Hempstead Lake State Park

Northwest and Northeast Ponds Impact Assessment and Environmental Enhancement Plan

October 2018

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Hempstead Lake State Park

Northwest and Northeast Ponds Impact Assessment and Environmental Enhancement Plan

EXECUTIVE SUMMARY

This report has been prepared to summarize the impacts to wetlands, both beneficial and adverse, associated with the enhancement of the Northwest ("NW") and Northeast ("NE") Ponds and associated improvements within Hempstead Lake State Park (the "Park"). The New York State Office of Parks, Recreation and Historic preservation is implementing the Hempstead Lake State Park component of the Rebuild By Design ("RBD") Living with the Bay ("LWTB") Program to protect and enhance the resiliency of the Mill River watershed in southwestern Nassau County, New York. The NW and NE Pond Enhancement (herein the "Proposed Action") involves a comprehensive suite of projects intended to restore existing wetland functions, mitigate the flow of sediment and contamination into the ponds, and prevent floatables and other debris from entering the ponds.

After consideration of feasible alternatives, the Proposed Action underwent a lengthy design process to avoid and minimize impacts to existing wetlands while achieving the proposal's purpose and need. Although Proposed Action would result in a net loss of 1.7 acres wetlands, environmental analyses indicate that the Proposed Action offsets that loss by restoring and improving the quality and function of the existing wetlands and wetland buffer areas within the Park and improving water quality and the environment throughout the Park and downstream along the Mill River.

Environmental impacts and enhancements associated with the project are as follows:

- The net wetland loss is 1.72 acres (a reduction from 56.39 acres to 54.67 acres, or a 3.0 percent loss, of wetland habitat within the NW and NE Ponds)
- Short-term construction impacts to wildlife and environmental setting during construction of the restoration project.
- The restoration of the dam to repair the 35-ft wide breach at the southern end of the NW Pond at an elevation below its original elevation to stabilize water levels, increase stormwater holding capacity and preserve this diverse wetland community. Dam restoration will prevent long-term drying out of the wet meadow wetland, which established following the dam breach and resulting

lower water levels.

- The wetland enhancement and creation activities that increase emergent wetlands will provide increased filtration of waters and removal of sediments during normal flows as well as runoff events.
- Constructed wetland detention ponds will capture sediment loads emanating from Mill Creek watershed at the northern end of NE Pond and the 96-inch pipe outfall at NW Pond, reducing sediment loading to the NE and NW Ponds and associated wetlands.
- Periodic removal of accumulated sediments in the wetland detention ponds will remove contaminants including metals associated with those sediments and provide an overall long-term reduction to contaminant loading of NE and NW ponds, which have elevated levels of runoff-derived contaminants in bottom sediments.
- Placement of clean soils to achieve proper elevations for emergent wetland construction, as well as the berms associated with the wetland and detention pond construction, will encapsulate existing sediments in portions of NW and NE Ponds, therefore reducing potential for release of those contaminants to the environment.
- Construction of filtering wetlands will provide treatment of stormwater runoff that currently discharge from the Southern State Parkway road drainage system directly into NE Pond and is a significant source of nutrients and contaminants.
- The installation of floatable debris collection systems at NE and NW Ponds will intercept the excessive flow of plastics, glass containers and other debris from upstream watershed areas. Periodic emptying of the floatable collectors will provide proper disposal of a substantial tonnage of debris and greatly decrease the potential impacts to pond, lake and downstream tidal and marine areas.
- The floatables cleanup to be implemented as part of the pond enhancement will remove a substantial amount of debris and will immediately enhance wetland areas severely degraded by the debris deposits.
- Reduction in sediment loading to NE and NW Ponds will prevent long-term degradation of existing wetlands and open water areas from excessive siltation and turbidity.
- Stabilization of the eroding creek bank at the section of Mill River immediately upstream of NE Pond will decrease sediment loading to downstream areas, with corresponding benefits to wetland

and open water areas.

- Restoration and stabilization of water levels at NW ponds will provide increased holding time of water in the system, including runoff waters from upstream areas and adjacent roadways, and increase natural filtration and treatment prior to discharge to downstream areas.
- Select planting of wetland trees and shrubs in areas of the NW Pond will provide an opportunity for forested and shrub wetland development, which will increase habitat diversity and improve overall quality of the wetland systems in the area.
- Revegetation of upland buffer areas adjacent to the ponds and wetlands with native vegetation will help to protect wetlands by providing natural watershed buffers, and enhance wildlife habitats in adjacent wetland areas.
- Increased resiliency to the Mill Creek watershed to withstand future storms will be achieved by increasing runoff storage, providing healthier and more diverse wetlands, stabilizing shoreline areas and reducing erosion potential.
- Increased visitor access to the NE and NW ponds by trails, walkways and overlooks will generally increase community appreciation for the NE and NW ponds, natural resources, wetlands and wildlife, and encourage community stewardship and involvement in protection of the resources.
- Increased passive recreational opportunities for the community brought about by opening significant areas of the Park to public use will have community health benefits.

Measures Incorporated into Project Design to Offset the Loss of 1.72 Acres of Wetlands

- Wetland detention ponds have been developed to provide significant holding capacity while minimizing the amount of wetland area used; given the lack of alternate available space within the pond system, a balance had to be achieved between adequate sizes of the basins versus utilization of existing wetland areas.
- Wetland detention ponds were oriented as to minimize disturbance to wetlands to the extent possible, given the space constraints imposed by the basin-like topography of the ponds with steeply sloping shorelines.
- Wetland detention pond design has been modified so as to allow much of the containment area to be planted with natural vegetation, so it can function as a restored wetland.

- The management plan for the wetland detention ponds includes provisions for partial, selective sediment removal as needed, so that wetland vegetation can remain viable and continuous in the basins even during maintenance events.
- Connecting water courses and wetlands between the NE and NW Ponds will be kept largely intact, with only modifications to remove invasive species and areas of stagnant water, so the connecting waterways can remain as functioning wetlands.
- The enhancement of existing, degraded wetland areas has been included in the design to return these wetlands to viable, sustainable and healthy systems (e.g. removal of existing debris covering shoreline wetland areas).
- Selective areas for wetland tree plantings in wet meadow areas with appropriate elevations, will be used to establish new forested wetlands, to mitigate loss of forested areas in the wetland detention pond areas.
- Wetland enhancement and construction were limited to areas within the existing ponds because of the constraints imposed by the basin-like and steep shoreline configuration of the ponds. Extending into shoreline areas would have included extensive earth moving and removal of natural woodlands; limiting the work within pond basins avoided substantial impacts that would have occurred if pond shorelines were expanded.
- Invasive Species Management and Native Species Enhancement Plan (ISMP): A ISMP for invasive species is being incorporated into the maintenance plan for the Proposed Action. The ISMP will provide for the identification, monitoring and removal of targeted invasive species, as part of the efforts to improve wetland and upland habitats in the NW and NE area.
- The design of wetlands was modified during the design process to minimize disturbance of contaminated sediments and to provide for capping and encapsulation of potentially contaminated sediments. These measures will help to reduce the potential for resuspension and release of sediments and associated contaminants during future storm events, providing future protection of the ecosystem and water quality.

The above measures and the overall beneficial impacts of the project provide an overall ecological uplift to the NW and NE Pond areas. Although Proposed Action would result in a net loss of 1.7 acres wetlands, the

Proposed Action will substantially improve the short-term conditions and long-term functionality of wetland areas, with associated benefits to water quality, wildlife habitat and community values.

Hempstead Lake State Park

Northwest and Northeast Ponds Impact Assessment and Environmental Enhancement Plan

1. INTRODUCTION

Hempstead Lake State Park

The purpose of the proposed Hempstead Lake State Park Project, as a component of LWTB Project and Resiliency Strategy, is to build resiliency for neighboring and downstream communities through improved stormwater management, enhanced natural ecosystems, increased connectivity among diverse populations and access to natural spaces and recreational resources, enhanced safety, and promotion of environmental education and storm resiliency programs.

Northeast and Northwest Ponds

Sometime before January 2012, the NW Pond Dam failed, creating a 35-foot breach of the embankment dam. This breach is expanding, resulting in a decrease in water levels in the NW Pond and NE Pond, impairing functionality of wetland systems and effectively converting and open water habitat to an emergent habitat. The embankment dam needs to be repaired in order to prevent the long-term drying out of wet meadow wetlands in the NW Pond, restore the ecological value of the NW Pond and NE Pond wetland systems, and to increase stormwater runoff impoundment during rainfall events and meet dam safety compliance standards.

The purpose of the Proposed Action is to provide increased storage and treatment of stormwater through ecological enhancements to NW and NE Ponds. Over the years, the waters entering the Park have become more polluted as a result of the increase of impervious surfaces in the Mill Creek Watershed. Unable to cleanse themselves via oxidation, the NE and NW Ponds have low oxygen levels and can be anoxic. Levels of fecal coliform exceed standard values and increase disease risk for aquatic species and may increase biological oxygen demand and eutrophication. Elevated pollutants in the system include nutrients (phosphorous and ammonia), heavy metals and other anthropomorphic contaminants.

The drainage systems along Mill Creek and other outfalls do not prevent floatables from entering the piped system, and substantial levels of floatables are carried through the system and into and through the Park during each rain event. Containers of plastic, glass and other wastes cover and seriously degrade many

wetland and upland areas surrounding the ponds.

Heavy sediment loads, as well as pollutants, are also carried in the runoff and are within the area north of NE Pond and the pond's shoreline areas at the outfalls. The sediment load has blocked and modified the drainage patterns in the creek and the area north of NE Pond and altered the flow between the ponds.

With nothing in place upstream to capture sediment and floatables, the NW and NE Ponds act as sediment and garbage retention basins. Ultimately, the plastics and garbage end up farther downstream as they break down or are dislodged during storm events, finally affecting the bay and ocean. Pollutants also continue downstream, increasing the pollutant load for downstream communities and waters, finally affecting the bay and ocean. Installation of floatables catchers, detention ponds and enhanced wetlands are needed to improve water quality within the Park and throughout the Mill River system south of the Park.

Existing Conditions

The NW and NE Ponds are fed by flow from Mill Creek, groundwater and from the piped stormwater drainage systems that outfall into the ponds and Mill Creek. The surface drainage area that discharges to NE Pond through the associated drainage systems is 3.843 square miles and the surface drainage area that discharges to NW Pond through the associated drainage system is 1.2 square miles.

Originally the waterbody was modified as part of the Hempstead Lake Reservoir system. When the Southern State Parkway was constructed, the waterbody divided into the NW and NE Ponds north of the new parkway with Hempstead Lake to the south. The Northeast Pond was designed to serve as the impoundment area/recharge area for drainage that discharged into the pond from the parkway outfalls and from Mill Creek at the northern end of the pond. Over time sediment loads and debris have modified the elevations and flow into and through the NE Pond. A photolog of the existing conditions is included as Appendix A to this document.

Overtime, the watershed draining into the NW and NE Ponds became more impervious and the flow into the ponds more polluted. There are significant floatables deposits, sediment load and oil residue apparent near many of the outfalls, and water sampling showed elevated levels of pollutants in the first flush volume. The high sediment load has filled the creek channel and the high velocity of the runoff has resulted in significant erosion of the channel depositing sediment in the wetlands and ponds within the Park. Soil sampling indicates elevated levels of contamination in the sediments throughout the NW and NE Ponds.

Sometime prior to January 2012, the NW Pond Dam had been breached. Since that time, the dam's wooden piles have mostly rotted away underneath the concrete slab and there are numerous voids where the embankment material has been washed away. The initial breach lead to the conversion of open water habitat to emergent wetland habitat. While the breach continues to grow as the embankment erodes, the water levels of the NW and NE Ponds are lowering. The current water level is approximately elevation 21 feet, but varies seasonally with the ground water levels.

2. ALTERNATIVES CONSIDERED BUT NOT ADVANCED TO DESIGN

A. No Action Alternative

Under the No Action Alternative, floatables, sediment and contamination will continue enter the NW and NE Ponds without any controls to prevent or reduce the spread of pollution throughout the Park and downstream environments of the Mill River, and eventually the bay. Additionally, under the No Action Alternative, the breach of the NW Pond Dam will not be addressed reducing the stormwater retention capacity of the NW and NE Ponds, and continuing to allow uncontrolled flow of water to leave the NW Pond and enter Hempstead Lake, which is likely to lead to the long-term drying out of the emergent wetland habitat that established following the breach of the NW Pond Dam.

B. Offsite Alternatives

Various offsite alternatives were considered but disregarded as not feasible. The Mill River Watershed comprises approximately 10,000 acres in a densely developed, urban environment. The sources of pollution outside of the Park (stormwater drainage systems) are too voluminous to effectively mitigate the floatables, sediment and contamination entering the Park. Additionally, the steep banks and surrounding topography of the 1,200 linear-foot portion of the Mill Creek upstream from the NE Pond would make the installation of sediment basins and floatable catchers infeasible.

C. Repairing the NW Dam to Historic Elevation

Repairing the NW Pond to its former elevation of 27 feet would result in the drowning of emergent wetland habitat that has developed along the shores of the NW Pond as a result of the dam's breach. Therefore, this alternative was disregarded in order to preserve and maintain the extensive wetland habitat that has formed in NW Pond.

3. DESCRIPTION OF THE PROPOSED ACTION

The New York State Stormwater Management Design Manual ("Design Manual") was utilized as the basis for the development of the design criteria. The Design Manual identifies the water quality storm event of the 90% rainfall event (estimated to be 1.5"/24-hour) as the ultimate goal for improving the water quality, when considering that the watershed area, and its impervious percentage, would not be modified by this project, and the project's location within a public park with natural wetlands, other sensitive natural habitats and public use space, provide limited space for stormwater mitigation. Assessment of the capacity of the permitted design will determine the level of achievement under the 90% storm event treatment goal.

The Proposed Action would mitigate the pollutant loads that enter the ponds and wetlands by constructing methods to collect floatables and sediments and by enhancing wetlands that will filter pollutants from the runoff. Installation of these measures will improve the water quality in the Park and reduce pollutant loading downstream to the bay. The Proposed Action includes wetland enhancement efforts that will result in a loss of 1.7 acres of wetlands within the NW and NE Ponds (a reduction from 56.39 acres to 54.69 acres, or a 3.0 percent loss, of wetland habitat within the NW and NE Ponds). The loss of 1.7 acres of wetlands will be substantially offset by the positive improvements to the overall NW and NE Ponds area, including significant functional amelioration to existing wetlands.

The components of the Proposed Action are described below. Appendix B includes the Wetland Assessment Maps on which the proposed action is overlaid on the delineated wetlands. Additional design information is contained on the Design Plans which are submitted under separate cover.

A. Northeast Pond - Mill Creek

The primary flow into NE Pond is from the segment of Mill Creek (aka Horse Brook) north of the pond adjacent to Peninsula Boulevard. The Mill Creek drainage area is 2440.46 acres (3.8 mi^2) and predominantly urban. The drainage system is predominantly piped and discharges into the open channel beginning at Tyler Avenue approximately 2000 feet north of the NE Pond. The creek flow velocity dissipates after passing a berm as the channel widens and enters the NE Pond within the Park causing floatables, debris and sediment to be deposited and accumulate in this location and can be carried throughout the ponds during periods of high water and flooding from larger storm events.

- Channel Bank Stabilization and Erosion Control - The Mill Creek channel will be stabilized from the north property line of the Park to the proposed creek channel retaining walls required for the floatables catcher construction, an approximate distance of 60 linear feet. The channel will be lined with rip-rap and open grid pavers, either gravel filled or seeded, to stabilize banks and reduce soil erosion. In addition, the high-volume flows through the wetland detention pond auxiliary spillway into NE Pond during significant storm events also requires that a stabilized spillway structure and side slopes be provided to prevent erosion and undermining of the structures. Constructed slopes within the project limits that are 1 in 3 or greater will be stabilized with coir mats or erosion control fabrics.

- Floatables Catcher - The proposed floatables catcher is a Trashtrap™ Netting System as manufactured by Fresh Creek Technologies, Inc. and distributed by Storm Trap and would be constructed at the location of the remains of the existing Brooklyn Waterworks brick structure to utilize existing topographic changes that channelize the flow prior to entering NE Pond. The design provides channel flow volume from the 1-year storm event to flow through a netting system to collect floatables. The proposed NE Pond floatables catcher is a stationary double netting system that is 3 feet in height by 25 feet wide with two rows of seven nets, each designed for a water quality volume ("WQV") flow of 875 cubic feet per second. The nets will have an opening size of 1½ or 2 inches to capture bottles but will allow smaller sized materials (i.e., leaves and organic matter) to pass through. The floatables catcher requires an access location from Peninsula Boulevard that will allow a maintenance vehicle with crane to lift the filled nets from the structure and drop into a trash disposal vehicle to transport to a disposal location as well as allow access to the floatables catcher to install replacement nets. The net system has a capacity to capture 1,200 CF of material. Capture rates will correlate to rainfall events; however, based on a collection rate of 12 times per year the annual volume of floatables removed is estimated to be 528 CY. Floatables that bypass the system during extreme flow events will be subject to capture in the downstream sediment basin, where it will be easier to remove them than if they are distributed downstream.

- Wetland Detention Pond – Detention ponds that provide capacity for 10% of the WQV can remove up to 70% of the sediment in the WQV, as well as associated oils, metals, and hydrocarbons. The proposed wetland detention pond would be constructed immediately downstream of the floatables catcher to collect sediment that would be carried to and impact the existing and proposed wetlands.

The wetland detention pond has been sized to contain the volume from 6.43% (8.23 acre-feet provided) of the 1.5-inch WQV (129.6 acre-feet). The proposed wetland detention pond will cover a 4.03-acre area and will have a main section of 6-foot storage depth and secondary section of 2-foot storage depth to the west to allow emergent vegetation to be established within the pond. Flow will enter the 6-foot deep basin which will allow sediment to settle before overflowing through the 2-foot depth sections into the filtering wetlands or wetland channel. Two of the wetland detention pond spillways will equally direct the WQV volume to the in-pond filtering wetland and the wetland channel. When larger storm events occur, a third auxiliary spillway will directly discharge to the NE Pond impoundment. The spillways are proposed to be gabion structures with rip rap slopes where runoff velocities indicate the need for slope stabilization. The development of emergent vegetation within the wetland retention pond will provide additional filtering of the runoff. The wetland detention pond outfalls will be designed to direct the WQV flow equally via service spillways to the in-pond filtering wetland and the channel to NW Pond. When the storm volume exceeds the WQV, the flow will begin to also flow directly into NE Pond thru the auxiliary bypass spillway.

- In-Pond Filtering Emergent Wetland - The in-pond filtering emergent wetland will be vegetated with native herbaceous wetland species within the NE Pond along the northwestern edge to slowly filter the runoff. The wetland detention pond overflow will be set to direct the first flush volumes to channels and the wetlands before flowing over the auxiliary spillway directly to the pond. Soils excavated for construction of the wetland detention pond and new soils will be used to raise the pond bottom elevation in the wetland area to the elevations required to vegetate the area with emergent wetland vegetation. The design for the 2.07-acre in-pond filtering emergent wetland includes forebays at each detention pond spillway and a permanent pool prior to the spillways into the permanent pond. The in-pond filtering emergent wetland will have bermed edge to contain the volume within the wetland with a stabilized spillway to direct the filtered runoff to an outfall into the NE Pond impoundment. Filtering wetlands can remove up to 25% of the nitrogen, 50% of the phosphorus, 60% of fecal coliform, and 40% of metals in the treated portion of the flow.

- Channel to NW Pond Enhancement – Historic construction documents from the SSP construction identify the NE Pond as an impoundment area with excess flows being routed from Mill Creek through the forested wetlands to a linear channel directly to NW Pond. Over time these channels and the pipe connection have been filled with sediment. During field visits assessing the site

conditions, the water in the channels appeared stagnant. Currently the channels may only be flushed during major storm events that flood the entire area. The wetland detention pond will be designed to direct first flush runoff equally to this channel and to the proposed in-pond filtering emergent wetland by developing an overflow structure that will divide the flow volume. The Proposed Action would reestablish the flow through these channels by removing debris, excavating sediment deposits, reconstructing the pipe connections, and revegetating the disturbed area with emergent wetland vegetation to redevelop a channel to filter the runoff directed to the in-pond filtering emergent wetland from the wetland detention pond. The existing wetland vegetation, including the scrub shrub vegetation, will be protected during construction and all accumulated debris cleaned from the area to improve the habitat.

- NE and NW Pond Connection Improvements – In its present condition, due to the sediment-filled channel from Mill Creek, the northern segment of NW Pond is stagnant except during large storm events. The proposed improvements will consist of the installation of NE Pond discharge inverts to handle the flow from a storm event in excess of the 25-year storm at three locations: 1) the existing southern culvert; 2) the proposed new culvert between the ponds; and 3) the reconstructed channel culvert. The inverts would be set at the same elevation of 24.75 feet to equalize the outflow, minimize stagnant pools and improve water quality within NW Pond. Once runoff enters NE Pond, water travels to the southern end of the pond to an existing creek segment that flows thru a pipe culvert to NW Pond.

B. Northeast Pond - Southern State Parkway Outfalls

The Southern State Parkway ("SSP") Watershed Area – Road runoff from the SSP is directed via a piped drainage system in the roads to outfalls along the southern shoreline of NE Pond. The SSP drainage area is 26.30 acres (0.041 mi^2) and discharges directly from pipe culverts to stone or concrete spillways into the NE Pond.

- In-Pond Filtering Emergent Wetland - The in-pond filtering emergent wetland will be vegetated with native herbaceous wetland species along the southeastern edge of the NE Pond. The construction of the in-pond filtering wetland will include forebays at each outfall location, to collect sediments, floatables and associated oils and hydrocarbons as well as debris, and allow for removal of these pollutants. Soils excavated for construction of the wetland detention pond and new soils will be used to raise the pond bottom elevation in the wetland area to the elevations required to

vegetate the area with emergent wetland vegetation. The wetland will have bermed edges to contain the runoff volume within the wetland with a piped spillway to discharge the filtered runoff into NE Pond. The forebays will collect sediments and associated oils and hydrocarbons as well as debris and floatables.

- Pedestrian Access and Educational Overlook – To improve the experience of visitors to the Park and specifically within the NW and NE Ponds, a new trail is proposed on the above described berm to connect the southeast NW Pond trail to the new NW wetland trail. The wetland bermed trail will allow visitors to walk between the wetlands and open waters of the pond. A deck with open grating surface is proposed at the pond to provide an overlook and space for educational programming and interpretation.

C. Northwest Pond - Pipe Outfall

Additional drainage flows into NW Pond from the 96-inch pipe outfall located on the west side of the pond. This outfall drains a 787-acre (1.23-square mile) watershed to the west of the NW Pond, which is predominantly residential. There is no mechanism in this system to collect sediment and debris prior to discharge into NW Pond, which allows the materials to enter and spread throughout the NW Pond.

- Wetland Detention Pond – Detention ponds that provide capacity for 10% of the WQV can remove up to 70% of the sediment in the WQV, as well as associated oils and hydrocarbons. The proposed wetland detention pond downstream of the 96-inch outfall will collect sediment that would otherwise be carried into the existing wetland. The proposed wetland detention pond is designed to contain the volume from 8.2% (3.25 acre-feet provided) of the 1.5-inch WQV (38.0 acre-feet.). The proposed wetland detention pond will cover a 0.93-acre area and will have main section of 3-foot storage depth and secondary section of 2-foot storage depth to the north to allow emergent vegetation to be established within the pond. Flow will enter the 3-foot depth section before overflowing through the 2-foot depth sections into the adjacent wetland areas. The spillway is proposed to be a gabion structure with riprap slopes proposed where runoff velocities indicate the need for slope stabilization. Construction of an access road will allow maintenance vehicle access to the basin. When the storm volume exceeds the 10-year storm, the flow will begin to overtop the pond berm and flow into NW Pond.

- Floatables Catcher – The proposed floatables catcher is a boom system that will be able to collect and remove floatables that are carried through the piped system into the NW Pond. The system is designed to collect the trash from the flow as it enters the detention pond. By installing a floatation boom with 12-inch skirt angled across the basin directing debris to collect at the shoreline near the proposed basin access ramp, the collected materials can be raked out, bagged, loaded on a pickup truck, and removed from the site on a regular basis.

- Improve Filtering through Existing Wetland – The existing wetlands to the north of the 96-inch outfall would be regraded to develop an extended channel from the detention pond spillway that provides additional filtering capacity through the wetlands before reaching open water.

D. Northwest Pond – Dam and Twin Culvert Replacements

The NW Pond Dam was constructed in the 1960s as an earthen embankment dam featuring two rows of wooden piles filled with semi-pervious materials and topped with an 11-inch concrete slab at an elevation of approximately 27.1 feet. The dam had two 24-inch diameter pipe culverts with valves that extend through and about 15 feet beyond the embankment on both sides. The outer portion of the dam includes concrete and asphalt rubble, although that was possibly added at a later date to prevent erosion.

The valves on the twin culverts ceased to function decades ago. And, sometime prior to January 2012, the NW Pond Dam had been breached. Since that time, the dam's wooden piles have mostly rotted away underneath the concrete slab and there are numerous voids where the embankment material has been washed away. The initial breach lead to the conversion of open water habit to emergent wetland habitat. While the breach continues to grow as the embankment erodes, the water levels of the NW and NE Ponds are lowering. The current water level is approximately elevation 21 feet, but varies seasonally with the ground water levels.

- Northwest Pond Dam Replacement - The proposed NW Pond Dam is a 230 feet long steel sheet pile dam with a concrete cap, featuring a 40 feet wide step weir set at elevation 21 and a top elevation of 25 feet. The proposed weir elevation will provide a stable water elevation to improve and maintain the extensive wetland habitat that has formed in NW Pond. The proposed elevation will also provide more effective storage volume within the NW Pond during a major storm event. The dam design also minimizes adverse impacts to the existing upstream drainage collection system

as well as the downstream culvert under the Southern State Parkway. The NW Pond Dam and the downstream outlet channel into Hempstead Lake have been designed to optimize the flow of water into the Hempstead Lake, with the flow of water leaving the Hempstead Lake Dam through the new control gates.

- Twin Culvert Replacement - The twin pipe culverts from the NW Pond to Hempstead Lake will be removed and the open channel and vegetated shoreline reestablished; a new pedestrian bridge will be installed over the open channel for access. The channel opening improves flow conditions from North Ponds into Hempstead Lake and creates a small amount of additional open water and wetland shoreline.

E. Additional Improvements

In addition to the proposed improvements within the ponds and wetlands to improve the filtering of storm flows into the ponds, further work is proposed that will result in significant improvements to habitats and use of the public space.

- Existing Debris and Floatables Removal and Disposal - Areas of shorelines within NW and NE Ponds are so covered with debris that wetland vegetation cannot grow. The *Floatables and Debris Investigation Existing Conditions Northwest and Northeast Ponds Hempstead Lake State Park* prepared by Cashin Associates in December 2016 estimated that the volume of debris within the NW and NE Ponds to be 11,000 CF or 17.3 tons. The existing visible floatables and debris are proposed to be removed during the construction phase of the Proposed Action prior to earthwork to prevent the materials from being mixed in when the soils are disturbed.

F. Operation and Maintenance of Wetland Detention Ponds and Floatables Catchers

After construction of the wetland detention ponds and floatables catchers, the debris and sediments that enter the systems will be efficiently collected and disposed of on a regular basis. Prior to the completion of construction, Parks will develop a Monitoring Plan and an Operation and Maintenance ("O&M") Plan that will outline the required monitoring and inspection periods for each component and the operations and maintenance methods. The O&M Plan shall follow *NYSDEC Maintenance Guidance Stormwater Management Practices September 7, 2016* or latest edition. Particular sections that apply

to NW and NE Ponds include Section 2.10 and 3.10 for Ponds and Wetlands and Section 4 Diagnostic and Maintenance Measures with particular attention to sub sections 4.7 Sediment Build-up and 4.9 Vegetation.

The minimum requirements to be addressed in the O&M Plan include:

i. Identification of operators for the Monitoring Plan and O&M Plan. Identification of entities that will be responsible for the inspections and management of the maintenance operation for each component. The operators will be the New York State Office of Parks Recreation, and Historic Preservation with the specific department or group identified during development of the Monitoring and O&M Plan.

ii. Periodic inspections and maintenance of the floatables catchers, detention ponds, forebays, berm embankments, service and auxiliary spillways. Inspection schedules will be driven by seasonal conditions and adjusted accordingly as conditions warrant.

iii. Prompt removal of large debris in the creek channels of ponds.

iv. Replacement of floatables collection nets when they reach capacity. Inspection and repair or replacement of damaged components on floatables catchers.

v. Removal of sediment when it reaches pre-determined storage elevations – considered to be 50% of the lower storage area.

vi. Periodic mowing of vegetation on berms to control growth of trees, brush and invasive species.

vii. Periodic inspection of safety components and immediate repair if necessary.

viii. Monitor the condition and growth of planted wetlands

Additional wetland vegetation monitoring will include the identification of transects, quadrats and fixed-point photo stations. These locations shall be photographed prior to construction, immediately after construction is complete, approximately one month after construction, after one year and then annually for an additional four years.

4. AVOIDANCE AND MINIMIZATION

The Proposed Action seeks to offset the impacts to the wetland and environment through design revisions during the development and through additional activities that will enhance the wetland and the surrounding

environment. The sections below outline the design revisions that have taken place during the development phases and the benefits presented by the Proposed Action for those aspects of the design where impacts could not be avoided. A series of conceptual and preliminary plans that illustrate the design progression are included in Appendix C.

Design Considerations and the Minimization Process

During the design process multiple design options for different aspects of the design were considered. The design options were developed through discussions with project partners, input from community members and feedback from field meetings with NYSDEC wetland representatives. Concepts were presented at public meetings and at meetings with the NYSDEC. Designs were modified as identified in the table below based on location, design concept, limitations and constraints. The table also identifies the minimization of wetland impacts or impacts to other habitats for each option. Appendix C - Design Progression & Options Maps includes the site plans by date where options considered are shown and then removed.

No work is proposed in the north end of Hempstead Lake due to the presence of a NYSDEC-identified Significant Natural Community and the lack of direct outfalls identified.

DESIGN OPTIONS CONSIDERATION TABLE					
Option ID	**Design Option Considered**	**Design Intention/Limitations**	**Implementation Constraints/Potential Impacts to Wetlands or Habitat**	**Appendix C Plan Includes Option**	**Appendix C Option Removed**
NORTHEAST POND					
NE-1	Locate Floatables Catcher and Detention Basin in NE Pond	Create an area for collection of debris and trash and sediments within the north section of the NE Pond. Design limited by flat topography prior to pond, large quantities of floatables and trash deposited north of pond; and lack of maintenance access in water.	Concept would require berm construction for 450 LF to channelized stream to carry flow into NE Pond. Avoided 0.23 AC of emergent wetlands impacts by conversion from emergent to upland berm. Impacts of 0.02 AC open water net loss by conversion of 0.13 AC to upland berm and increase of 0.11 AC by conversion of upland to channel.	1, 2, 3	4
NE-2	Construct Stormwater Wetlands at North End of Pond	Construct stormwater filtering wetland at north end of NE Pond. Design limited treatment of South State Parkway (SSP) outfalls located along southeast shoreline of the pond.	Concept would need to identify method and means to redirect portion of flow back to wetland channel to NW Pond. Avoided conversion of 4.0 acres of surface water to emergent wetland.	2 - 3	4
NE-3	Basin and Wetland Berm Height and Width	Berms elevation set to accommodate a 25-year storm event prior to overflow. Berm width 18'.	The berm height and width resulted in the creation of additional upland area within the pond open water. Lowering of the berm to the proposed 10-year storm event elevation and reducing berms width	1 - 5	6

DESIGN OPTIONS CONSIDERATION TABLE					
Option ID	**Design Option Considered**	**Design Intention/Limitations**	**Implementation Constraints/Potential Impacts to Wetlands or Habitat**	**Appendix C Plan Includes Option**	**Appendix C Option Removed**
			resulted in the avoidance 0.68 AC of wetland impacts.		
NE-4	Dredge NE Pond	Dredge sediments to the hard bottom for additional storm volume capacity and increased holding period, as well as providing improved habitat for aquatic species during the winter. Dredged materials proposed to be relocated within the pond to construct the filtering wetlands.	Due to elevated contaminant levels in sediments determined through sampling, the NYSDEC would have required disposal of dredged materials off Long Island. Cost would not be within the available project budget. There was no avoided impact to wetland or upland vegetation with this option.	1 - 11	12
NE-5	Alter Detention Pond Shape	Construct the detention pond north of the NE pond. Design limited by steep slopes, and property boundaries limit potential location.	NYSDEC wetland impact discussion led to reshaping of the detention pond to reduce scrub shrub wetland impacts along its western side. Reshaping the detention pond resulted in the avoidance of 0.17 AC (net) of forested wetland impacts.	4 - 9	10
NE-6	Expand Wetland By Upland Excavation	Excavation of upland western shoreline of NE Pond to construct additional wetland area.	Construction requires the removal of forested upland. Resulted in avoidance of 1.84 AC of impacts to upland woodland.	4 - 8	9
NE-7	Overlook and Education Gathering Space	Create an enlarged gathering space along the wetland pedestrian trail. Requires additional fill in open water.	Created additional upland area within NE Pond. Resulted in avoidance of 0.20 AC of open water wetland impacts.	7 - 11	12
NE-8	Revise Depth of Detention Basin for emergent planting.	Regrade bottom of basin to provide area for emergent planting. Grade changes reduces basin capacity.	Regrading area limited by major storm flow channel and erosion potential. Regrading provides 1.08 AC of vegetated emergent wetland planting within detention basin originally proposed as open water.	12	
WETLAND CHANNEL TO NW POND					
WC-1	Expand Wetland at Channels	Excavate and regrade east side of existing channels to increase wetland area and improve flow and filtering. Requires the removal of upland forest.	Scrub shrub wetlands in the channels are in good condition and would be impacted by this option as well as upland forest. Resulted in avoidance of 4.47 AC of upland forest impacts and up to 1.56 AC of scrub shrub impacts.	4 - 8	9
WC-2	Reshape and Revegetate Channels	Reshape the existing channels to improve flow and filtering without disturbance of west side of channel and upland forest area.	Scrub shrub wetlands in the channels are in good condition and would be impacted by this option. Resulted in avoidance of 0.49 AC of scrub shrub impacts along east side of channels.	9	10
NW POND					
NW-1	Construct Sediment and Floatables WQU within the Piped Drainage	Install floatables catcher and sediment collector water quality unit (WQU) on existing piped drainage system in the adjacent	Locating and installing a WQU was infeasible because it requires a location outside of Park's jurisdiction or the depth to pipe made	3 - 5	6

DESIGN OPTIONS CONSIDERATION TABLE					
Option ID	**Design Option Considered**	**Design Intention/Limitations**	**Implementation Constraints/Potential Impacts to Wetlands or Habitat**	**Appendix C Plan Includes Option**	**Appendix C Option Removed**
	System	street or upland park property	maintenance impossible. There was no avoided impact to wetland or upland vegetation with this option.		
NW-2	Install Floatables Catcher Netting System	Install a similar system to that proposed for NE Pond floatables catcher system. System requires channelized flow.	System determined not to be feasible because water depths of detention pond and lack of channelization would reduce collection levels. There was no avoided impact to wetland with this option.	6 - 7	8
NW-3	Dredge Sediment from NW Pond	Dredge sediment deposits to the hard bottom for additional storm volume capacity and increased holding period. Sediment averaged 6" in depth, resulted in achieving minimal increased water depth	Dredging of the entire sediment layer determined to provide no substantial improvement to the NW Pond. There was no avoided impact to wetland with this option.	3 - 5	6
NW-4	Create Park Trail along the South Side of the Ponds.	Create a multi-use trail within the park. Current access is along asphalt path on SSP shoulder but sloped grade south of pond limits locating a park trail.	Path location constrained by wetlands along shoreline and upland slope. NYSDEC recommendation to construct a retaining wall upland of wetland to raise elevation for an upland trail. Resulted in avoidance of 0.21 AC of wetland impact.	5 - 9	10
NW-5	Dredge habitat area in open water of NW Pond:	Dredge the center 1.6 acres of the lower portion of NW Pond and deepen to 6' depth to improve the pond habitat by providing fish and other aquatic species with overwintering areas and improving species survival when the pond level drops due to drought conditions. The volume of dredge was 12,000 CY which is proposed to be used to construct the detention pond at the pipe outfall and filtering wetlands.	Due to elevated contaminant levels in sediments determined through sampling, the NYSDEC would have required disposal of dredged materials off Long Island. Cost would not be within the available project budget. There was no avoided impact to wetland or upland vegetation with this option.	9 - 11	12
NW-6	Revise Depth of Detention Basin for emergent planting.	Regrade bottom of basin to provide area for emergent planting. Grade changes reduces basin capacity.	Regrading area limited by major storm flow channel and erosion potential. Regrading provides 0.43 AC of vegetated emergent wetland planting within detention basin originally proposed as open water.	12	
DAM					
D-1	Early Dam Design Analysis	Modelling of early designs for the weir identified factors that would impact how runoff flows through the entire system from North Ponds to South Pond and included different weir lengths, different starting water elevations, and storage volumes in the North Ponds	Flooding potential north and south of the Park limited the final design selected. Based on the original dam elevation, avoids flooding of 20.56 AC of the wet meadow and scrub shrub wetland that has established in NW Pond since the breach.	1 - 3	4

DESIGN OPTIONS CONSIDERATION TABLE					
Option ID	**Design Option Considered**	**Design Intention/Limitations**	**Implementation Constraints/Potential Impacts to Wetlands or Habitat**	**Appendix C Plan Includes Option**	**Appendix C Option Removed**
		with and without the center berm to develop recommendations for the proposed design. Various designs reviewed could result in flood condition either north or south of the ponds for some storm events			
D-2	Construct a Stepped Weir at dam	Design for the replacement dam was a stepped weir set at elevations 23/25/27 feet to approximate the existing water level conditions prior to the dam breach. Resulted in increase to open water from current condition with breach.	This design was modified to the current elevation 21.0 proposed design to further reduce impacts to the emergent wet meadow habitat. Avoids flooding of 18.23 AC of emergent and scrub shrub wetland that have developed since the dam breach.	4 - 6	7

5. ASSESSMENT OF WETLAND IMPACTS

The Proposed Action has been superimposed over the wetland mapping for the ponds and the impacts to the wetland and upland communities assessed. The Wetland Assessment Figures and Tables include detailed information on the impacts to wetlands in each location resulting from the work within the project area. The below provides a summary of the impacts to the wetland habitats within the NW and NE Ponds presented by each component of the Proposed Action.

A. Wetland Impacts by Project Component

i. Northeast Pond – Mill Creek

- Channel Stabilization – The installation of the grid pavers are within a 25’ by 50’ section of the open water creek. The location had previously stabilized bottom and the creek will continue to flow through this segment. The wetland quantification of this segment is included in the detention pond table below.
- Floatables Catcher – The floatables catcher structure is located to the same location and is of similar proportion to the brick wall structure that existed as part of the Brooklyn Waterworks facility. The structure will be installed within a 25’ wide by 50’ section of the open water creek. The location had previously stabilized bottom and the creek will continue to flow through this segment. The wetland quantification of this segment is included in the detention pond table below.

- Wetland Detention Pond –Due to the size of the 2440.46 acre watershed, a detention pond with an effective storage area of 2.6 acres is required. To enhance the habitat within the basin the bottom is proposed to have a deeper 6' section where runoff enters and where sediment will predominately be deposited, and a 2'deep section where emergent vegetation will be established within the basin. The impacts of the NE Pond wetland detention basin installation on the wetlands are shown on the below table. The detention pond installation results in a minor permanent loss of wetland with greater areas of conversion to open water and emergent vegetation and an increase in wetland area as a result of the conversion of upland to open water and emergent areas within the detention basin. The area of wetland loss is in a degraded condition because of sediment and trash deposition, and will continue to deteriorate unless trash and sediment input is alleviated.

Location		Impact Type				
	Wetland Class/Habitat	Permanent Loss	Conversion to Open Water (SW)	Conversion to Emergent	Temporary Displacement	Wetland Gain
WAA 1 & WAA 2 NE Pond - Detention Basin	Open Water (SW)	0.07	0	0.16	0	0.35
	Emergent	0	0.11	0	0.15	0.43
	Scrub Shrub	0	0	0	0	
	Forested	0.11	0.55	0.58	0	
	Total	0.18	0.66	0.74	0.15	0.78

- In-Pond Filtering Emergent Wetlands – The construction of the in-pond filtering wetland along the northwest side within NE Pond will result in the permanent loss of predominately open water area for conversion to emergent wetland with an additional wetland gain from conversion of upland to emergent wetland.. The impacts of the NE Pond Wetland C installation are shown on the below table.

Location		Impact Type				
	Wetland Class/Habitat	Permanent Loss	Conversion to Open Water (SW)	Conversion to Emergent	Temporary Displacement	Wetland Gain
WAA 1 NE Pond - Wetland C - Mill Creek	Open Water (SW)	0.72	0	2.32	0	0
	Emergent	0.02	0	0	0.04	0.15
	Scrub Shrub	0	0	0	0	
	Forested	0.04	0	0	0	
	Total	0.78	0.00	2.32	0.04	0.15

- Connection Improvements – The construction of the connection improvements between NE and NW ponds results in slight loss of scrub shrub wetland and a greater conversion of it to emergent wetland to allow for the sediments accumulated in the channels to be

removed and then revegetated with herbaceous species.

Location		Impact Type				
WAA1, WAA 3 WAA 4 - Improved Connections between channels and ponds	Wetland Class/Habitat	Permanent Loss	Conversion to Open Water (SW)	Conversion to Emergent	Temporary Displacement	Wetland Gain
	Open Water (SW)	0	0	0	0	0
	Emergent	0	0	0	0.02	0.05
	Scrub Shrub	0.05	0	0	0	
	Forested	0	0	0	0	
	Total	0.05	0.00	0.00	0.02	0.05

ii. Northeast Pond – Southern State Parkway Outfalls

- In-pond Filtering Emergent Wetlands - The construction for the in-pond filtering wetland along the southeast side in NE Pond result in the permanent loss of predominately open water for conversion to emergent wetland.

Location		Impact Type				
WAA 1 NE Pond - Wetland B -SSP	Wetland Class/Habitat	Permanent Displacement	Conversion to Open Water (SW)	Conversion to Emergent	Temporary Displacement	Wetland Gain
	Open Water (SW)	1.03	0	4.2	0	0
	Emergent	0.05	0	0	0	0
	Scrub Shrub	0	0	0	0	
	Forested	0.02	0	0	0	
	Total	1.10	0.00	4.20	0.00	0.00

iii. Northwest Pond - Pipe Outfall

- Wetland Detention Pond –. Due to the size of the 787 acre watershed, a detention pond with an effective storage area of 0.93 acres is required. To enhance the habitat within the detention pond, the bottom is proposed to have a deeper 3' section where runoff will enter and where sediment will predominately be deposited, and a 2'deep section where emergent vegetation can be established. The impacts of the NW Pond detention basin installation on the wetlands are shown on the below table. The detention pond installation results in a permanent loss of scrub shrub and emergent wetlands with additional conversion of areas of scrub shrub and emergent to open water and scrub shrub to emergent. These portion of areas are part of the 18 acres of wet meadow that established

after the dam breach as discussed below.

- Floatables Catcher – The floatables catcher is proposed to be located within the detention basin so the above discussion and below table are inclusive of the floatables catcher. No further impacts result from the floatables catcher installation.
- Improve Filtering through Existing Wetland – The proposed location of the detention basin overflow will allow for increased length of filtering through the existing wetland. The impacts for this component result in the conversion of 0.24 acres of emergent vegetation to open water and temporary disturbance for the work within the wetland

Location		Impact Type				
WAA 4 NW Pond - Detention Basin	Wetland Class/Habitat	Permanent Loss	Conversion to Open Water (SW)	Conversion to Emergent	Temporary Displacement	Wetland Gain
	Open Water (SW)	0.02	0	0.00	0.00	0.03
	Emergent	0.32	0.06	0.00	0.15	0.09
	Scrub Shrub	0.44	0.33	0.19	0	
	Forested	0	0	0	0	
	Total	0.78	0.39	0.19	0.15	0.12

iv. Northwest Pond - Dam and Twin Culvert Replacements

- Dam Reconstruction and Pipe Removal- Reconstruction of the dam at elevation 21 will preserve the wet meadow that has developed in NW Pond since the dam breach, and improve habitats in Northwest Pond. The breach has increased the vegetated wetland area within the system significantly, by an estimated 18 acres. The below table assumes the existing wet meadow that developed after the dam breach are existing and are not included in the wetland gains in the below table. Impacts to the 18-acre of wet meadow are discussed above in the section of the NW Pond - Pipe Outfall. The table includes the impacts to wetland for the construction of the new dam at the south end of the NW Pond and removal of outfall pipes into Hempstead Lake and the construction of an open channel. The permanent loss and temporary impacts are a result of the closure of the breach and the dam reconstruction. The conversion to open waters from the pipes results in conversion of upland to emergent and open water wetlands.

Location		Impact Type				
WAA 4 NW Pond - Dam Replacement, Flow Improvements & Improved Wetland Filtering	Wetland Class/Habitat	Permanent Loss	Conversion to Open Water (SW)	Conversion to Emergent	Temporary Displacement	Wetland Gain
	Open Water (SW)	0.003	0	0.01	0	0.041
	Emergent	0.02	0.29	0.00	0.39	0.01
	Scrub Shrub	0	0	0	0	0
	Forested	0	0	0	0	0
	Total	0.02	0.29	0.01	0.39	0.05

v. Additional Improvements

- Existing Debris and Floatables Removal –Approximately 3.87 acres of wetland and adjacent areas have heavy accumulation of debris to the extent that vegetation is seriously affected. The project proposes the removal of the debris from this acreage where the heavy debris load prevents vegetation from growing. Following removal of the debris, areas that are unvegetated will be raked out and seeded with native seed mixes specified for the appropriate to the water regime on the project plans to encourage additional native vegetation and habitat and prevent invasives from getting a foothold in the areas.
- Revegetation of Mown Lawn and Unvegetated Area – In addition to the revegetation of wetlands and upland areas discussed above, it is also proposed to revegetate currently unvegetated areas as discussed above and mown lawn areas with native species to improve the plant communities in the park. These include areas identified, because of their disturbed state, for use for construction staging operations. The areas where the revegetation of mown lawn areas that will serve as construction staging areas are proposed include the old horse paddock along the west side of NW Pond, a maintenance area west of the proposed NE pond detention pond and the large lawn area along Peninsula Boulevard. The project will include revegetation of all disturbed areas with native plant species appropriate to water and/or upland regime, which will increase the variety of species throughout the site. Following staging operation the soils in those locations will be deconsolidated and seeded with native upland seed mixes specified on the project plans. Revegetation of these areas with native species will encourage additional habitat and prevent invasive species from getting a foothold in the areas.

B. Summary Of Wetland Functional Assessment

i. EPW Re-Evaluation and Summary of Findings

The EPW functional assessment was re-evaluated to account for the design and operational changes to the project areas. The added benefits of potential offsetting actions were not included as part of the evaluation. The changes are reflected in WAAs 1, 2 and 4 only. The complete Evaluation of Planned Wetland Functional Assessment is submitted under separate cover.

The findings of the EPW functional assessment of baseline and planned conditions for each WAA are described below. Tables 1 through 4 provide a summary of the baseline and planned FCI and FCU values by function, the difference in scores, and potential additional wetland acreage required to attain baseline FCU values for each function. Under the Additional Wetland Acreage Required column, a positive value indicates the additional wetland acreage required at the planned wetland FCI score to have no net change in wetland functions, whereas a negative value indicates a surplus in FCUs provided by the planned wetland in response to enhancements in functional capacity.

WAA1 - Northeast Pond

The results for WAA1 show a net improvement in all four FCI scores and a net increase in three of the four planned wetland FCU values. Only Nontidal Fish FCU score declined which is strictly due to the reduction in open water habitat acreage; however, over 12 acres of improved fish habitat will remain. The open water that will be maintained within the created wetland detention pond was not included in this acreage as this open water area will not have a direct connection with the larger pond, though it will be deep enough to support a small fish population. The main drivers for the improved FCI scores and FCU values are due to the conversion of open water habitat to emergent wetland habitat which creates additional wetland types (emergent wetlands) with persistent and non-persistent vegetation to provide more diverse wildlife habitat and water quality treatment. In addition, the improvement in debris removal and water quality conditions due to the upstream floatables catcher and sediment basin also contribute to the functional improvement. Overall, the planned condition results in a surplus of FCUs that exceed baseline conditions.

Table 1. WAA1 – Northeast Pond EPW Scores and Additional Wetland Acreage Needs

Wetland Function	Baseline WAA			Planned Wetland			FCU Score Change (Planned FCU - Baseline FCU)	Additional Wetland Acreage Required to Attain Existing FCU Score (-1*FCU Score Change / Planned FCI)	Target FCU (Planned FCI x (Planned Wetland Area + Additional Wetland Area))
	FCI	Area (acres)	FCUs	FCI	Area (acres)	FCUs			
Sediment Stabilization	0.53	21.90	11.55	0.67	20.41	13.73	2.17	-3.23	11.55
Water Quality	0.33	21.90	7.14	0.54	20.41	10.92	3.77	-7.06	7.14
Wildlife	0.12	21.90	2.69	0.31	20.41	6.31	3.62	-11.71	2.69
Nontidal Fish	0.63	20.90	13.17	0.68	12.67	8.66	-4.51	6.60	13.17
Average Additional Wetland Acreage Required to Attain Baseline FCU Score								-3.85	

WAA2 - Mill Creek Forested Wetland

The results for WAA2 show a decrease in the FCI scores for two of the three functions, and a net decrease in FCU values for all three assessed functions. The primary reason for the reduction in FCU values is the permanent loss of 1.49 acres of forested and emergent wetlands within the WAA due to the construction of the sediment basin. The creation of an additional emergent and open water wetlands within the basin are reflected in the net increase of 0.47 acres in the size of WAA under the planned condition. The FCI scores for sediment stabilization function decreased slightly due to a change in cover types, and the wildlife function decreased primarily due to the simplification of the wetland habitat structure. The water quality FCI increased slightly due to the increase of vegetation in contact with water within the new emergent wetlands, and the benefits of the removal of debris, floatables and sediments by the upstream floatables catcher and sediment basin. Overall, the planned condition results in a deficit of FCUs compared to baseline conditions.

Table 2. WAA2 – Mill Creek Forested Wetland EPW Scores and Additional Wetland Acreage Needs.

Wetland Function	Baseline WAA			Planned Wetland			FCU Score Change (Planned FCU - Baseline FCU)	Additional Wetland Acreage Required to Attain Existing FCU Score (-1*FCU Score Change / Planned FCI)	Target FCU (Planned FCI x (Planned Wetland Area + Additional Wetland Area))
	FCI	Area (acres)	FCUs	FCI	Area (acres)	FCUs			
Sediment Stabilization	0.74	2.43	1.79	0.57	2.90	1.65	-0.13	0.23	1.79
Water Quality	0.64	2.43	1.55	0.69	2.90	2.01	0.46	-0.66	1.55
Wildlife	0.45	2.43	1.08	0.25	2.90	0.74	-0.34	1.35	1.08
Average Additional Wetland Acreage Required to Attain Baseline FCU Score								0.31	

WAA3 - Mill Creek Linear Scrub Shrub Wetland

The results for WAA3 show a decrease in the FCI scores for all three functions, and a commensurate decrease in FCU values. The decrease in both FCI scores and FCU values are primarily due to the conversion of a portion of a well-structured and high functioning scrub shrub wetland to a more mixed cover type with emergent wetland and a continuous open channel that receives stormwater runoff. While the planned wetland provides some added benefits such as increased plant-water interaction for nutrient removal, the channel limits the amount of sheet flow through the system to mostly the larger storm events resulting in a net reduction in the water quality score. The change in plant community structure results and changes to the extent of ponding due to the proposed channel and the culvert results in slight decrease in the wildlife function. The removal of debris, floatables and sediments by the upstream floatables catcher and sediment basin provides some benefit to the WAA and is factored into the scores. Overall, the planned condition results in a slight deficit of FCUs compared to baseline conditions.

Table 3. WAA3 – Mill Creek Linear Scrub Shrub Wetland EPW Scores and Additional Wetland Acreage Needs

Wetland Function	Baseline WAA			Planned Wetland			FCU Score Change (Planned FCU - Baseline FCU)	Additional Wetland Acreage Required to Attain Existing FCU Score (-1*FCU Score Change / Planned FCI)	Target FCU (Planned FCI x (Planned Wetland Area + Additional Wetlands Area))
	FCI	Area (acres)	FCUs	FCI	Area (acres)	FCUs			
Sediment Stabilization	0.95	2.32	2.20	0.67	2.27	1.52	-0.69	1.03	2.20
Water Quality	0.78	2.32	1.80	0.59	2.27	1.35	-0.45	0.76	1.80
Wildlife	0.54	2.32	1.25	0.42	2.27	0.95	-0.30	0.72	1.25
Average Additional Wetland Acreage Required to Attain Baseline FCU Score								0.83	

WAA4 – Northwest Pond

The results for WAA4 show a net improvement in three of the four FCI scores and no change in score for one function, Sediment Stabilization. An increase in three of the four planned wetland FCU values was also recorded. The only reduction in FCU score was for the Sediment Stabilization function which is due to the reduction in the WAA wetland area by 0.63 acres as a result of the construction of the sediment basin and pipe outfall protection. The approximately 1370 linear feet of new channel and plunge pool below the sediment basin is not included in the impact acreage. The main drivers for the improved FCI scores and net increase in FCU values include the restoration of the dam to provide more stable water levels, improvement in fish habitat with the stabilization and expansion of aquatic bed, emergent and scrub shrub plant communities, and the water quality improvements from debris, sediment and nutrient removal from the upstream floatables catcher and sediment basin. Overall, the planned condition results in a surplus of FCUs that exceed baseline conditions.

Table 4. WAA4 – Northwest Pond EPW Scores and Additional Wetland Acreage Needs

Wetland Function	Baseline WAA			Planned Wetland			FCU Score Change (Planned FCU - Baseline FCU)	Additional Wetland Acreage Required to Attain Existing FCU Score (-1*FCU Score Change / Planned FCI)	Target FCU (Planned FCI x (Planned Wetland Area + Additional Wetlands Area))
	FCI	Area (acres)	FCUs	FCI	Area (acres)	FCUs			
Sediment Stabilization	0.95	30.05	28.55	0.95	29.42	27.95	-0.60	0.63	28.5
Water Quality	0.71	30.05	21.41	0.88	29.42	25.98	4.57	-5.17	21.4
Wildlife	0.45	30.05	13.49	0.49	29.42	14.42	0.92	-1.88	13.5
Nontidal Fish	0.50	9.40	4.74	0.76	9.37	7.10	2.36	-3.12	4.7
Average Additional Wetland Acreage Required to Attain Baseline FCU Scores								-2.39	

6. ENHANCEMENTS AND OFFSETTING IMPACTS TO WETLAND HABITAT

This section identifies proposed enhancements and additional actions that offset the unavoidable impacts of the wetlands losses due to the proposed project.

A. EPW Assessment

i. Functional Assessment Results

The overall change in the FCUs from baseline condition to planned conditions for each WAA function are summarized below in the Table 5. The summary indicates that compared to baseline conditions, the planned wetlands would provide a surplus of FCUs for Water Quality and Wildlife, a small reduction in FCUs for Sediment Stabilization and Nontidal Fish. For Nontidal Fish, the reduction is due to the conversion of open water habitat to emergent wetland in WAA1, resulting in a reduction of open water habitat from approximately 29 to 12 acres, but increasing the functional value of the remaining fish habitat as demonstrated by the higher FCI score. The other functions in WAA1 would have positive increases in their functional capacity, and an even better result would occur for WAA4. Both WAA2 and WAA3 would have a loss of functional capacities, but for different reasons. For WAA2 the loss would be driven by the permanent loss of wetland acreage within the WAA. For WAA3, the loss would be due to the conversion of a high functioning wetland system to a slightly less complex system subject to more frequent stormwater flow.

Collectively, the planned wetland changes associated with the project would result in a net benefit and functional uplift within the collective wetland systems of the northern ponds to offset the permanent and temporary impacts to the wetlands and open waters in the project area. As such, no additional project measures are warranted to achieve a goal of no-net-loss of wetland functions.

Table 5. Overall Change in Functional Capacity Units

Wetland Function	Change in Functional Capacity Units				
	WAA1 Northeast Pond	WAA2 Mill Creek Forested Wetland	WAA3 Mill Creek Linear Wetland	WAA4 Northwest Pond	Cumulative Functional Capacity Unit Change
Sediment Stabilization	2.17	-0.13	-0.69	-0.60	0.76
Water Quality	3.77	0.46	-0.45	4.57	8.35
Wildlife	3.62	-0.34	-0.30	0.92	3.90
Nontidal Fish	-4.51	NA	NA	2.36	-2.15

ii. Additional Considerations

The EPW assessment does not assess two key areas of wetland functions that are applicable to the project and should be factored into any consideration of the functional uplift provided by project implementation.

Flood attenuation is a functional benefit of the proposed project but is not assessed within EPW. The proposed improvements at the WAA 1, WAA 2, and farther downstream at the Hempstead Lake Dam and South Pond Dam, have been designed to work together to attenuate the impact of large storm events on adjacent residential communities and to increase the safety of these structures to protect the downstream portion of the watershed. Restoration of the Northwest Pond Dam will result in lower peak flow elevations. Increased capacity within the Northeast and Northwest Ponds will also reduce flooding upstream and minimize downstream peak flows.

The EPW assessment also does not account for the water quality benefits that will extend downstream to Hempstead Lake, South Pond and ultimately to the Bay and surrounding tidal wetlands which are vulnerable to pollutant loadings from stormwater runoff and floatables (plastics) from urban areas. The proposed stormwater remediation measures for the Northern Ponds are estimated to remove up to 70% of sediments, 25% of nitrogen, 50% of phosphorus, 60% of fecal coliform and 40% of metals each year, as well as an estimated 500 CY (or 50 dump truck loads) of floatables debris, from the treated runoff volume from the associated drainage areas. The construction of pollution mitigation measures upstream, such as sediment basins, floatable and debris catchers, and filtering wetlands, will reduce the pollutant load entering the Mill Creek in the

storm runoff from urban areas, roadways, and densely developed residential neighborhoods. These actions upstream will benefit the overall health of the Mill River corridor and watershed, particularly the wetland system, and ultimately improve the tidal wetland complex, enhancing its resiliency during storm events.

B. Upland and Wetland Habitat Enhancements

The action proposes the construction of filtering wetlands in NE Pond. NE Pond was constructed as an impoundment area for runoff from the Southern State Parkway when it was constructed and separated the North Ponds area from Hempstead Lake. The impoundment design includes 3 on 1 side slopes that do not support a significant wetland habitat around the pond and does not include a method to collect sediment and debris carried into the pond in the storm runoff from the parkway drainage system, nor does it provide a beneficial solution for filtering of nutrients and bacteria from the runoff. As the land north of the NE Pond was further developed, the watershed became more impervious carrying greater runoff through the creek and pond during storm events and carrying greater loads of trash and debris and other pollutants in the runoff. In addition, the velocity of flow during the major storm events is scouring the creek channels and depositing that material into the north end of the park, modifying the flow channels through the park. The proposed action provides methods to reduce or filter the pollutant and actions to enhance the upland and wetland habitats as discussed below

i. Filtering Wetland Emergent Habitat Enhancement

The filtering wetlands within NE Pond have been designed to create additional habitat in NE Pond without sacrificing the storm storage volume or impact flood conditions north and south of the park. The filtering wetland locations proposed in NE Pond allow runoff from Mill Creek and from the Southern State Parkway outfalls to filter through wetlands prior to flowing into the main impoundment area of NE Pond. The interior filtering wetland plantings will be predominantly a emergent vegetation plugs planting with shrub planted in limited masses. All planting will be overseeded with native obligate or facultative species seed mixes to enhance the cover and aid in the stabilization of the ground surface as rapidly as possible. This area represents the creation of 6.3 acres of emergent wetland planting in a location that was previously open water.

In addition to the proposed filtering wetlands, the wetland detention ponds are designed to be constructed with two levels allowing for the section at the higher elevation to be vegetated with

emergent plant species. The basin design allows for the lower elevation to accumulate the majority of the sediment that enters the basin. The NE Pond wetland detention basin design with a 6' deep open water section and a 2' deep emergent planting section results in the loss of 1.22 acres of forested wetland and 0.02 acres of emergent wetland and provides for the establishment of 0.99 net acres of new emergent wetland.

ii. Pond Emergent Wetlands Habitat Enhancement

The new wetland edge of the NE Pond impoundment berm shorelines will be vegetated with native shrub species using live stakes in the low marsh, with the high marsh areas planted with emergent grass and herbaceous species with limited plantings of tree and shrubs that are appropriate to the high marsh water regime. The live stakes planting are proposed to stabilize the shoreline. All planting will be overseeded with native obligate or facultative species seed mixes to enhance the cover and will aid in the stabilization of the ground surface as rapidly as possible. This area represents the creation of 0.42 acres of emergent wetland planting in a location that was previously open water.

iii. Native Upland Meadow and Woodland Habitat Establishment

Conversion of Mown Lawn and Unvegetated Areas - In addition to developing new wetlands to filter storm runoff and pond edge wetlands where necessary for project construction, there are upland locations where the new vegetation is proposed that will be native species that will replace bare soils or mown lawn to improve the habitat diversity in the park. The areas include the lawn area adjacent to Peninsula Boulevard, a formerly Parks maintenance area located on the northwest side of NE Pond and an old horse paddock located on the west side of NW pond. These areas of approximately 3.5 acres total will be cleared, regraded and reseeded with native grass and herbaceous species seed mixes that will not require mowing.

These mown locations have also been identified as locations for construction staging to reduce impacts to vegetated areas of the site. After construction staging, the soil shall be deconsolidated and regraded.

Revegetation of Woodland Areas Disturbed by Construction - Where vegetation removal is necessary to construct the improvements and/or provide necessary public or maintenance access, revegetation with native upland species of trees, shrubs and herbaceous plants along with

overseeding with native seed mixes is proposed.

These locations where the excavation and/or regrading requires the removal of vegetated areas to construct the proposed action, including upland areas, revegetation with native species is proposed. These revegetation areas include regraded slopes to construct the multi-use trails connections and maintenance access roads. The revegetation proposes the use of native species of tree saplings planted at a rate of 300 per acre in masses per species (spacing approximately 12' on centers) that will return the area to woodland over time. The sapling plantings will be overseeded with appropriate native seeding to quickly provide surface cover vegetation to stabilize the newly graded areas. Over time this planting, totaling approximately 1.5 acres, will restore the woodland cover to these areas where the disturbance was necessary to construct the proposed action. As some trail connection are close to wetlands, the selected sapling and vegetative species will be appropriate to the water regime where they are planted.

C. Invasive Plant Species Removal and Planting

During construction, control of invasives will include removal of stands of *Phragmites* (common reed) and Japanese Knotweed encountered within the disturbance areas, including excavation of their root mass for disposal off site. In order to further enhance of the natural communities in the North Ponds area, NYS Office of Parks, Recreation and Historic Preservation (Parks) will develop an Invasive Species Management and Native Species Enhancement Plan (ISMP) that will address continuing management in the North Ponds area. The ISMP will be developed prior to and will be in place when construction of the proposed work is completed. This plan will address invasive species in both upland areas and wetland areas including areas that are not being disturbed as part of the proposed construction work. Invasive species addressed in this plan will be based on the New York Invasive Species Council (ISC) standardized list of known invasive species in New York and their statewide invasiveness rankings (ISC 2010). The ISMP will work in conjunction with the Monitoring Plan and Operation and Maintenance Plan described above.

The goals/planning steps that will be developed and provided in the plan include:

i. Inventory and Map Invasive Species.
ii. Prioritize Invasive Species for Control and Set Targets – Rank invasive species according to the feasibility of control and significance of impact on the environment. Determine realistic,

attainable goals for invasive species control.

iii. Control and Remove Invasive Species – Select control methods and develop removal plans.
iv. Native Species Enhancements – Plan enhancements, choose species, and plant native species.
v. Maintain Native Ecological Systems – Monitor sites to prevent re-invasion and to identify and maintain areas free of invasive species.
vi. Promote Stewardship – Train, educate, and provide outreach to staff and the public to provide ongoing support for plan success.

Preliminary assessment of the North Ponds area has identified invasive species including (but not potentially limited to) the species in the below table. By developing the plans outlined above, to target and control those species that are identified to be the most significant invasives, and then replanting and reseeding removal areas with native species, the native communities can be further enhanced and the habitat quality for wildlife species improved.

North Pond Invasive Species Observations	
Autumn olive	*Elaeagnus umbellata*
Bittersweet nightshade	*Solanum dulcamara*
Black locust	*Robinia pseudoacacia*
Brier	*Smilax sp.*
Bull thistle	*Cirsium vulgare*
Burning bush	*Euonymus alatus*
Chinese wisteria	*Wisteria sinensis*
Common mullein	*Verbascum thapsus*
Common reed/phragmites	*Phragmites australis*
English ivy	*Hedera helix*
Garlic mustard	*Alliaria petiolata*
Glossy buckthorn	*Frangula alnus*
Grape	*Vitis sp.*
Japanese angelica tree	*Aralia elata*
Japanese barberry	*Berberis thunbergii*
Japanese holly	*Ilex crenata*
Japanese honeysuckle	*Lonicera japonica*
Japanese knotweed	*Fallopia japonica*
Japanese maple	*Acer palmatum*

Mugwort	*Artemisia vulgaris*
Multiflora rose	*Rosa multiflora*
Norway maple	*Acer platanoides*
Oriental bittersweet	*Celastrus orbiculatus*
Porcelain berry	*Ampelopsis brevipedunculata*
Tartarian honeysuckle	*Lonicera tatarica*
Tree-of-heaven	*Ailanthus altissima*
White mulberry	*Morus alba*
Wineberry	*Rubus phoenicolasius*

D. Diversity Enhancement with Scrub Shrub and Forested Species Plantings

Where significant amounts of trash are currently lining the pond shoreline, particularly in NW Pond, the removal of the trash and debris will leave bare soils in low marsh and high marsh wetland areas exposed and vulnerable to establishment by invasive species. These locations offer opportunities to enhance the wetland communities by seeding with emergent vegetation and adding scrub shrub and red swamp planting in some locations. The predominant areas that will appear as potentially suitable for replanting are along the north and south shorelines of NE Pond from the shoreline to approximately 15 feet upland where the heaviest trash deposits are located and some of the areas where medium level deposits were assessed along both ponds' eastern shoreline. It is estimated that this revegetation could include at least two acres of wetland revegetation.

By maintaining the wet meadow that has developed in NW Pond, there is opportunity to enhance the wetland communities within the 18 acres by identifying locations where the planting of scrub shrub and forested wetland community plant materials may be added. This planting could compensate for some of the loss of those communities in other locations. A proposed location for planting with shrub and tree species into the existing wetlands includes along the shoreline on the western side of NW Pond between elevation 24.0 and 26.5 for an approximately 0.10 acre area.

Due to surface water elevation drop in NW Pond there are locations where a sandy unvegetated shoreline exists behind wetland plant growth at the new pond edge. To revegetate this area of open sandy shoreline along southwest bank of NW Pond, soil will be regraded to the current elevation of the willows along the shoreline and planted along the approximately 300' length by 10-15' width (0.10 acre) with scrub shrub alternately flooded species.

7. CONCLUSION

This report presents a summary of the impacts associated with a comprehensive project to enhance the NW and NE Ponds within Hempstead Lake State Park. New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) is implementing the Hempstead Lake State Park component of the Rebuild by Design Living with the Bay Project to protect and improve resiliency of the Mill River Watershed in Nassau County. The NW and NE Pond enhancement involves a comprehensive suite of projects intended to restore existing wetland functions, mitigate the flow of sediments and contamination into the ponds and river upstream, and prevent excessive amounts of floatables and other debris from entering the ponds and downstream waterways. The NW and NE Ponds project included the following components:

- Repairing the breached dam at the southern end of the NW Pond to stabilize water levels and increase stormwater holding capacity.
- Wetland enhancements to restore existing wetlands, increase emergent wetlands, and provide greater wetland diversity.
- Construction of wetland detention ponds to capture sediment loads and associated contaminants entering from the Mill River.
- Removal of excessive debris accumulation in wetland and shoreline areas from up-gradient watershed areas, and installation of a floatable collection system to intercept the floatables loading and allow collection for proper off-site disposal.
- Construction of filtering wetlands to provide treatment of stormwater runoff from the adjacent parkway drainage system.
- Stabilization of the Mill River shoreline immediately upstream of the NE pond to decrease sediment loading and improve habitat.
- Revitalization of upland buffers adjacent to the ponds to provide greater protection of wetlands and surface waters.
- Construction of trails and other visitor amenities to provide for public access and passive recreational use of the NW and NE areas of the park.

The nature and scope of improvements were established after a thorough analysis of existing environmental conditions and feasible alternatives, and a lengthy design process to identify project components that could avoid or minimize adverse impacts while achieving project objectives.

Although the selected project will result in a net loss of 1.7 acres of existing wetlands, environmental analyses indicate that the proposed action will offset that loss by improving the quality and function of existing wetlands, increasing and improving wetland buffers, and improving water quality and environmental conditions throughout the park and downstream Mill River. Offsetting measures incorporated into the project design will provide an overall ecological uplift to the NW and NE Pond areas, and substantially impact the short-term conditions and long-term functionality in the wetland areas, with associated benefits to water quality and wildlife habitats. The public access components of this project will allow public use in areas of the park now essentially unavailable to the public, and provide substantial benefits to community value in terms of opportunities for passive recreation activities and health value. The ecological and wetland benefits will strengthen the area's long-term resiliency to future storm events.

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APPENDIX A
EXISTING CONDITIONS PHOTOLOG

APPENDIX B
WETLAND ASSESSMENT MAPS

APPENDIX C
DESIGN PROGRESSION & OPTIONS MAP

APPENDIX D

EVALUATION FOR PLANNED WETLANDS

FUNCTIONAL ASSESSMENT

Available Under Separate Cover

APPENDIX E

DESIGN PLANS – DRAFT 90%

Included Under Separate Cover

Restoration of Northeast and Northwest Ponds Stormwater Remediation Project

Northwest Pond Dam and Pedestrian Bridges