensive impacts. However, similar to the proposed project, the Potter Plan would be expected to include the necessary archaeological investigations and all work would be performed in accordance with reviews and approvals by LPC and SHPO, as necessary. Therefore, neither the proposed action nor the Potter Plan Alternative would result in potential significant adverse impacts historic and cultural resources.

## **URBAN DESIGN VISUAL CHARACTER**

Under this alternative, the widespread construction of streets, sewers, and other hydraulic structures would result in substantial losses of wetlands, woodlands, and trees and would substantially alter the visual character of the Mid-Island area. The proposed project would clear vegetation and trees, both in early successional woodlands and in some mature woodlands. However, the proposed amended drainage plans would generally limit this clearing to the proposed BMP sites and would provide enhanced and expanded wetlands, rather than streets, which would occur under this alternative. At proposed BMP NC-6: Boundary Avenue and proposed BMP NC-11: Last Chance Pond, the proposed project would include the conversion of the mature interior woodlands to open water or high and low marsh wetlands. Visually and ecologically, these sites would be graded and planted as natural yet diverse landscapes and perimeter trees would be preserved, to the greatest extent feasible, under the proposed project. In addition, the proposed BMP plantings and debris removal would enhance and improve the visual character of the area. Under the Potter Plan Alternative, sewers and streets would replace such landscapes and this benefit would be foregone under this alternative

The Potter Plan also calls for many streets to be raised substantially above the current street grade. In many instances, these street raisings would be as much as seven feet above existing street elevations. These widespread street grade raisings would leave many existing houses and yards at elevations well below the street elevation and significantly alter views along the streetscape and from adjacent properties. Thus, this alternative would have a potential significant adverse impact on visual character and urban design, whereas the proposed project would not.

## **NATURAL RESOURCES**

### *HYDROLOGY*

The Potter Plan Alternative would reduce flooding in the watersheds, but through a piped system rather than through BMPs and wetlands. Moreover, the Potter Plan, with only standard outfalls discharging into the Lower Bay, would not relieve flooding to the same extent as the proposed project because each of the proposed outfalls would be equipped with tide gates to prevent tidal influences. Therefore, during high tide events, stormwater runoff would continue to collect in the system and surcharge during storm events with the associated flooding of local streets and private properties. Under this alternative, only during low tide would upstream stormwater drain into the Lower Bay. In contrast, under the proposed amended drainage plans, stormwater would be stored in the lower watershed extended detention BMPs until such time as the tide recedes and the tide gates open. Therefore, the proposed project would relieve flooding throughout the

watershed in comparison to the more limited flood control capabilities of the Potter Plan design. Thus, under a conventional sewer system, these benefits would be foregone.

The Potter Plan would also significantly alter natural hydrology and wetland systems. Under this alternative, runoff to streams is replaced by storm sewers and associated wetlands would be impacted with extensive landfilling and excavation for sewer installation. Under the proposed amended drainage plans, improvements would be consolidated on specific sites and implemented in conjunction with a wetland planting program. Moreover, stormwater flows would be attenuated to within acceptable velocities through outlet stilling basins, extended detention basins and velocity attenuators. Overall, the same volume of stormwater would reach the streams. However, with the proposed amended drainage plans, this volume would be controlled with a regulated release, such that flooding and erosion impacts would be reduced. As compared to the Potter Plan, the proposed project would not have potential significant adverse impacts on hydrology.

In addition, as stated above, the Potter Plan would require many street raisings, as much as seven feet above existing street elevations in some cases. These widespread street raisings would leave many existing houses in depressions that would be subject to continued localized yard flooding.

#### *WATER QUALITY*

The Potter Plan Alternative would eliminate most existing streams and ponds and would directly discharge unfiltered stormwater into Lower Bay. This alternative would therefore forego eliminate all pollutant removal features and the associated water quality benefits of the proposed project.

#### *WETLANDS*

The Potter Plan Alternative would result in a substantial loss of freshwater wetlands as compared with the increases in wetland acreage and the qualitative enhancements of the proposed project. Under this alternative, wetlands within all mapped streets would be filled with storm sewers for the full build –out of mapped streets. Wetland resource values throughout Mid-island would therefore be eliminated. Thus, the loss of freshwater wetlands under this alternative would be a significant adverse impact to natural resources that would not occur under the proposed project. For wetlands not directly impacted, the Potter Plan would severely reduce surface water flow to the wetlands that would also indirectly impact additional acres of wetlands by draining them and eliminating hydrologic inputs. Overall, the natural resource impacts of this alternative would be significantly adverse. In contrast, the proposed amended drainage plans protect, enhance, and expand freshwater wetlands. Both this alternative and the proposed project would have temporary and permanent impacts on tidal wetlands that would need to be addressed with a compensatory wetland restoration plan.

#### *VEGETATION AND TREES*

Under the proposed project, clearing and tree loss is generally limited with the exception of woodland areas, at BMPs NC-6: Boundary Avenue and NC-11: Last Chance Pond in the New Creek watershed. With the proposed project, this clearing would be for the purposes of creating diverse and enhanced wetlands at the proposed BMP sites (e.g., creating open water and emergent marsh). In contrast, the Potter Plan Alternative would need to undertake similar clearing measures but to complete the sewer grid and the affected areas would be replaced by streets or cleared corridors that would not provide any replacement vegetation or trees. Thus, the

impacts of this alternative with respect to vegetation and trees are significantly greater and more adverse than the impacts of the proposed project.

#### *WILDLIFE*

The proposed project would benefit wildlife including avian and water-dependent species through the expanded wetlands and improved habitats associated with the proposed BMPs. Under the Potter Plan, this habitat would be eliminated and the benefits of the proposed project would not occur. While the proposed BMPs may potentially disturb sites of protected wildlife or plant species, mitigation measures would be implemented to avoid potential impacts. The Potter Plan would eliminate habitat and would not provide this mitigation.

The proposed project would also provide a greater variety of aquatic habitats, including extended shorelines and deep pools, that would benefit fish, aquatic wildlife, and wading birds that may feed upon these resources. Under the Potter Plan, no such features would be provided and this alternative would have a significant unmitigated adverse impact on wildlife, particularly aquatic wildlife.

#### *TIDAL WETLANDS*

Both this alternative and the proposed project would have impacts on tidal wetlands due to the proposed outfalls. However, the proposed project includes a tidal wetland restoration plan that would fully mitigate these impacts.

#### **HAZARDOUS MATERIALS**

The Potter Plan Alternative, similar to the proposed project, would require construction in areas of potential hazardous materials. With both the proposed project and this alternative, soil and groundwater testing as well as removal and disposal of contaminated soils would comply with Federal, State and City rules and regulations. With these measures in place, neither the proposed project nor this alternative would be expected to have potential significant adverse impacts on hazardous materials.

#### **IMPACTS DURING CONSTRUCTION**

Under the proposed project, there would be phased construction activity throughout the three watersheds, in addition to the surrounding areas. Erosion and sediment control, noise and air quality controls, and protection of wetlands and adjacent areas would be implemented. Under the proposed project, all construction controls would be in place to minimize any impacts such that no significant impacts would occur.

Under the Potter Plan Alternative, considerably widespread infrastructure installation in streets and open spaces would be required. In addition, extensive construction activities would be necessary to implement the Potter Plan in full. For example, this alternative would require construction in all mapped streets throughout Mid-Island with widespread filling of waterbodies and streams that would result in significant water quality impacts during construction and loss of habitat without the replacement of equal or improved ecological values.

## **D. ALTERNATIVE DRAINAGE PLAN DESIGN: ELIMINATION OF UPSTREAM DETENTION AT PROPOSED BMPS NC-6: BOUNDARY AVENUE AND NC-11: LAST CHANCE POND**

### **DESCRIPTION OF THE PROPOSED ALTERNATIVE**

Under this alternative, the extended detention wetlands at BMPs NC-6: Boundary Avenue and NC-11: Last Chance Pond would not be included in the proposed amended drainage plans which would reduce related tree clearing and grading at these two sites. This alternative includes the necessary storm sewer outlets for the upstream piped systems at these locations (see Figures 4.1-8 and 4.1-11 of Chapter 4.1 “New Creek Drainage Plan Project Description”). However, the area of impact would be reduced to that shown on **Figure 7.1-1** and the BMPs would provide conveyance only.

BMPs NC-6 and NC-11 are located at the head of the West Branch and Main Channel of the New Creek system, respectively, and handle a combined drainage area of 286 acres. Thus, about 40 percent of the total drainage area for the West Branch and Main Channel flows through these two locations. Under the proposed project, proposed BMPs NC-6 and NC-11 would provide about 20 percent of the required stormwater storage for the lower watershed. Both sites are located at higher elevations than the lower watershed where the downstream topography is flat with elevations generally within two feet of mean high tide and opportunities to provide significant stormwater storage are limited. Under this alternative—with no detention assumed at these two sites—the resulting downstream hydrology would be significantly modified without flood prevention. A comparative assessment of this alternative with the proposed project with respect to natural resources impacts is presented below.

### **NATURAL RESOURCES IMPACTS**

#### *HYDROLOGY*

**Figure 7.1-2** shows the areas in the lower watershed along the West Branch and Main Channel that are at the lowest elevations in the watershed and thus have the greatest potential to be flooded under the proposed project and this alternative. Under existing conditions, all areas—containing a total of 115 homes (**Table 7.1-1**)—are subject to flooding during the 10-year storm event. Under the proposed project, flooding of these properties is reduced or eliminated because peak water surface elevations are reduced. Under the alternative, the loss of upstream stormwater detention at BMPs NC-6 and NC-11 would increase peak stage water elevations by 12-20 percent, thereby moderately to significantly increasing the risk of flooding in Area A (51 homes), as well as slightly increasing the risk of flooding in Area B (64 homes) based on existing conditions.

Berms would be necessary downstream to address the increased flood risk and would have to be higher and longer with lengthened periods of ponding in adjacent properties as compared to the proposed project.

At both locations, the delay in peak flow provided by the BMPs would be significantly reduced. With no extended detention at proposed BMP NC-6, storm flows would reach Midland Avenue with almost no delay, rather than a 3-hour delay provided by the proposed project. For NC-11, the travel time for flows reaching Hylan Boulevard would be reduced to about 1.5 hours rather than the 6.5 hours provided by the proposed project. This would result in peak flows reaching the downstream reaches of the West Branch and Main Channel much faster, thereby increasing the likelihood of downstream surges, erosion and flooding.

**Table 7.1-1**  
**Homes Located within Areas of Flooding Concern along the**  
**West Branch and Main Channel of New Creek**

Location	Description	# of Homes
Area A	Below El. 0	51
Area B	Below El. 0-El.1	64
<p><b>Note:</b> All elevations are Staten Island datum. Zones do not include the areas within existing stream banks or within proposed BMP areas.</p> <p><b>Source:</b> Hazen and Sawyer, March 2011.</p>		

An additional impact would be that flows from the proposed BMP would have higher velocities and, therefore, carry greater sediment loads than under the proposed project. This would contribute to streambank scour and erosion along the downstream channels. This is a particular concern for the West Branch, where directly downstream from proposed BMP NC-6 there are recreational fields and 11 homes located in close proximity to the stream channel. These uses are currently outside of the flood concern areas during the design storm, but could be at risk if the stream banks were destabilized and widened due to faster flows and scouring under this alternative. The increased sediment load downstream of NC-6 and NC-11 would also trigger additional maintenance along the West Branch and Main Channel.

Assuming that the elevations of the drainage pipes are as high as possible given existing topography and similar to the proposed project, this alternative would increase peak water surface elevations in the BMPs downstream. As a consequence, the downstream outlets for the proposed BMPs would be further submerged and those peak elevations would back up into the sewers, reducing the capacity of the tributary piping and potentially resulting in street flooding. To restore this lost capacity, pipes and streets would need to be raised. (Street raising impacts on hydrology are discussed in Chapters 3.9, 4.9, and 5.9.)

#### *WATER QUALITY*

Under this alternative, the proposed BMPs in the lower watershed would not be large enough to offset the elimination of upstream stormwater detention. This would reduce the overall settling time in the BMPs, potentially impacting downstream water quality and diminishing the quality of the water discharged to the Lower Bay from the New Creek watershed.

#### *WETLANDS*

Under the proposed project, wetlands are expanded at proposed BMP NC-6: Boundary Avenue with no net change in wetland acreage at proposed BMP NC-11: Last Chance Pond. At proposed BMP NC-6, NYSDEC wetlands are expanded by about 3 acres (no NYSDEC wetlands are currently mapped at this site) and NWI wetlands would be expanded by about 1.6 acres (based on the current NWI wetland limits and adding in the expanded wetlands of the proposed BMP). Under the alternative, the wetland addition at proposed BMP NC-6 would be limited to the channelized streams from the proposed stormwater outlets across the Boundary Avenue site, resulting in a minimal increase in wetland acreage. Under this alternative there would also be the disturbance of wetlands at Last Chance Pond, although the area of disturbance would be reduced.

VEGETATION AND TREES

With respect to vegetation and trees, the tables below present a comparison in the cover types and tree removal under the proposed project and with this alternative. As shown in these tables, the extent of the proposed clearing would be reduced to about 1.1 acres at NC-6 (about 1.9 fewer acres of clearing than the proposed project) and about 2.2 acres at NC-11 (about 6.2 fewer acres). As would be expected, this reduction in clearing would have a corresponding reduction in estimated tree clearing compared to the proposed project, as presented in **Tables 7.1-2 through 7.1-5**. However, in both this alternative and in the proposed project, tree clearing would be necessary at both sites, and DEP would coordinate with DPR in both the final design of the proposed BMP as well as a tree replacement plan.

**Table 7.1-2**

**Comparative Changes in Vegetative Cover: Proposed BMP NC-6: Boundary Avenue**

Vegetative Cover	Estimated Total Acres	Estimated Impact Acreages (proposed project)	Estimated Impact Acreages (no extended detention alternative)	Net Change
<b>Southern Portion of Site</b>				
Red maple/hardwood swamp I	0.3	0.2	0.2	0.0
Red maple/hardwood swamp I and Coastal oak/hickory forest I	0.9	0.5	0.1	-0.5
Coastal oak-hickory forest I	1.5	0.2	0.0	-0.2
<b>Freshwater Watercourse</b>				
Freshwater watercourse	0.2	0.2	0.2	0.0
<b>Northwestern Portion of Site</b>				
Red maple/hardwood swamp II and Successional southern hardwoods I	0.2	0.1	0.1	0.0
Successional southern hardwoods III and Urban vacant lot	0.5	0.2	0.0	-0.2
Red maple/hardwood swamp II and Successional southern hardwoods I	0.7	0.5	0.4	-0.1
Urban vacant lot	0.4	0.3	0.2	-0.1
Coastal oak/hickory forest II	0.6	0.3	0.0	-0.3
Successional southern hardwoods II	1.0	0.5	0.0	-0.5
<b>Total Estimated Acreage</b>	<b>6.3</b>	<b>3.0</b>	<b>1.1</b>	<b>-1.9</b>
<p><b>Notes:</b> Estimates were calculated using ArcMap Version 9.3.1 and were based on aerial photographs, field observations, and the proposed BMP NC-6 and alternative conceptual designs.</p> <p><b>Sources:</b> AKRF, Inc. 2011; Hazen and Sawyer 2011</p>				

**Table 7.1-3**  
**Comparative Tree Clearing Estimates: Proposed BMP NC-6 Boundary Avenue**

Ecological Community	Plot ID	Acres of Impacted Habitat	Estimated Total Trees (proposed project)	Estimated Total Trees (no extended detention alternative)	Net Change
Coastal oak/hickory forest	BA-1, BA-7	0.42	400	0	-400
Successional southern hardwoods and Successional southern hardwoods III and Urban vacant lot	BA-3, BA-4	1.06	750	150	-600
Red maple/hardwood swamp and coastal oak-hickory forest	BA-2, BA-5, BA-6	1.32	950	575	-375
Watercourse	Assumes no trees above 4" dbh.	0.20	0	0	0
Total		3.00	2,100	725	-1,375
<p><b>Notes:</b> Estimates are based on an average of transect data (where possible) and were calculated using the average of trees per acre for each size category. All numbers were rounded to the nearest 50 trees; these data and results are intended as estimates. To determine the exact tree removal/protection numbers, tree surveys would be conducted during the final design phases of each BMP.</p> <p><b>Sources:</b> AKRF, Inc. 2011</p>					

**Table 7.1-4**  
**Comparative Changes in Vegetative Cover: Proposed BMP NC-11:Last Chance Pond**

Ecological Community	Estimated Acreages	Estimated Proposed Impact Acreages (proposed project)	Estimated Impacted Acreages (no extended detention alternative)	Net Change
Red maple/hardwood swamp and Silver Maple swamp	8.9	4.69	0.0	-4.69
Shallow emergent marsh I and shrub swamp and Dike and Shallow emergent marsh II / Red maple-hardwood swamp III	1.54	1.16	1.2	0.0
Red maple/hardwood swamp II and Successional old field	2.45	1.04	0.6	-0.44
Shallow emergent marsh III	0.75	0.75	0.2	-0.55
Shallow emergent marsh III and Modified stream	1.16	1.16	0.2	-0.96
Total	14.8	8.8	2.2	-6.64
<p><b>Notes:</b> Estimates were calculated using ArcMap Version 9.3.1 and were based on aerial photographs, field observations, and proposed impact figures.</p> <p><b>Sources:</b> AKRF, Inc. 2010; Hazen and Sawyer 2010</p>				

Table 7.1-5

Comparative Tree Clearing: Proposed BMP NC-11 Last Chance Pond

Ecological Community	Plot ID	Acres of Impacted Habitat	Total Trees (proposed project)	Total Trees (no extended detention alternative)	Net Change
Red maple/hardwood swamp (includes silver maple and sweetgum pockets)	LC-1, LC-2, LC-3, LC-5, LC-6 and LC-8	4.69	3,700	930	-2,770
Shallow emergent marsh I and shrub swamp and Dike and Shallow emergent marsh II and Red maple/hardwood swamp III	LC-4	1.16	700	300	-400
Red maple/hardwood swamp II and Successional old field	LC-7	0.31	200	65	-135
Terrestrial-cultural and Mowed lawn with successional old field	Assumes no trees above 4" dbh.	0.15	0		
Open water and Shallow emergent marsh III	Assumes no trees above 4 dbh.	1.62	0		
Common reed marsh	Assumes no trees above 4" dbh.	0.75	0		
Terrestrial-Cultural and Modified stream and basin	Assumes no trees above 4" dbh.	0.00	0		
Riverine cultural and Modified stream	Assumes no trees above 4" dbh.	0.12	0		
<b>Total</b>		<b>8.80</b>	<b>4,600</b>	1,295	<b>-3,305</b>
<p><b>Notes:</b> Estimates are based on averages developed during the baseline survey and were calculated using the average of trees per acre for each size category. All numbers were rounded to the nearest 50 trees; these data and results are intended for use as estimates. To determine the exact tree removal/protection numbers, tree surveys would be conducted during the final design phases of each BMP.</p> <p><b>Source:</b> AKRF, Inc. 2010.</p>					

Compared to the proposed project, this alternative would not provide the expanded aquatic habitats of the proposed BMPs. At the same time, however, this alternative would not require the clearing of trees and woodland stands that would result in loss of habitat for avian species. This alternative would also not submerge and replace wooded groundcover and the current habitat that is provided at these sites for amphibians and birds.

In sum, under this alternative, there would be increased risk of flooding and downstream bank destabilization, both of which put property at risk, along with a decrease in water quality, as compared with the proposed project. Additionally, contemporary stormwater design practice dictates that detention should be distributed throughout the watershed to the greatest extent possible, which would not be achieved under this alternative. Removing the upstream storage would overburden the downstream stream channels and BMPs, increasing risk to homeowners, properties, roadways and stream banks if failure occurs at any point within the New Creek stormwater management system. Disturbance of woodlands and trees at BMPs NC-6 and NC-11 would still be necessary in order to accommodate stormwater conveyance from the upstream drainage area. Finally, with minimal wetland creation, habitat diversity would not be achieved.

## E. GREEN INFRASTRUCTURE ALTERNATIVE

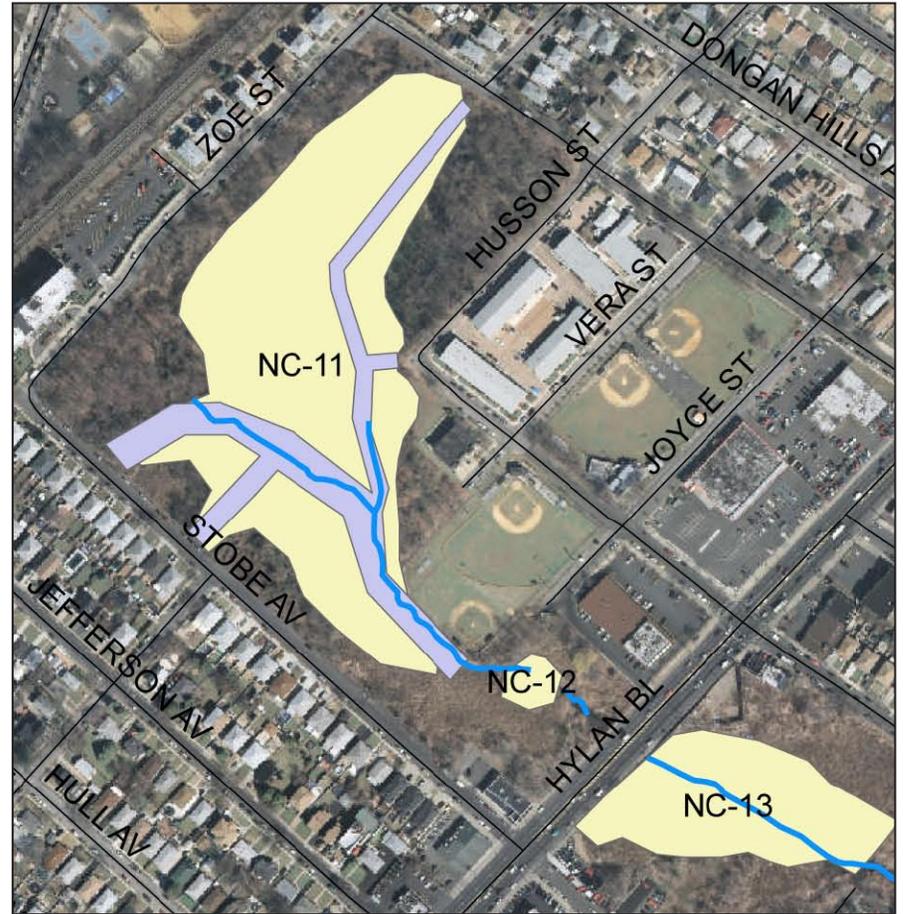
In 2010, the City of New York released its “Green Infrastructure Plan, a Sustainable Strategy for Clean Waterways.” The plan is one of a series of reports that were prepared in support of

implementing PlaNYC's water quality goal. The NYC Green Infrastructure Plan presents an alternative approach to improving water quality that integrates Green Infrastructure such as swales and green roofs with investments to optimize the existing systems and to build targeted smaller scale "grey" or traditional infrastructure.

With respect to stormwater management, a critical goal of the plan is to capture and manage the first inch of rainfall from over 10 percent of the impervious surfaces in combined sewer watersheds. The City seeks to achieve this goal through the implementation of detention and retention source controls such as, blue roofs, green roofs, porous pavement infiltration practices for streets and off-street parking lots, streetside swales and tree pits, and constructed wetlands. Implementation would vary by land use, and techniques would be incorporated into the design specifications for City streets and sidewalks and other capital projects. DEP, in collaboration with other City agencies including the School Construction Authority, DPR, DOT, NYCHA, and MTA has implemented a number of pilot projects that incorporate these controls.

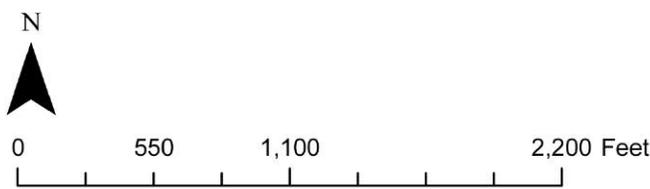
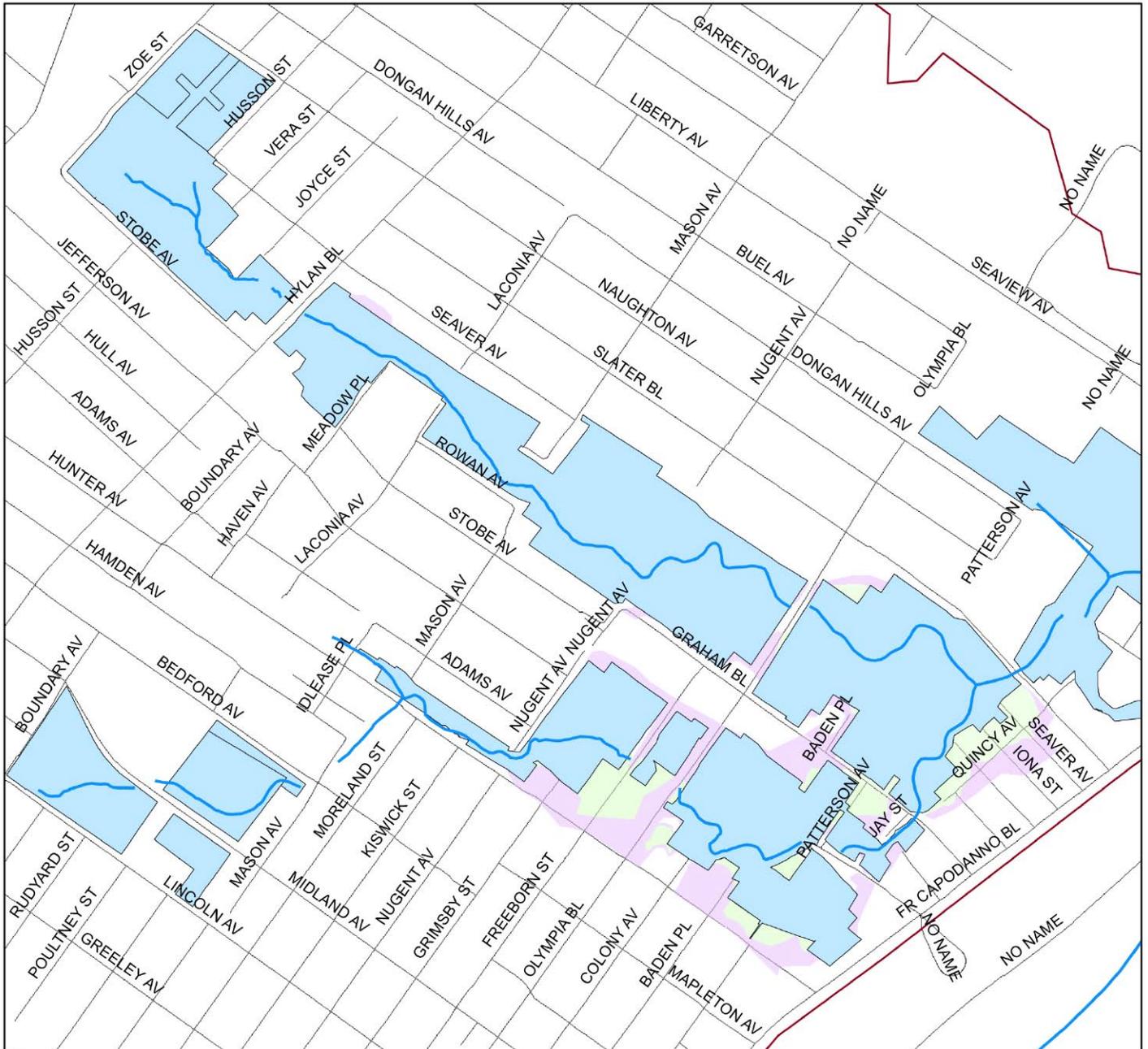
Under this alternative, green infrastructure techniques are assumed to be employed at a watershed level to allow for the downsizing of storm sewers and proposed BMP footprints at proposed sites such as proposed BMPs NC-6 and NC-11 or the proposed BMP sites in the New Creek upper watershed around Reeds Basket Willow Swamp Park. Although source controls described in the NYC Green Infrastructure Plan are being implemented, they are currently not credited in the City's drainage plan design process because the results of studies are pending and criteria have not been developed or accepted for use in drainage plan design. The Green Infrastructure Plan is targeted toward combined sewer areas where source controls can store and slow the runoff contribution to the combined sewer thereby freeing up capacity in the combined sewer system during rain events and without requiring permanent retention. After the storm and the peak rain event has passed, stored water is then released to the combined sewer system and conveyed to wastewater treatment plants for pollutant removal prior to discharge into receiving waters.

Based on data collected about proposed BMP sizing, retention and release rates, and related benefits, drainage plan criteria design details and specification for green infrastructure could be developed. In the future, Bluebelt program could be supplemented with green infrastructure. However, the performance green infrastructures over the course of a year and the effects of runoff, time of concentration, and maintenance requirements are unknown at this time. Therefore, BMP sizes cannot be reduced at this time based on an assumption that green infrastructure would achieve the same objectives as the proposed project with respect to providing comprehensive stormwater management, reducing flooding and erosive velocities, and improving water quality. Therefore, to achieve the same stormwater goals as the proposed project, BMP areas of disturbance (i.e., the area of clearing and grading) and the associated natural resources impacts under this alternative may ultimately be similar to the proposed project. \*



-  *BMP Footprint with Proposed Project*
-  *Area Impacted Under this Alternative*
-  *Existing Stream Channel*

Alternative for BMPs N-6 and NC-11  
without Extended Detention  
**Figure 7.1-1**



- Legend**
- DEP-DPR Bluebelt Properties
  - Area A (below EI 0): Primary Flooding Risk
  - Area B (EI 0 to EI 1): Secondary Flooding Risk

Areas in Lower Watershed of New Creek  
Where Flood Risk Will Increase From  
Proposed Project to Alternative of Extended  
Detention Without BMPs NC-6 and NC-11