SILVER LAKE DRAINAGE IMPROVEMENTS STUDY FINAL REPORT

New York State Governor's Office of Storm Recovery (GOSR) – Funded Disaster Recovery

Prepared For:

Nassau County Department of Public Works

DECEMBER, 2018

Governor's Office of Storm Recovery

Project Team:

LKMA

GEDEON GRC CONSULTING

ENG NEERS • PLANNERS • CONSTRUCT ON MANAGERS

GdB GAYRON de BRUIN Land Surveying & Engineering, PC

TABLE OF CONTENTS

Executive Summary

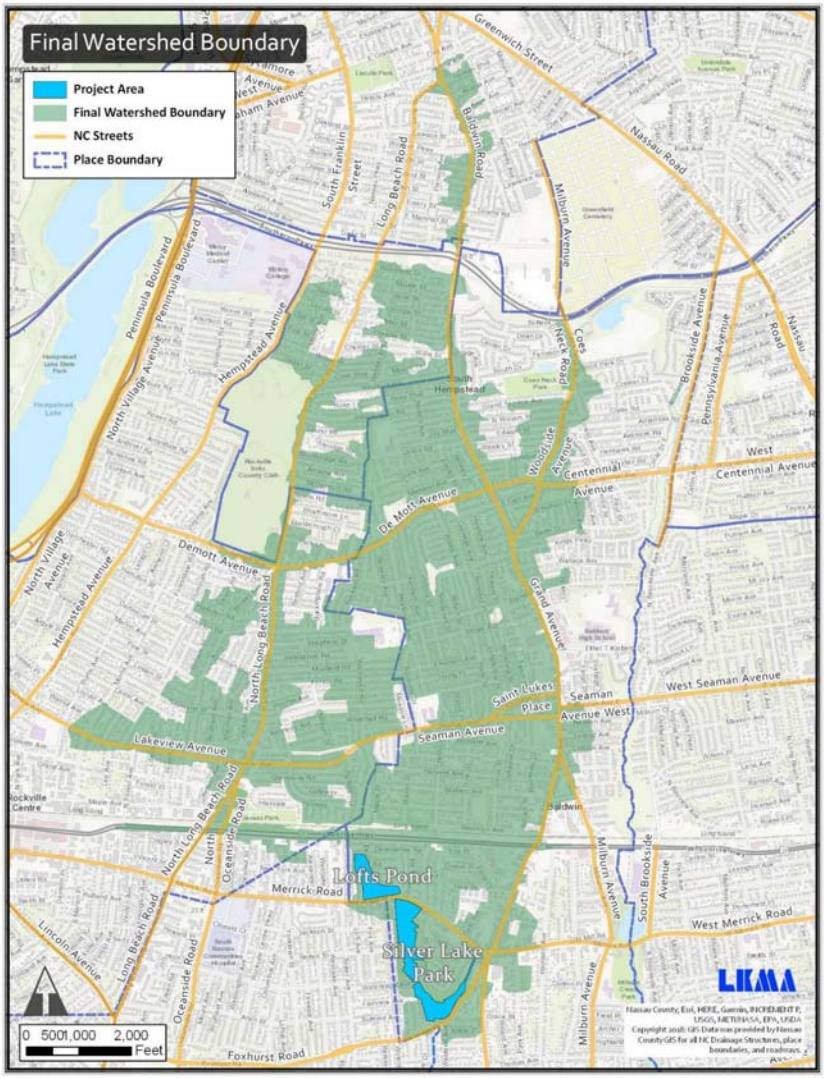
The purpose of this study is to identify deficiencies in the existing drainage system(s) of Silver Lake, located in Baldwin, NY, and develop alternative mitigation improvements that can be implemented within the available project budget. The Nassau County Department of Public Works is managing this project which is funded by and conceived through the NY Rising Community Reconstruction Program of the Governor's Office of Storm Recovery (GOSR). The available funds for constructing the project is approximately $2 million. However, this includes the cost of final design and construction inspection & administration. Assuming that final engineering and construction inspection services will be approximately 15% of the construction cost, the estimated funds available for construction is approximately $1.7 million. Proposed alternative improvements eligible under this grant shall benefit the area which encompasses Silver Lake Park and/or its neighboring properties. Eligible alternatives shall be improvements; replacement in-kind or repair type work is not eligible under this grant.

Project Study Area of Silver Lake Drainage Study

The need for this project is a result of regularly occurring flooding inside the confines of Silver Lake Park. This report identifies and documents that flooding can occur as a result of either tidal surges or heavy rainfall events. Additionally, the analysis indicates that a combination of both occurring simultaneously exacerbates the severity of the flooding.

An important aspect of this study was the coordination with the local residents and community stakeholders. In addition to four (4) community stakeholder meetings that were held at various stages of the study, two public meetings took place at Baldwin High School. These occurred on April 12, 2018 and October 22, 2018. These meetings were well attended, and the design team collected valuable data, and first hand reports from residents related to a variety of issues. In addition to the expected flooding issues that were known to occur at Silver Lake Park, the residents also voiced their desire that the project also aim to address important issues such as water quality, park aesthetics, and ecological improvements such as fish passage to Silver Lake and possibly Caroline's Pond.

In the preliminary stages of this project, the design team performed an extensive drainage inventory inside the upland 2,675 acre contributory watershed. Stormwater drainage data throughout the entire 2,675 acre watershed was gathered via a combination of record plans, geographic Information systems (GIS), field investigations, and limited topographic survey located mainly in the vicinity of Silver Lake Park. The drainage data collected was entered geospatially into a GIS database; which will be made available to Nassau County for future use.



Silver Lake Watershed Boundary

Watershed and upland drainage system data collected was used to develop an *AutoDesk Storm & Sanitary Analysis Software™* drainage model. This software utilizes USEPA Storm Water Management Model (SWMM) methodology as its engine, and is a complete dynamic flow routing model that performs advanced flow and hydraulic grade line calculations. Additionally, this software is capable of modeling the effects of tidal influence as well as tide gates / backflow check valves. The hydrologic and hydraulic analysis for existing and proposed conditions were all performed using this software.

Once the existing drainage model was created, the task of identifying feasible design solutions that can be implemented within the limited project funds commenced. As a result of limited funds, a variety of design components were developed to address the various Park issues that were voiced at the public and outreach meetings. As documented in the body of this report, the available funds will be able to pay for a combination of feasible alternative design components that will significantly improve the Silver Lake Park conditions with respect to flooding, aesthetics, water quality and ecology (i.e. fish passage). Additionally, since funds are limited, this report prioritizes the feasible alternatives so that the future public bid contract documents can incorporate the lower priority components as add-on alternatives in the case that the actual construction bid prices exceed the allocated budget.

It is notable that during the development of the Alternatives, a variety of design scenarios were evaluated in order to consider the various combinations of design rainfalls and tailwater elevations at Parsonage Creek Canal that can affect the hydraulic results. It is important to understand that this study did not have a specific design criteria that was required to be met. The recommended feasible high priority alternatives included in the report are a combination of proposed improvements aimed to most efficiently utilize the construction budget with a goal of also addressing the public's concerns.

As described in Chapter IV of this report, in addition to the feasible alternatives developed, the design team also identified some larger scale improvements that could provide a greater level of flood protection. However, as a result of the large scope and cost of these alternatives, they are not feasible within this project's construction budget. For example, the removal and replacement of the existing twin outfall culverts with larger high capacity outfall culverts and expanded Silver Lake weir was considered and analyzed. Although this potential improvement could provide an increased level of protection for Silver Lake Park, its cost alone (> $3 million) cannot be accomplished within the available budget. Hence, the recommended alternatives presented in this report are design components that have the potential to fit within the available funds.

The recommended Build Alternative (Alternative 1) is comprised of four (4) design components as follows:

Component 1. Elevate Perimeter Walkway of Silver Lake to Elevation 5.0' (NAVD88)

This design component would require raising the top of bulkhead elevation to a minimum of 4.0 (NAVD88) and elevating the perimeter walkway to an elevation of approximately 5.0' (NAVD88). Existing conditions observations, local resident accounts from the Public Meeting, and the drainage model indicate that that the existing bulkhead and walkway, which are at elevation 3.0' (NAVD88), flood on a regular basis as a result of either heavy rainfalls, tidal surges or a combination of both.

Since the proposed design will be raising the walkway approximately 2 feet higher than existing, the conceptual design section offsets the pathway approximately 10 feet from the edge of the lake so that pedestrians aren't walking next to a 3 foot drop without a protective railing. In order to provide safe access to the edge of the lake, overlook areas with railings can be provided at key locations around the perimeter. This treatment would be applied where there is existing bulkhead.

On the west side of the Lake where the existing shoreline is natural, existing vegetation which is mostly invasive species will be removed and the shoreline will be reshaped with fill to raise the landward pathway area above the elevation of 5.0' (NAVD88). The reshaped shoreline will be planted with native wetland species appropriate for the salinity levels in the lake.

On the east side of the Lake, the shallow vegetated area inside the perimeter walls will be excavated to remove the invasive vegetation, and regraded to re-establish an appropriate water depth. Excavated material from the lake will need to be disposed of at an appropriate upland area approved by the NYSDEC Materials Division.

The Estimated Construction Cost for this design component is **$797,000**

Component 1 - Photo-simulation looking west from Silver Lake Weir

Component 1 - Photo-simulation looking east from Silver Lake Weir east of Baldwin Creek Footbridge. Existing Invasive vegetation in lake to be removed.

Component 1 - Photo-simulation looking towards northwest area of Lake west of Parsonage Creek footbridge. Proposed sitting wall area and natural stone shoreline.

Component 2. Install Tide Gates on Silver Lake Outfalls

This component includes the installation of tidal gates on the Silver Lake outfalls to reduce the occurrence of flooding as a result of tidal surges. From field investigations, it was determined that although there is space to fit a tidal gate on the existing 10' x 7.3' eastern culvert outfall, there is not enough space to install a tide gate on the existing 6'x6' western culvert without reconfiguring the bulkhead on the west side of the canal.

Component 2 - Tide Gate Photo-simulation at Parsonage Canal Outfall

As a result of the limited space at the western outfall, this design component proposes to install the tide gate at a point between the culvert's inlet and outlet, inside the park. Since fish passage and normal tidal flushing of the lake are desired to be maintained, the conceptual design proposes the use of an "ecologically friendly" self-regulating tide gate (SRT) that stays open during the normal tide cycle and only closes when the tailwater elevation reaches an elevation that would cause upstream flooding. It is estimated that this elevation would be approximately 3.5' (NAVD88). These type of tide gates utilize a system of floats to close the gate at the desired elevation

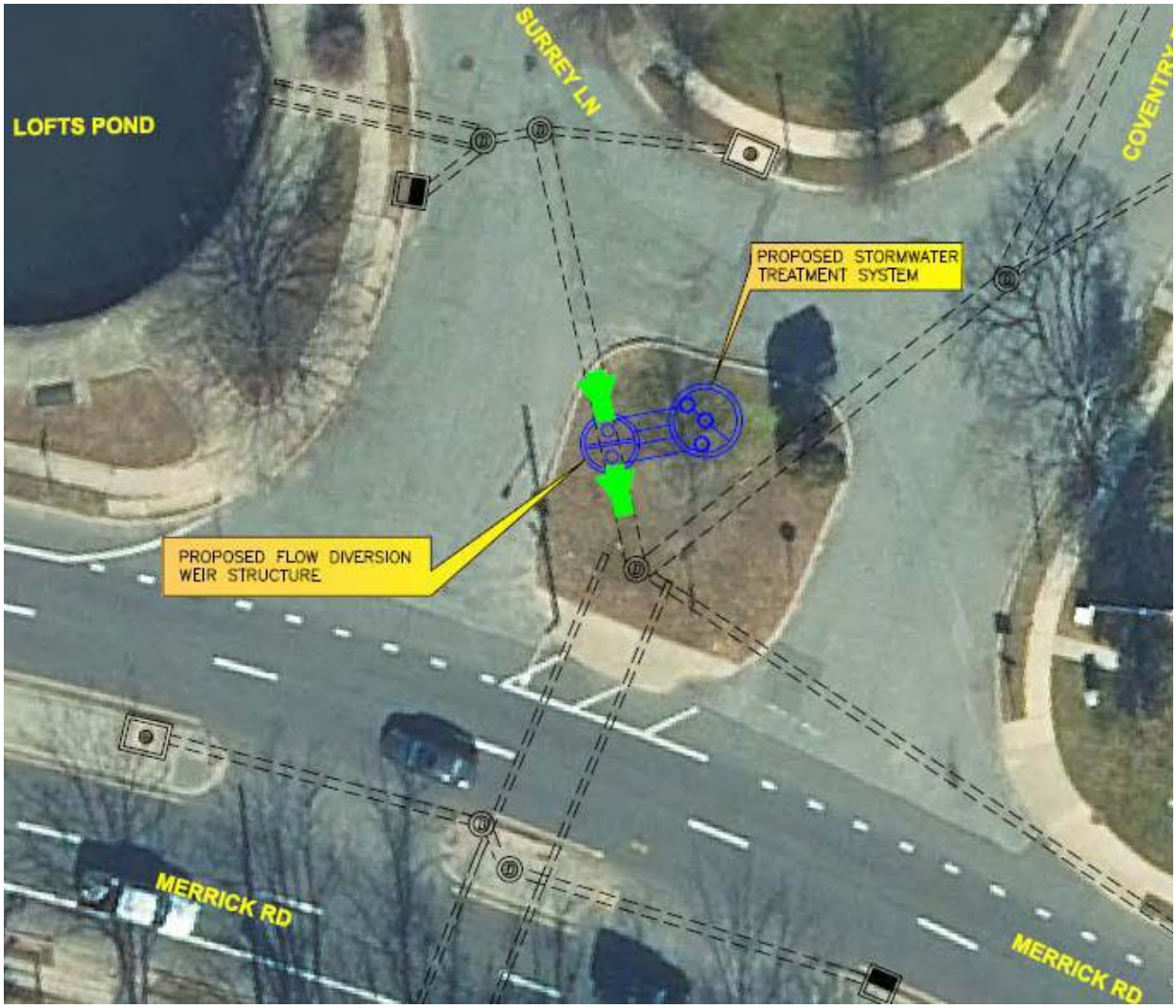
The Estimated Construction Cost for this design component is **$711,000**

Component 2 - SRT Tide Gate Photo-simulation at Parsonage Canal Outfall

Component 3. Install a Stormwater Treatment Device between Lofts Pond and the Natural Channel of Parsonage Creek Located South of Merrick Road

The purpose of this component is to improve water quality by capturing floatables, oils, and sediment coming from the Lofts Pond and the positive drainage system collecting runoff from the roadways in the vicinity of Coventry Road, Coventry Drive, and Surrey Lane. The proposed stormwater treatment system can be installed in a grass island located near the intersection of Surrey Lane, Coventry Road and Merrick Road.

The Estimated Construction Cost for this design component is **$174,000**



Component 3 - Conceptual Plan for Proposed Stormwater Treatment System

Component 4. Provide Fish Passage to Caroline's Pond

Currently the existing trapezoidal channel north of Wateredge Avenue, restricts fish passage during normal flow conditions as a result of inadequate depth of flow. This design component would address the condition by constructing a low flow channel below the invert of the existing trapezoidal channel. The fish passage channel would be sized to handle the measured base flow under dry weather conditions and would require a depth of approximately 12" for fish passage. In addition to the modifications to the trapezoidal channel, a small weir would need to be constructed across Parsonage Creek just south of the Wateredge Avenue culvert in order to increase the minimum depth of base flow during dry-weather conditions.

Component 4. Trapezoid Channel south of Caroline's Pond Currently Restricting Fish Passage. Proposed Location of Low Flow Channel for Fish Passage Depicted

The Estimated Construction Cost for this design component is **$97,000**

The Tables below show the results of the drainage analysis with respect to the maximum water surface elevations in Silver Lake and Caroline's Pond for a variety of design scenarios. The results are presented for the recommended design Alternative 1, which includes Design Components 1, 2, 3, & 4. Results in red indicate flooding and results in green indicate no flooding.

Silver Lake - Table of Maximum Water Surface Elevation (NAVD 88)			
Tide	Rainfall Event	Existing Condition Silver Lake Maximum Water Surface Elevation in Feet (Depth of Flooding above Perimeter Pathway El. 3.0 in Feet)	Alternative 1* Silver Lake Maximum Water Surface Elevation in Feet (Depth of Flooding above Perimeter Pathway El. 5.0 in Feet)
Normal Tide (Max Tidal El. = 2.682' NAVD 88)	Dry Condition	2.67 (0.00)	2.41 (0.00)
	1-Yr Rainfall	4.05 (1.05)	4.03 (0.00)
	10-Yr Rainfall	5.11 (2.11)	5.00 (0.00)
	100-Yr Rainfall	6.29 (3.29)	6.32 (1.32)
Highest Annual Tidal Cycle from Sandy Hook, NJ (2017) (Max Tidal El.=4.42' NAVD 88)	Dry Condition	4.42 (1.42)	3.03 (0.00)
	1-Yr Rainfall	5.03 (2.03)	5.00 (0.00)
	10-Yr Rainfall	6.05 (3.05)	6.09 (1.09)
	100-Yr Rainfall	6.53 (3.53)	6.54 (1.54)
Maximum Tide Before Overtopping Foxhurst Rd. (Max Tidal El.=5.90' NAVD 88)	Dry Condition	5.88 (2.88)	3.4 (0.00)
	1-Yr Rainfall	6.32 (3.32)	6.34 (1.34)
	10-Yr Rainfall	6.67 (3.67)	6.68 (1.68)
	100-Yr Rainfall	6.74 (3.74)	6.74 (1.74)
10 Yr. Stillwater (Max Tidal El.=6.40' NAVD 88)	Dry Condition	6.39 (3.39)	4.15 (0.00)
	1-Yr Rainfall	6.59 (3.59)	6.59 (1.59)
	10-Yr Rainfall	6.74 (3.74)	6.74 (1.74)
	100-Yr Rainfall	6.89 (3.89)	6.90 (1.90)

*Alternative 1-Tide gates implemented on both culverts exiting Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88)

Red Result Indicate Flooding
Green Results Indicate No Flooding

Caroline's Pond Table of Maximum Water Surface Elevation (NAVD 88)			
Tide	Rainfall Event	Existing Condition Carolines Pond Maximum Water Surface Elevation in Feet (Depth of Flooding above Bulkhead El. 5.0 in Feet)	Alternative 1* Carolines Pond Maximum Water Surface Elevation in Feet (Depth of Flooding above Bulkhead El. 5.0 In Feet)
Normal Tide (Max Tidal El. = 2.682' NAVD 88)	Dry Condition	3.32 (0.00)	3.32 (0.00)
	1-Yr Rainfall	5.93 (0.93)	5.93 (0.93)
	10-Yr Rainfall	6.66 (1.66)	6.66 (1.66)
	100-Yr Rainfall	7.00 (2.00)	7.00 (2.00)
Highest Annual Tidal Cycle from Sandy Hook, NJ (2017) (Max Tidal El.=4.42' NAVD 88)	Dry Condition	4.44 (0.00)	3.32 (0.00)
	1-Yr Rainfall	5.94 (0.94)	5.94 (0.94)
	10-Yr Rainfall	6.56 (1.56)	6.58 (1.58)
	100-Yr Rainfall	7.00 (2.00)	7.00 (2.00)
Maximum Tide Before Overtopping Foxhurst Rd. (Max Tidal El.=5.90' NAVD 88)	Dry Condition	5.92 (0.92)	3.42 (0.00)
	1-Yr Rainfall	6.61 (1.61)	6.62 (1.62)
	10-Yr Rainfall	7.00 (2.00)	7.00 (2.00)
	100-Yr Rainfall	7.16 (2.16)	7.16 (2.16)
10 Yr. Stillwater (Max Tidal El.=6.40' NAVD 88)	Dry Condition	6.41 (1.41)	4.15 (0.00)
	1-Yr Rainfall	6.84 (1.84)	6.84 (1.84)
	10-Yr Rainfall	7.07 (2.07)	7.08 (2.08)
	100-Yr Rainfall	7.19 (2.19)	7.19 (2.19)

*Alternative 1-Tide gates implemented on both culverts exiting Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88)

Red Result Indicate Flooding
Green Results Indicate No Flooding

Benefits of Recommended Design Alternative 1 (which includes Components 1, 2, 3, 4)

The recommended design alternative will reduce the occurrence of flooding in Silver Lake and will also address a variety of issues related to water quality, aesthetics, and ecology. Some of the main benefits are the following:

- Historical rainfall and tidal data from storms over the past 10-years were gathered and it was determined that over that past 10 years only five (5) storm events would have been severe enough to flood the Alternative 1 Conditions at Silver Lake. These are:
    - 3/13/10 (St. Patrick's Day Nor'easter; Peak Tide Elevation 6.21 with 1.74" rainfall)
    - 8/28/11 (Hurricane Irene)
    - 8/14/11 (Historic Long Island Flash Flooding; 7.8" Rainfall)
    - 10/29/12 (Superstorm Sandy)
    - 1/10/16 (January 10th Rain and Wind Event; Peak Tide Elevation 5.20 with 1.28" rainfall)

- Raising the perimeter walkway elevation above elevation 5.0' (NAVD88), and the installation of tidal gates will significantly reduce the occurrence of flooding as a result of regularly occurring tide surges that occur during the full moon, new moon and coastal storms. Elevation 5.0' (NAVD88) is significant because even if a 10-year peak rainfall occurs concurrently with the low tide period, the elevation in Silver Lake will rise to elevation 5.0' (NAVD88) as a result of the existing weir and culvert outfall capacity limitations.

- The alternative will mitigate flooding at Silver Lake for a design scenario that includes a 1-year rainfall (2.8" 24-hour storm) peak intensity occurring simultaneously with a 1-year tailwater elevation (Elevation 4.42' NAVD88). The design alternative will reduce walkway flooding compared to existing conditions by a depth of 2 feet for this scenario.

- The design alternative will mitigate flooding at Silver for a design scenario that includes a 10-year rainfall (5.3" 24-hour storm) peak intensity combined with a normal high tide of 2.62' (NAVD88). The design alternatives will reduce walkway flooding compared to existing conditions by a depth of 2 feet for this scenario.

- The installation of tide gates will significantly reduce the potential of flooding for Silver Lake and Caroline's Pond from a tidal surge up to a 10-year Stillwater elevation during dry weather or low intensity rainfalls.

- The design alternatives will remove existing invasive plants at the existing natural shoreline areas, and create sections of living shoreline with native plant species. This will improve the natural habitat of Silver Lake.

- The new walkways will replace the existing deteriorated asphalt walkways, and address ADA / PROWAG compliance.

- The overall aesthetics of Silver Lake Park will be significantly improved as a result of the new landscaped lake perimeter, overlooks and reconstructed walkway.

- The proposed stormwater treatment device, Component 3, will reduce the amount of floatables, oils and sediment entering the Parsonage Creek natural channel south of Merrick Road.

- The SRT Tidal Gate (Component 2) will maintain fish passage at Silver Lake by allowing the normal tide cycle range to continue to backflow over the outfall weir and into the lake. Additionally, the proposed fish passage design at Caroline's Pond (Component 6) will provide new fish passage to the Caroline's Pond habitat.

- The proposed fish passage, Component 4, south of Caroline's Pond will increase the natural habitat for ecologically important fish species such as river herring (alewife).

- Elevating the perimeter walkway around Silver Lake to elevation 5.0' (NAVD) from its existing elevation of 3.0' will help alleviate future issues that may occur as a result of potential sea-level rise. The NYSDEC has estimated that the Long Island Region can expect to be impacted by a rise in sea-level of approximately 8 inches to 30 inches by the 2050s.

Prioritization

The available funds for the construction project is approximately $2 million. However, this includes the cost of final design and construction inspection & administration (CI/CA). Assuming that Engineering costs for final design and CI/CA are approximately 15% of the overall project budget, this leaves approximately **$1.7 million for construction**. Since construction costs can fluctuate, and there is a possibility that all of the design components cannot be constructed within the project's budget, the following is the recommended prioritization of design components for the future Silver Lake Drainage Improvements:

Silver Lake Drainage Improvements – Prioritization Matrix		
	Flood Mitigation Level of Protection Provided by Component	**Construction Cost***
Component 1 - Elevate Perimeter Walkway of Silver Lake to Elevation 5.0' (NAVD88)	1-yr Rainfall Event with 1-yr Tailwater & 10-yr Rainfall Event with normal high tide	$797,000
Component 2. Install Tide Gates on Silver Lake Outfalls (See Appendix D for Plans and Details)	Dry Condition with up to a 10-year Tailwater	$711,000
Component 3. Install a Stormwater Treatment Device between Lofts Pond and the Natural Channel of Parsonage Creek Located South of Merrick Road	NA	$174,000
Component 4. Provide Fish Passage to Caroline's Pond	NA	$97,000
	Total Cost =	**$1,779,000**

***Costs above include a 20% contingency and do not include final design and construction inspection.**

Chapter I. Introduction

The purpose of this study is to identify deficiencies in the existing drainage system(s) of Silver Lake, located in Baldwin, NY, and develop alternative mitigation improvements that can be implemented within the available project budget. The Nassau County Department of Public Works is managing this project, which is funded by and conceived through the NY Rising Community Reconstruction Program of the Governor's Office of Storm Recovery (GOSR). The available funds for constructing the project is approximately $2 million. However, this includes the cost of final design, and construction inspection & administration. Proposed alternative improvements eligible under this grant shall benefit the area which encompasses Silver Lake Park and/or its neighboring properties. Eligible alternatives shall be improvements; replacement in-kind or repair type work is not eligible under this grant.

Figure I-1. Project Study Area of Silver Lake Drainage Study

To perform the necessary existing conditions analysis, an extensive drainage inventory inside the upland contributory watershed was completed. Stormwater drainage data throughout the entire 2,675 acre watershed was gathered via a combination of record plans, geographic Information systems (GIS), field investigations, and limited topographic survey located mainly in the vicinity of Silver Lake Park. The drainage data collected was entered geospatially into a GIS database using either on-site hand held iPad devices, in the case of the field inspections, or a GIS desktop applications, in the case of record plan information. Once the drainage inventory was complete, the drainage data in the GIS database

was imported into the *AutoDesk Storm & Sanitary Analysis Software™* drainage model. This software utilizes USEPA Storm Water Management Model (SWMM) methodology as its engine, and is a complete dynamic flow routing model that performs advanced flow and hydraulic grade line calculations. Additionally, this software is capable of modeling the effects of tidal influence as well as tide gates / backflow check valves. The hydrologic and hydraulic analysis for existing, proposed and future conditions were all performed using this software.

In addition to the drainage inventory and drainage model analyses, another important aspect of the development of alternative mitigation improvements was the public outreach meetings. This included four meetings with the Silver Lake Park Community Stakeholder Committee, and two well attended public information meetings held at Baldwin High School. These took place on April 12, 2018 and October 22, 2018. These meetings helped shape the recommended mitigation alternatives presented in this report.

Prioritization of the alternative improvements is an important aspect of this study because the construction budget on this project is limited and all potential improvements may not fit within the allocated funds. Additionally, if contractor bid prices come in greater than anticipated, only portions of the alternative improvements presented in this report will be able to be implemented. However, this report can serve as a guide for Nassau County on how to go about implementing drainage improvement projects as we proceed into the future.

This study was prepared by L.K. McLean Associates, P.C., with the assistance of Gayron-deBruin Land Surveying & Engineering, P.C. (GdB) and Gedeon GRC Consulting (Gedeon). Gayron-deBruin Land Surveying & Engineering, P.C. performed the topographical survey within the limits of Silver Lake Park and portions of the surrounding area. Gedeon GRC Consulting Assisted L.K. McLean Associates, PC with a portion of the drainage inventory north of DeMott Avenue.

Chapter II. Existing Conditions

A. Drainage Inventory & Base Map Generation

As an initial estimate for the Silver Lake watershed, a GIS application and USGS contour data was used to generate an initial watershed boundary. This boundary was used to identify the limits of the drainage inventory. A combination of Aerial Mapping, Record Plans (Nassau County & Town of Hempstead), USGS 2014 Coastal Lidar Contours, limited topographic survey, and field inspections were used to develop the base mapping, drainage inventory, and watershed boundaries of Silver Lake Park.

The Town of Hempstead Department of Public Works assisted the design team during the Drainage Inventory Phase of the project by providing their Master Drainage Record Plans (Figure II-1) in digital Adobe Acrobat (.pdf) format for a majority of the Town owned roadways located within the Silver Lake watershed. Due to the large size of the watershed (2,675 acres) which includes hundreds of Town owned roadways, gathering detailed as-built record plans of all the roadways in the watershed was not practical within the project schedule. However, the Town of Hempstead's Master Drainage Record Plans were sufficient enough to provide critical upland drainage system information such as drainage structure type (catch basin or manhole), approximate structure location and drainage pipe size.

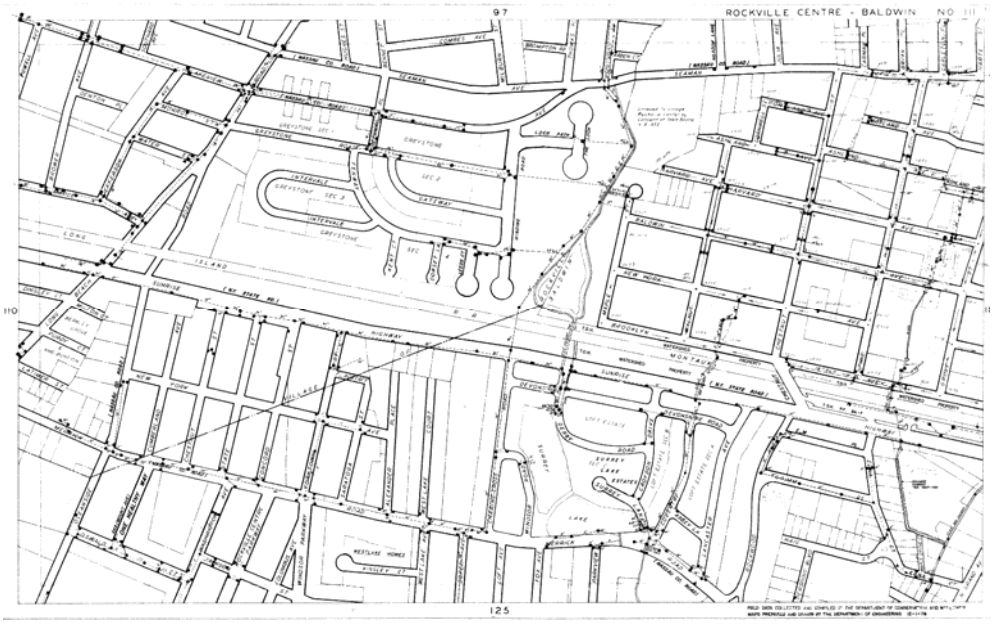


Figure II-1. Example of Town of Hempstead Master Drainage Record Plan

GPS enabled hand held devices (i.e. iPads) were used during the field inspections to input field data directly into the GIS based inventory where drainage structure locations were not available on record plans. Figure II-2 below provides the overall USGS watershed with completed GIS inventory.

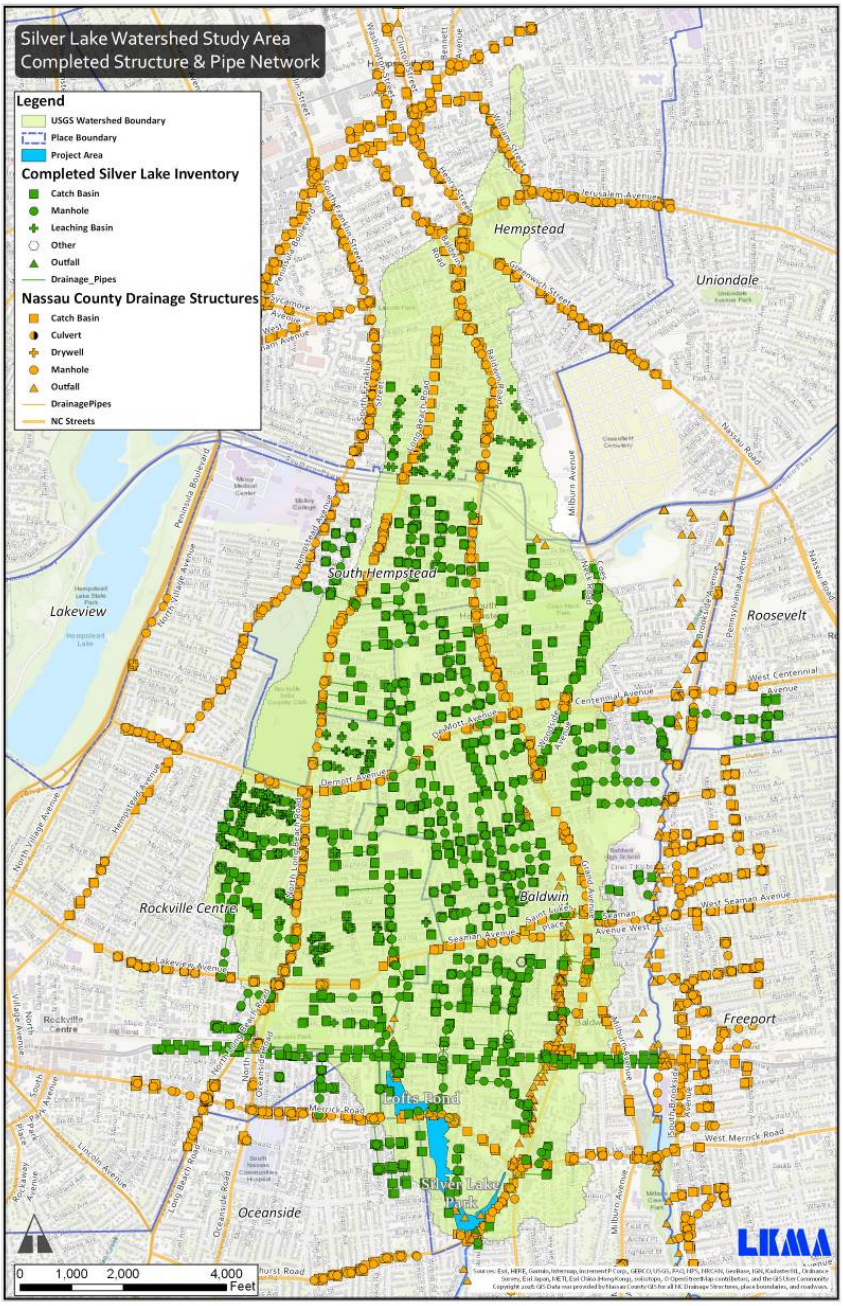


Figure II-2. Completed GIS Inventory for the Silver Lake Watershed Study Area

The GIS inventory included, wherever available, the following drainage information:

- Type of structure (i.e. catch basin, manhole, etc)
- Structure coordinate
- Depth to pipe inverts
- Pipe sizes, material and direction
- Rim elevation (extracted from 2014 USGS CMGP Lidar: Post Sandy, if not included in topographical survey)

B. Silver Lake Watershed

The GIS drainage inventory alongside 2014 USGS Lidar contours, aerial photography and field verifications were used to delineate 997 distinct sub-watersheds contained within the overall 2,675 acre watershed. These 997 sub-watersheds are collected by their own positive drainage system inlets that collect stormwater runoff which eventually flows to the surface waters of Silver Lake. Figure II-3 below shows all 997 sub-watershed areas overlaid on the initial USGS based watershed boundary. Any gaps within the original USGS watershed boundary were deemed self-contained and not included within the drainage model. The final watershed boundary can be seen in Figure II-4 below.

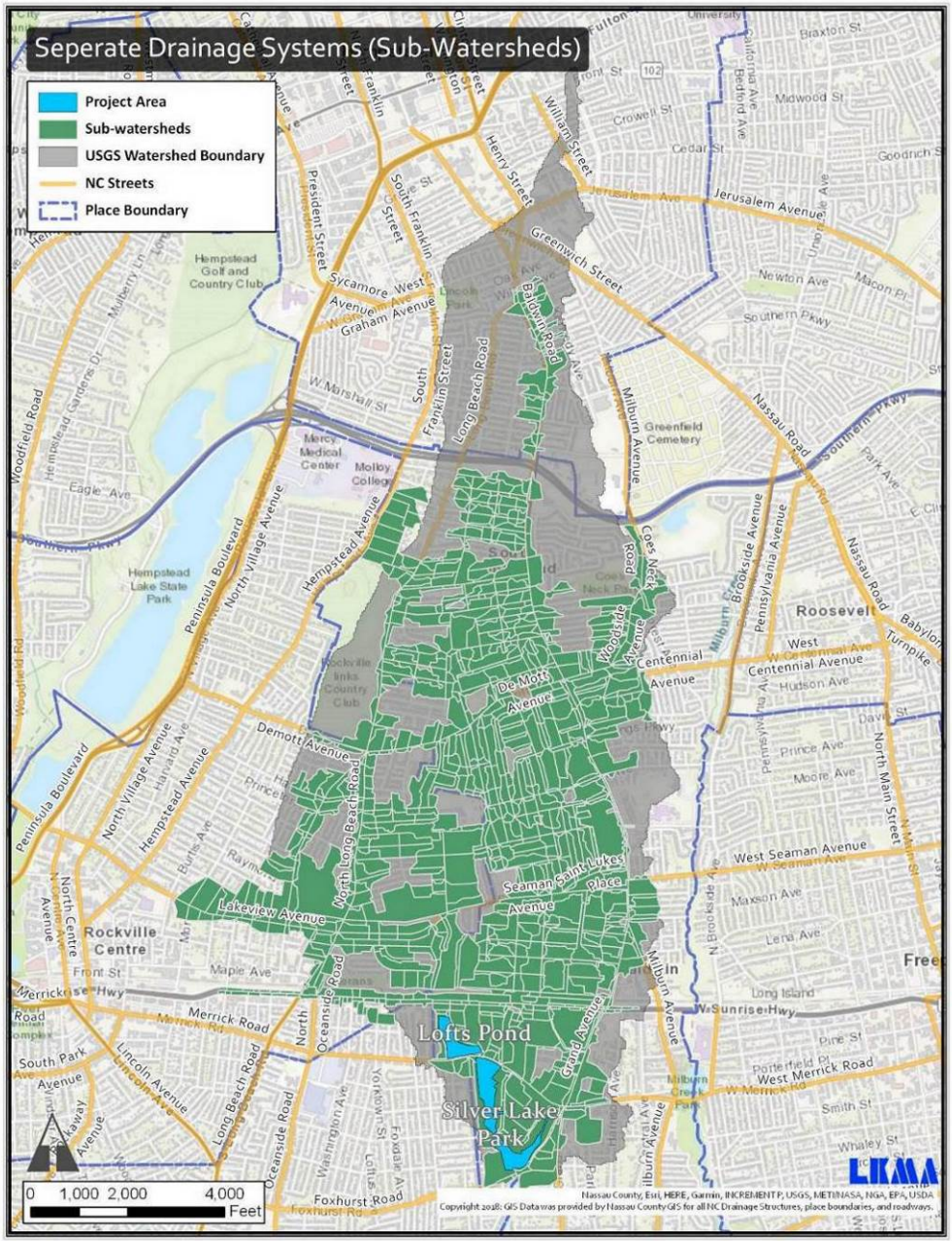


Figure II-3. Resulting Drainage Systems (997 Sub-watersheds)

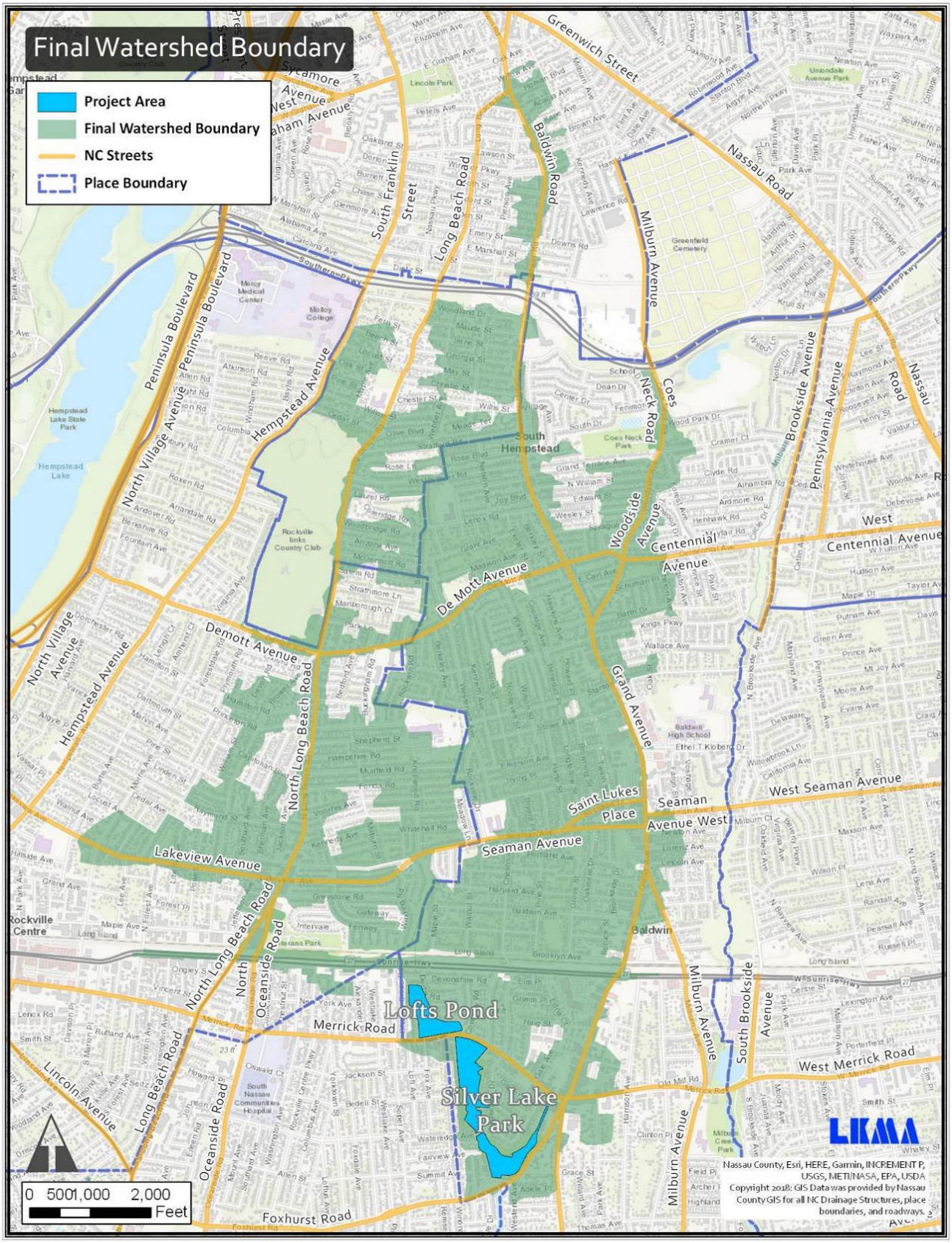


Figure II-4. Final Silver Lake Watershed Boundary

C. Public Outreach

Coordination with Residents – Public Meeting

During the inventory phase of the project and prior to the development of any alternatives, two highly attended public meetings were held on April 12, 2018 and October 22, 2018 at Baldwin High School. At the first meeting, the area residents shared their local knowledge with regard to the history of flooding in and around Silver Lake Park and gave their opinions as to what type of storm events result in flooding at Silver Lake Park (i.e. heavy rain, tidal surges, both). At the second meeting, the design team presented the proposed alternative improvements to the public and answered questions with regard to the project.

April 12, 2018 Public Meeting

At the start of the meeting, Nassau County Representatives and the design team presented the project overview, schedule and budget limitations. Subsequent to the presentation, residents were encouraged to talk to the design team, identify known flooding locations on a map, and fill out Flooding Information Sheets (Figure II-5) describing the issues they have observed. Information provided by residents at this meeting is included in Appendix D.

In general, the main consensus from the public was that a majority of the flooding events occur during storms that include a tidal surge. Additionally, they noted that heavy rain combined with a tidal surge will exacerbate the level of flooding. Lastly, the desire to improve the overall water quality and aesthetic appeal of the Silver Lake Park was a common concern of the local area residents.

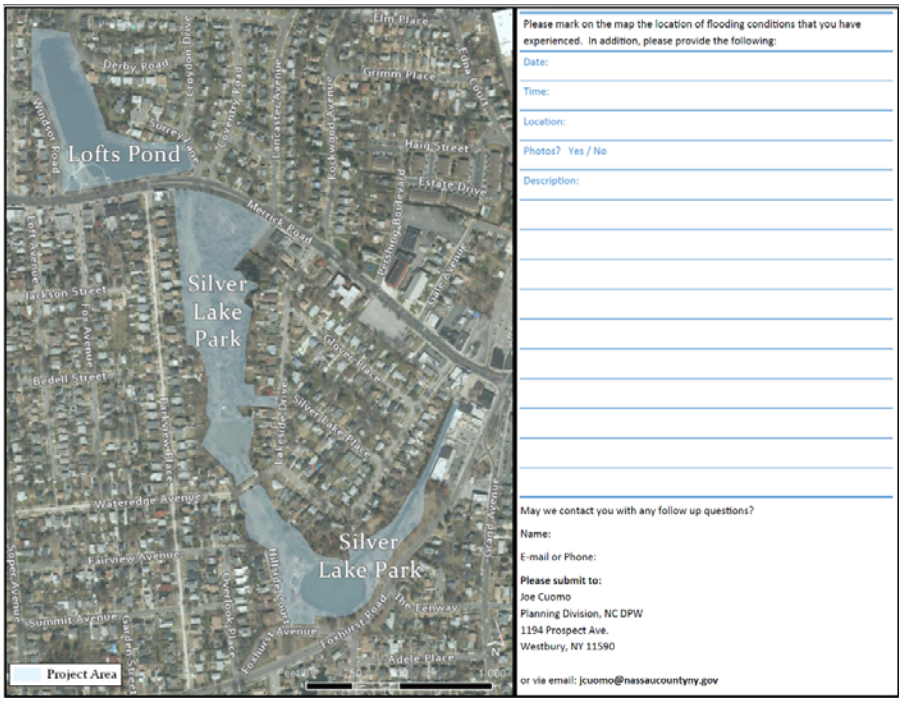


Figure II-5. Example of Flooding Information Sheet Residents at Public Meeting Filled Out

October 22, 2018 Public Meeting

At this meeting, Nassau County Representatives and the design team presented the findings of the drainage study as well as the proposed preferred alternative for the project both with poster boards and a PowerPoint Presentation. After the presentation, the design team fielded questions from the residents with regard to the project. Minutes of the meeting are included in Appendix B.

Outreach Meetings

Four (4) community Stakeholder meetings were held at the Baldwin Public Library during the progression of the project.

The first meeting was held on March 14, 2018 shortly after the commencement of the study. In attendance at this meeting were representatives from the consultant design team, Nassau County DPW, the Nassau County Local Legislator's Office, the Nassau County Executive's Office, HGA and GOSR. The purpose of this meeting was to review the design team's project approach, schedule and to discuss future public outreach efforts.

The second meeting was held on April 25, 2018 during the drainage inventory stage. Participants from the first meeting were also in attendance. In addition, this meeting had representatives from the Seatuck Environmental Association, Baldwin Chamber of Commerce, Baldwin Civic Association, and the Baldwin Fire District. At this meeting, the County gave an overview of the project, outlined the work performed to date, and discussed the "next steps" in the project. The design team presented various conceptual alternative ideas that would be evaluated during the study. These included: the installation of tide gates; increasing the impoundment capacity of the lake by raising the perimeter walls / natural shoreline; installation of trash racks to capture floatables; provisions for fish passage; replacement of the existing control gate at the weir to lower lake elevation prior to storm events; and the possibility of installing catch basin inserts or stormwater treatment devices on the upland positive drainage systems.

Stakeholders provided input on several of the conceptual alternatives discussed. Some main concerns provided by the Committee members include:

- Raising the perimeter of the lake with a natural "living shoreline" approach may require significant maintenance as a result of invasive species. It is preferable to simply raise the height of the perimeter bulkhead and pathway.
- Catch Basin inserts and trash racks need to be consistently maintained if they are going to be effective.

The representative from Seatuck Environmental Association made the following key comments about the conceptual alternatives:

- River herring have no issue passing over the weir of Silver Lake at high tide and suggested that a fish passage is only required at the culvert between Silver Lake and Caroline's Pond so that river herring can get upstream to Caroline's Pond.
- Creation of a living shoreline around the lake would be beneficial for the environment.
- A working control gate may help water quality of the Lake by bringing sediment to the marshes to the south which are currently deprived of sediment.

The third meeting was held on June 21, 2018. At this point in the project, the design team had begun developing the hydrologic and hydraulic drainage model, and had further progressed some of the conceptual design alternatives, based on the issues discussed at the second stakeholder meeting. Mostly the same representatives from the second stakeholder meeting attended the third meeting. At this meeting, County Representatives updated the group on the work performed to date, and the consultant design team described the advances in the design concepts, which included:

- Tide gates at outlet culverts – A traditional "flap type" tide gate can be installed at Parsonage Canal on the end of the existing 10'x7'-3" concrete box culvert. However, due to space restrictions in the canal, a tide gate on the western 6'x6' box culvert cannot be installed in the canal. In order to install a tide gate on the 6'x6' culvert, in must be installed in the park south of the Silver Lake weir and north of Foxhurst Avenue. It was recommended that this tide gate be a self-regulating tide gate (SRT) that will allow the normal tidal flushing of the lake up to mean high water and close at the desired tidal elevation for upland protection.

- Elevation of Perimeter around Lake for Additional Stormwater Impoundment – The design team explained that as a result of concerns expressed at the second stakeholder meeting, the new design approach to provide additional impoundment in the Lake will be to raise the perimeter wall / bulkhead and adjacent paths to the necessary elevation as determined by the drainage model. Areas around the perimeter of the lake, which currently are naturally vegetated, will be raised and replanted with new native plant species.

- Fish Passage at Caroline's Pond - Fish Passage in the trapezoidal concrete channel south of Caroline's Pond is not currently possible due to the shallow depth of base flow. The design team described that a proposed solution to provide fish passage would require changing the geometry of the bottom of the channel so that a depth of water approximately 12 inches deep is maintained at all times.

- Hydrodynamic Separation Unit Downstream of Lofts Pond – The design team explained that the natural channel north of Caroline's Pond and south of Merrick Road receives a constant base flow from a 36" diameter culvert that taps into the east end of Lofts Pond near Surrey Lane. In order to prevent floatables and debris from moving from Loft's Pond to the natural channel; a conceptual design concept is to install a hydrodynamic separator within the public right-of-way to capture and collect debris and sediment.

- Floating Debris Boom – Since keeping out floatables and debris from entering Silver Lake was a concern of the public, the design team proposed a conceptual alternative that would install floating debris booms upstream of Silver Lake along the two channels that feed the Lake. This is a low cost solution that can be maintained from the side of the channel.

- Refurbish or Replace Existing Control Gate at Weir – The concept of refurbishing or replacing the existing control gate located on the east side of the weir was discussed. The purpose of this improvement would be to have the ability to lower the lake elevation prior to an impending storm event so that additional stormwater

impoundment volume could be provided. The design team explained that the results of the drainage model will dictate whether or not this improvement has the potential to improve flooding conditions.

- Catch Basin Inserts on Upland Positive Drainage Systems Discharging to Silver Lake – The design team indicated that catch basin inserts can be considered as a low cost alternative to capturing debris and sediment before it enters Silver Lake. The County indicated that this type of improvement is not desired on County Roads, as they would not be able to adequately maintain them.

- Trash Rack at Loft's Pond Weir – The design team stated that preventing Loft's Pond floatables from entering Caroline's Pond may be accomplished by providing a trash rack at the Loft's Pond Weir. The concern with regard to this solution would be the aesthetic look of the trash rack, and the need for ongoing maintenance.

A preliminary estimate of the above conceptual design solutions was prepared and the design team indicated that all of the above alternatives may be able to be implemented within the available design budget. The presentation board from this meeting showing the location of the various conceptual design alternatives is shown below in Figure II-6.

The fourth Community Stakeholder Meeting was held on September 18, 2018. In attendance at this meeting were representatives from the consultant design team, Nassau County DPW, the Nassau County Local Legislator's Office, the Nassau County Executive's Office, HGA, GOSR, Baldwin Chamber of Commerce, Baldwin Civic Association and the Baldwin Fire District. The purpose of this meeting was to present the proposed design alternatives one last time before the final public meeting. At this meeting, the community panel made recommendations on some modifications to the public meeting presentation, and also voiced some concerns regarding long term maintenance of some of the proposed design components.

See Appendix B for minutes of stakeholder meetings and meeting presentation materials.

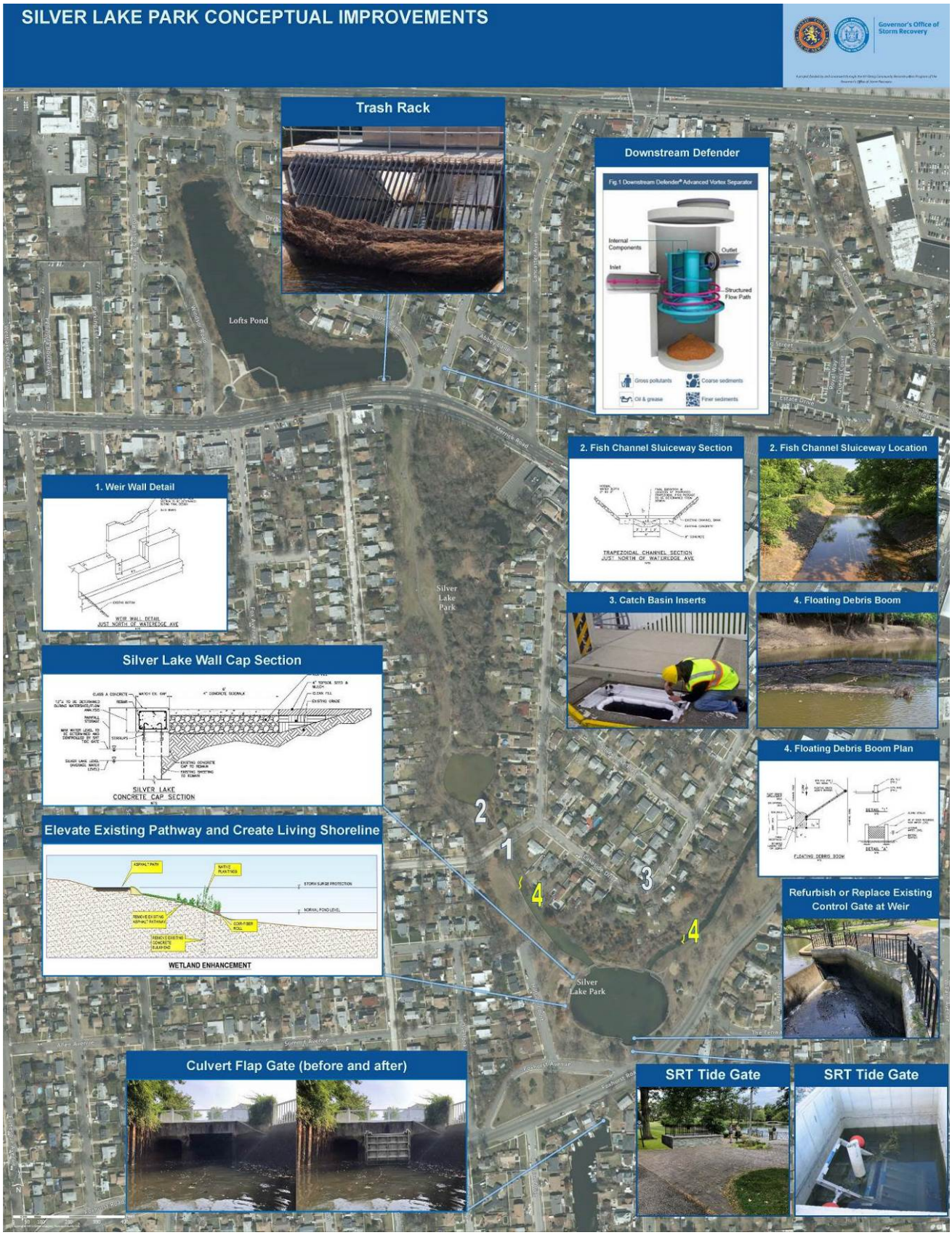


Figure II-6. Presentation Board from June 21, 2018 Community Outreach Meeting

D. Observed Flooding Locations

During the study period, our design team and Nassau County DPW representatives made site visits during rainfall events as well as full moon / new moon tidal events during dry weather conditions. Field observations of flooding were documented on the following dates:

Table II-1 – Observed Flooding Dates

Date	Rainfall (inches)	Moon Phase	Recorded Tide Elevations Freeport, NY (NAVD88)
March 2, 2018	2.16	Full Moon 100% Illumination	4.231’
July 10, 2018	0	Waning Crescent 10% illumination (3 days prior to New Moon)	3.12’

Observed Flooding

On March 2, 2018 significant flooding was observed at Silver Lake Park during peak high tide (Photo 1 & 2). On this date, the area experienced a combination of a 2.16 inch 24-hour rainfall and the local tidal gauges in Freeport, NY recorded a maximum water surface elevation of 4.231 feet (NAVD88). The flooding observed in the lake was approximately 1.2 feet above the top of bulkhead, which has a top of wall elevation of approximately 3.0 (NAVD88). The perimeter walkway around the pond was completely under water.

Photo 1. March 2, 2018 flooding observed in Silver Lake Park east of existing weir. Walkway is completely inundated with flood waters. Photograph taken at peak high tide.

Photo 2. March 2, 2018 flooding observed in Silver Lake Park west of existing weir. Walkway and benches are underwater and floatable trash is evident at the edge of the floodwaters.

Later in the day during the low tide period and while it was still raining, the design team revisited the site. It was observed that even though it was still raining, the flood waters receded below the top of bulkhead. This indicates that tidal surge was the main contributor to the flooding that occurred.

Photo 3. March 2, 2018 at Silver Lake Park east of existing weir. Flood waters have receded below the top of bulkhead elevation. Photograph taken at low tide.

Photo 4. March 2, 2018 at Silver Lake Park west of existing weir. Flood waters have receded below top of bulkhead elevation. Photograph taken at low tide.

On July 10, 2018, minor flooding of Silver Lake Park was observed and documented by Nassau County DPW (Photo 5 & 6). On this date, there was no rain recorded but an offshore storm combined with a period of time three days before the new moon resulted in the tide reaching an elevation of 3.12' (NAVD), which is slightly above the top of bulkhead elevation.

Photo 5. July 10, 2018 at Silver Lake Park east of existing weir. Tidal surge has breached the top of the existing bulkhead wall (top of wall = 3.0' NAVD)

Photo 6. July 10, 2018 at Silver Lake Park west of existing weir. Tidal surge has breached the top of the existing bulkhead wall (top of wall = 3.0' NAVD)

E. Existing Culvert Outfalls to Parsonage Creek Canal

There are two existing concrete box culverts downstream of the Silver Lake weir which convey flow from the lake to the tidal waters of Parsonage Creek canal. This culvert runs transversely below Foxhurst Road and through a drainage easement on private property located on the south side of the road. From 1980 record plans, it is apparent that prior to 1980 the system only had the eastern box culvert. As shown on the 1980 record plan below (Figure II-7), this culvert transitions from a 10'x5' box culvert to a 10'x7.25' box culvert before it outfalls into the canal. At some point after 1980, an additional 6'x6' concrete box culvert was installed most likely to increase the capacity of the system to handle the stormwater flows which may have been overwhelming the original design as a result of upland development and increased impervious areas.

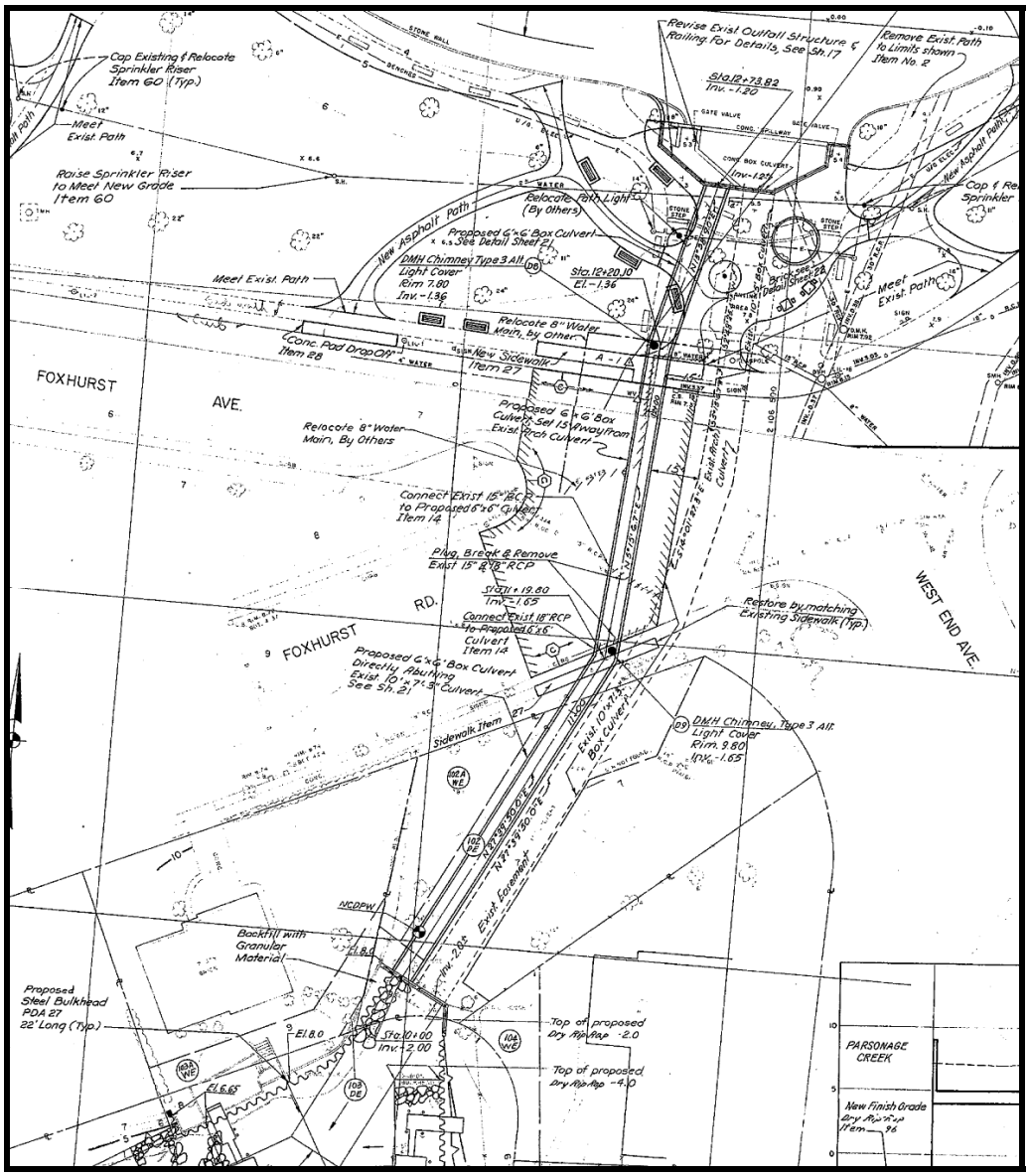


Figure II-7. Portion of July, 1980 Record Plan from the NCDPW Baldwin Creek Drain Flood Relief Project

As depicted on the 1980 record plans and shown in the photograph below the culverts terminate at the north end of Parsonage Creek Canal without any tide gates. Also evident is that the western wall of the 6'x6' culvert terminates basically in-line with a deteriorated steel bulkhead leaving insufficient room for a tide gate to be installed on the 6'x6' culvert.

Photo 7. Photograph of existing box culvert outfalls at Parsonage Creek Canal.

F. Parsonage Canal Bulkheads and Foxhurst Road Elevations

The twin box culvert outfalls from Silver Lake flow below Foxhurst Road and discharge into the tidal waters of Parsonage Canal. As part of our design team's drainage inventory, top of bulkhead elevations were surveyed on both sides of the canal for a distance of approximately 1,000 feet (See Figure II-8). Additionally, the roadway crown elevation of Foxhurst Road was surveyed from Overlook Place to The Fenway (Road), a distance of approximately 1,000 feet. The purpose of collecting this data was to determine the elevation that a tidal surge would overtop the canal's bulkhead and Foxhurst Road, and spill over into Silver Lake Park. Thus, making any proposed tidal gate alternatives ineffective.

What is apparent from the collected information is that bulkhead elevations in the canal vary from approximately 3.42 to 8.20 (NAVD88) with a majority of the bulkheads being in the range of elevation 4.0 – 5.5 (NAVD88). It is evident that when tidal waters elevate above the elevation of approximately 5.0 (NAVD88) flooding will begin to occur on West End Avenue.

Additionally, topographical survey on Foxhurst Road indicates that the low point of the roadway is located approximately 200 feet east of West End Avenue and is at elevation 6.13 (NAVD88). Since the intersection of West End Avenue and Foxhurst Road is at an elevation of approximately 6.25 (NAVD88), it is evident any tidal surges in excess of elevation 6.25 (NAVD88) will overtop Foxhurst Road and spill over into Silver Lake Park. It is notable, that this elevation is 0.15 feet lower than the FEMA 10-year Stillwater[1] elevation of 6.4' (NAVD88) and 1.65 feet lower than the FEMA 100-year Stillwater elevation of 7.9' (NAVD88).

[1] Stillwater means the flood level not including the effects of waves

Figure II-8. Parsonage Creek Top of Bulkhead Elevations & Foxhurst Road Crown Elevations (NAVD88)

G. Silver Lake Weir

The Silver Lake weir is located on the south side of the lake and controls water surface elevations in the lake by passing base flow and stormwater over a 52 foot wide spillway. The weir elevation is at 2.0 (NAVD 88) which is approximately 1 foot below the top of bulkhead that runs around the perimeter of the lake. The 1980 Record Plan indicates that the weir length was increased to accommodate the additional 6'x6' concrete culvert installed as part of the *Nassau County DPW Baldwin Creek Drain Flood Relief Project*.

Photo 8. Photograph of existing Silver Lake weir at low tide

H. Control Gate

One control gate is located at the east side of the weir structure. The purpose of a control gate is typically to allow the lake to be drained for maintenance or for lowering the water surface elevation prior to an anticipated rainfall event for additional storage capacity. Based on the elevation of the bottom of the control gate, this feature would allow approximately 2 - 4 feet of the lake to be drained. The control gate was not able to be operated during the study period, and it is unknown if it is still in working condition.

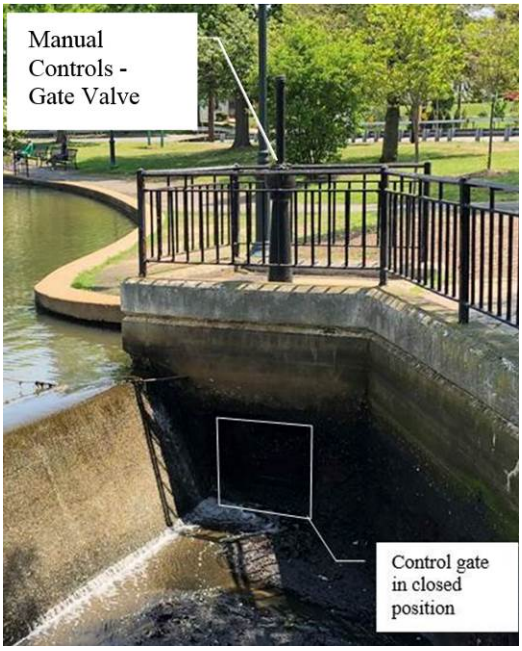


Photo 9. Photograph of existing control gate at the east side of the weir

I. Upstream Channels / Caroline's Pond / Lofts Pond

Silver Lake is fed from two upstream creeks. The western creek is Parsonage Creek and the eastern creek is Baldwin Creek. Parsonage Creek is mostly day-lighted from Silver Lake to Merrick Road. Immediately south of Merrick Road, the creek is a natural channel and runs in close proximity to the back yards of the homeowners on Lakeside Drive until it enters the surface waters of Caroline's Pond. This portion of the creek is fed via a base flow from a 36" pipe that connects to the bulkhead on the east end of Lofts Pond near the intersection of Surrey Lane and Merrick Road. South of Caroline's Pond the creek flow is controlled by and overflows to a concrete trapezoidal channel, and then a 4'x10' concrete box culvert below Wateredge Avenue. From Wateredge Avenue to Silver Lake, Parsonage Creek is bulkheaded on both sides, and ranges in width from approximately 25 feet to 60 feet.

Photo 10. Photograph taken from Wateredge Avenue looking north into Caroline's Pond. Concrete trapezoidal channel in forefront controls water surface elevations. Shallow base flow under normal conditions is not conducive for fish passage.

North of Merrick Road, Parsonage Creek is impounded by Lofts Pond, which receives base flow and stormwater runoff from a large upland urban watershed. As mentioned above, Lofts pond contributes constant base flow to the natural channel south of Merrick Road. Additionally, Lofts pond is equipped with a concrete/masonry weir structure that has the potential to release large flows to a 4'x8' concrete box culvert, which runs directly from Lofts Pond to Caroline's Pond. This can be considered a high flow bypass.

Photo 11. Weir Structure at Lofts Pond

The western creek feeding Silver Lake is called Baldwin Creek. From Silver Lake to Merrick Road, this creek is day-lighted for approximately 1,000 feet. North of Merrick Road, this creek is essentially a positive drainage system (4.5'x9' box culvert) that runs just west of Grand Avenue, collecting the local Town, County, and State owned roadways in the watershed.

Figure II-9. Location Map of Silver Lake Features

Chapter III. Model Development & Significant Findings

A. Overview of Computer Software utilized to Develop Model

Hydrologic and Hydraulic Calculations for the existing and proposed alternative Silver Lake drainage analysis were performed with Autodesk Storm and Sanitary Analysis Software™. This software is a comprehensive hydrology and hydraulic analysis application for planning and designing urban drainage systems, highway drainage systems, storm sewers and sanitary sewers. The software utilizes EPA SWMM methodology to perform hydrology (runoff) calculations, and is capable of performing advanced hydrodynamic routing calculations that can handle backwater, surcharging, and dynamic tidal conditions. The software is equipped with the necessary features to model the effects of tidal gates and check valves.

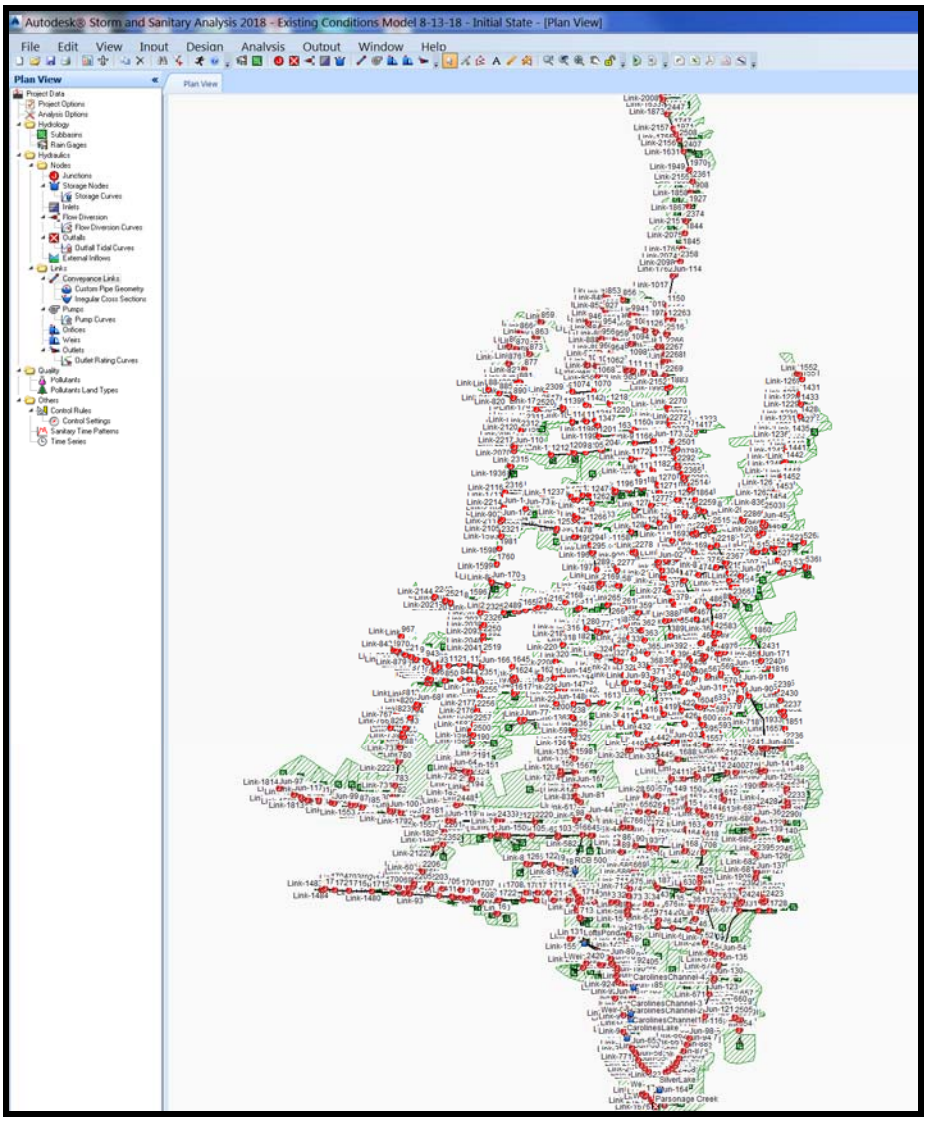


Figure III-1. Screenshot of Silver Lake Computer Drainage Model Created with AutoDesk Storm and Sanitary Analysis Software™

B. Existing Model Development

1. Design Criteria

1.a. Design Rainfalls

The scope of this drainage study is to evaluate the existing conditions of the Silver Lake drainage system for a variety of rainfalls and tidal events and identify existing deficiencies that can be addressed within the available construction budget. In order to analyze the functionality of the existing drainage system under a variety of conditions, the existing condition drainage models were evaluated for SCS Type III 24-hour synthetic rainfalls with 1 year, 10 year and 100 year returns (See Appendix A for result of hydraulic analysis). The total 24-hour rainfalls for these returns are as follows and were obtained from 2018 *NOAA Point Precipitation Frequency Estimates (https://hdsc.nws.noaa.gov)*:

- Dry weather = 0 inches
- 1 year = 2.8 inches
- 10 year = 5.3 inches
- 100 year = 8.28 inches

In order to analyze the effects of the 1-year, 10-year rainfall, and 100-year rainfalls, synthetic hyetographs were developed using a SCS Type III rainfall distributions (Figure III-2). This rainfall distribution is appropriate for the geographic location of the project.

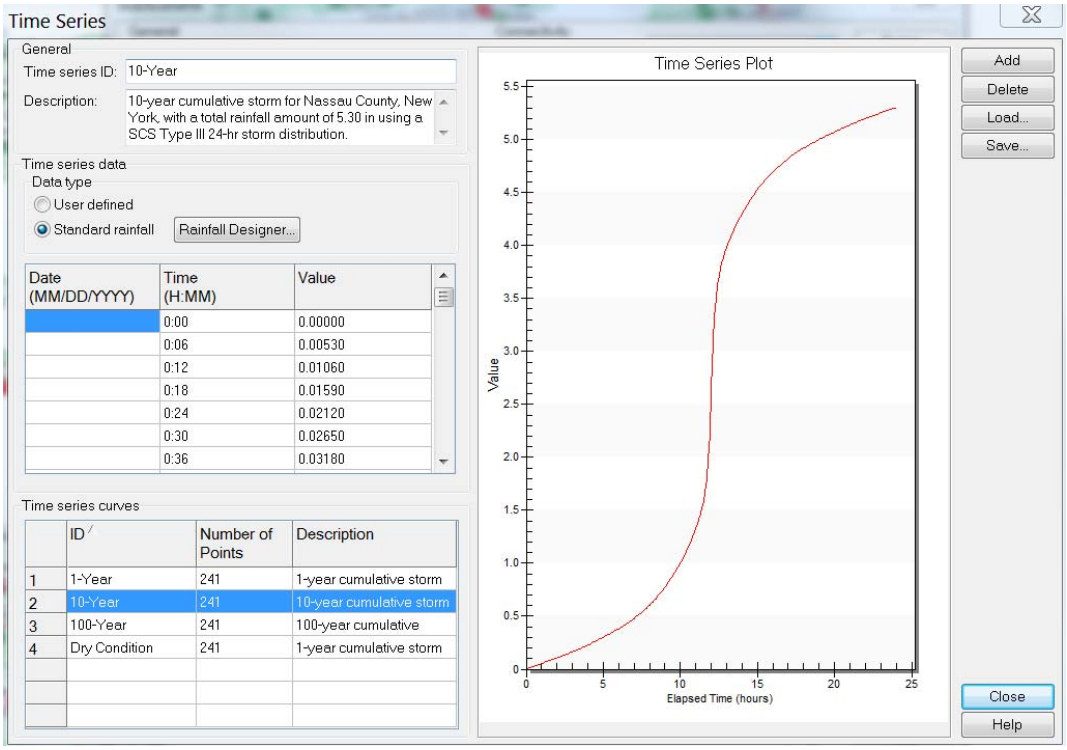


Figure III-2. Screenshot showing 5.3 inch – 24 hour synthetic rainfall with a Typical SCS Type III Distribution (10-year rainfall)

1.b Design Tailwater Elevation

To evaluate the existing conditions and proposed alternative solutions, a variety of Design Tailwater Elevations were analyzed in combination with the design rainfalls above. These include:

- Mean Tide Cycle = 2.68' (NAVD88)
- 1-yr Tidal Event = 4.42' (NAVD88)
- Maximum Tide Elevation Before Overtopping Foxhurst Road = 5.9' (NAVD88)
- 10-yr Stillwater Elevation (FEMA) = 6.4' (NAVD88)

The Mean Tide Cycle data was obtained via data collected by the School of Marine and Atmospheric Sciences at Stony Brook University, Freeport Tide Gauge (http://lishore.somassbu.org).

The 1-year tidal event is equal to the highest annual tidal cycle recorded in 2016 from Sandy Hook, NJ[2]. The maximum elevation of the highest tide cycle was recorded as elevation 4.42' (NAVD88).

The *"Maximum Tide Elevation Before Overtopping Foxhurst Road"* represents the highest elevation that surface waters in the Parsonage Canal can reach without exceeding the elevation of the low point on Foxhurst Road. This tailwater elevation of 5.9' (NAVD88), which is slightly below the 10-year Stillwater Elevation of 6.4' (NAVD88), was evaluated in order to analyze the potential benefits of the alternatives for a design scenario that represents the highest tailwater elevation that does not overtop Foxhurst Road. Tailwater Elevations above 5.9' (NAVD8) would result in a movement of tidal water from the Parsonage Canal to Silver Lake, thus making tidal gate improvements less effective.

The 10-yr Stillwater Elevation is equal to 6.4' (NAVD88)[3]. It is notable that this elevation will elevate above the top of bulkhead elevations in Parsonage Canal and the centerline crown of Foxhurst Road, and result in the tidal surge flowing overland into Silver Lake Park.

The 100-year FEMA Stillwater elevation at this location is 7.90' (NAVD88)[3]. Under the existing conditions, this tidal surge elevation will rise significantly above the top of bulkheads in the Parsonage Canal and the crown at the low point on Foxhurst Road. A 100-year tidal event will result in a flooding area that encompasses Silver Lake Park with a water surface elevation above 7.90' (NAVD88). From our analysis of the existing bulkhead elevations in Parsonage Canal, Foxhurst Road crown elevations and LIDAR contours, it is apparent that providing a solution for this condition would require either installing thousands of feet of new privately owned bulkheads with top of wall elevations above 7.90' (NAVD88) in the Parsonage Canal or raising Foxhurst Road approximately 2 feet for a distance of approximately 2,000 feet. Since both of these alternatives are clearly not feasible within the available construction budget, detailed

[2] Data source for Sandy Hook, NY tide elevations is NOAA Tide Station 8531680

[3] USGS & Prepared in cooperation with the Federal Emergency Management Agency, *Analysis of Storm-Tide Impacts From Hurricane Sandy in New York, Scientific Investigations Report 2015-5036*, p. 54, Map 85

hydraulic analysis with design scenarios that included the 100-year Stillwater elevation was not performed in this drainage study.

In order to replicate for the potential "worst case" scenario of the highest intensity rainfall occurring simultaneously with the peak of high tide, the design tidal cycle was synchronized with the SCS Type III distribution[4] peak intensity which occurs at the 12th hour of the synthetic storm.

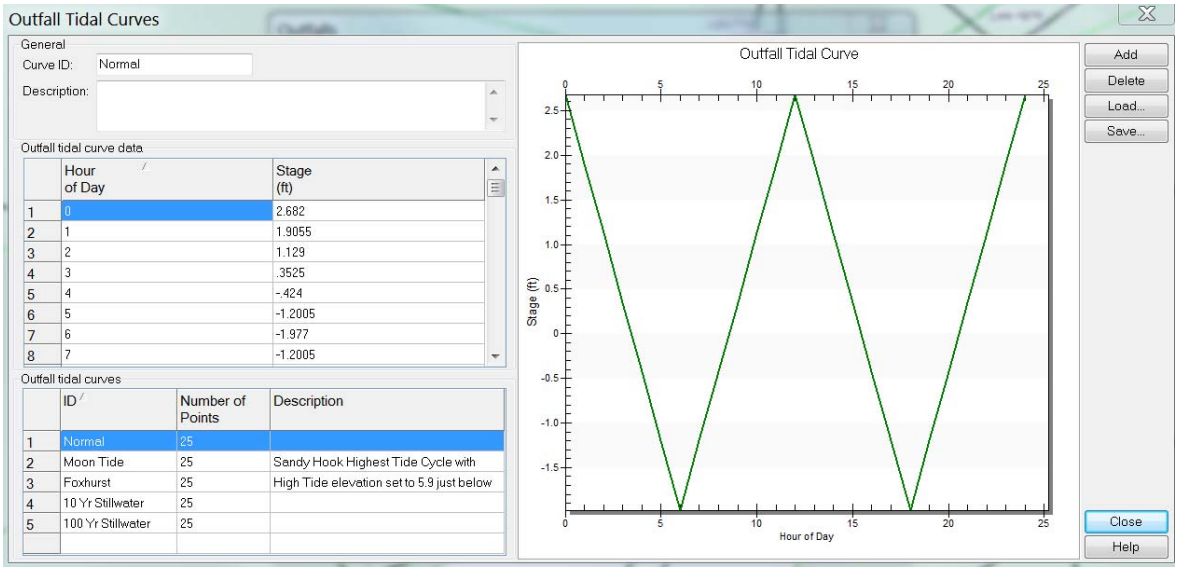


Figure III-3. Screenshot depicting Mean Tidal Cycle

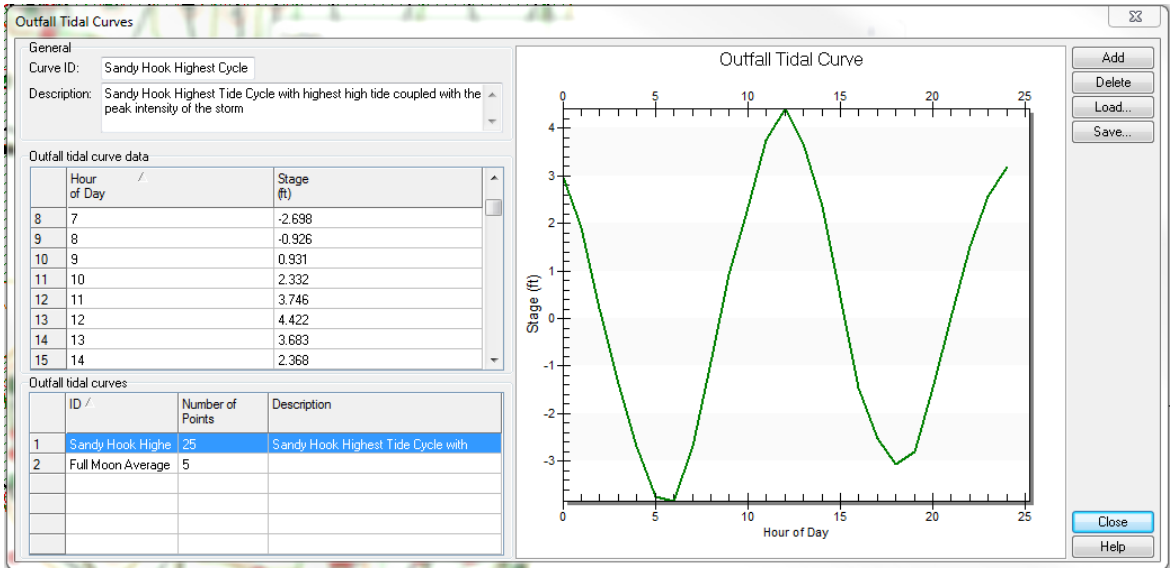


Figure III-4. Screenshot depicting 1-yr Tidal Event

[4] SCS Type III Distribution is a 24-hour rainfall distribution of rainfall vs. time appropriate for the Long Island Region. Distributions developed by the Natural Resource Conservation Service (NRCS), formerly known as the Soil Conservation Service (SCS).

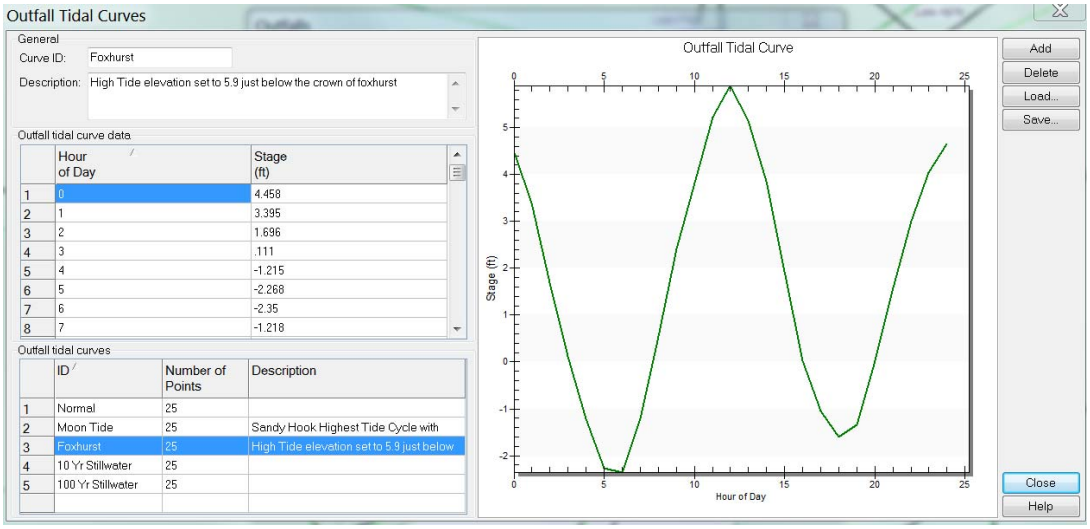


Figure III-5. Screenshot depicting Maximum Tide Elevation before Overtopping Foxhurst Road

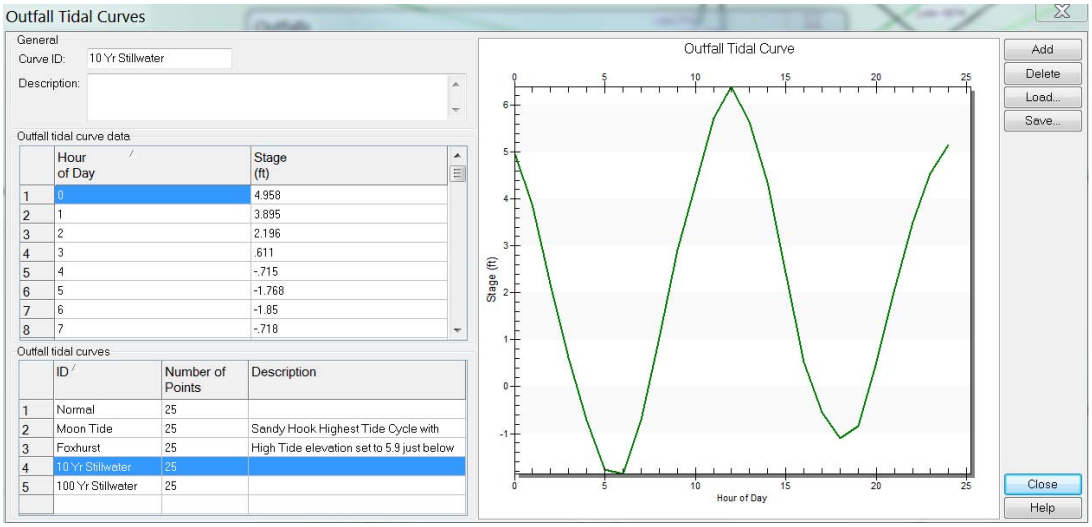


Figure III-6. Screenshot depicting 10-yr Tidal Event

2. Watershed Hydrology

The total watershed area modeled for the Silver Lake drainage system equates to approximately 2,675 acres of land that consists of roadway surfaces, sidewalks, lawns, roofs, driveways, parkland, schools and commercial parking lots. The hydrologic model breaks up the overall watershed into 997 distinct sub-watersheds. For each of the sub-watersheds, runoff parameters such as contributory area (acres), equivalent width of sub-catchment (ft), overland slope (%), and percent impervious area were calculated and input into the drainage model. Runoff flows were generated in the model using EPA SWMM methodology. This method utilizes Horton infiltration equations to estimate the amount of stormwater lost to infiltration in pervious areas of the watershed. Infiltration equations assumed sandy loam soils with a maximum infiltration rate of 4 in/hr and a minimum infiltration rate of 0.45 in/hr. These assumptions were based on a review of *USDA Natural Resource Conservation Service Soils Maps – Web Soil Survey (Figure III-7)*.

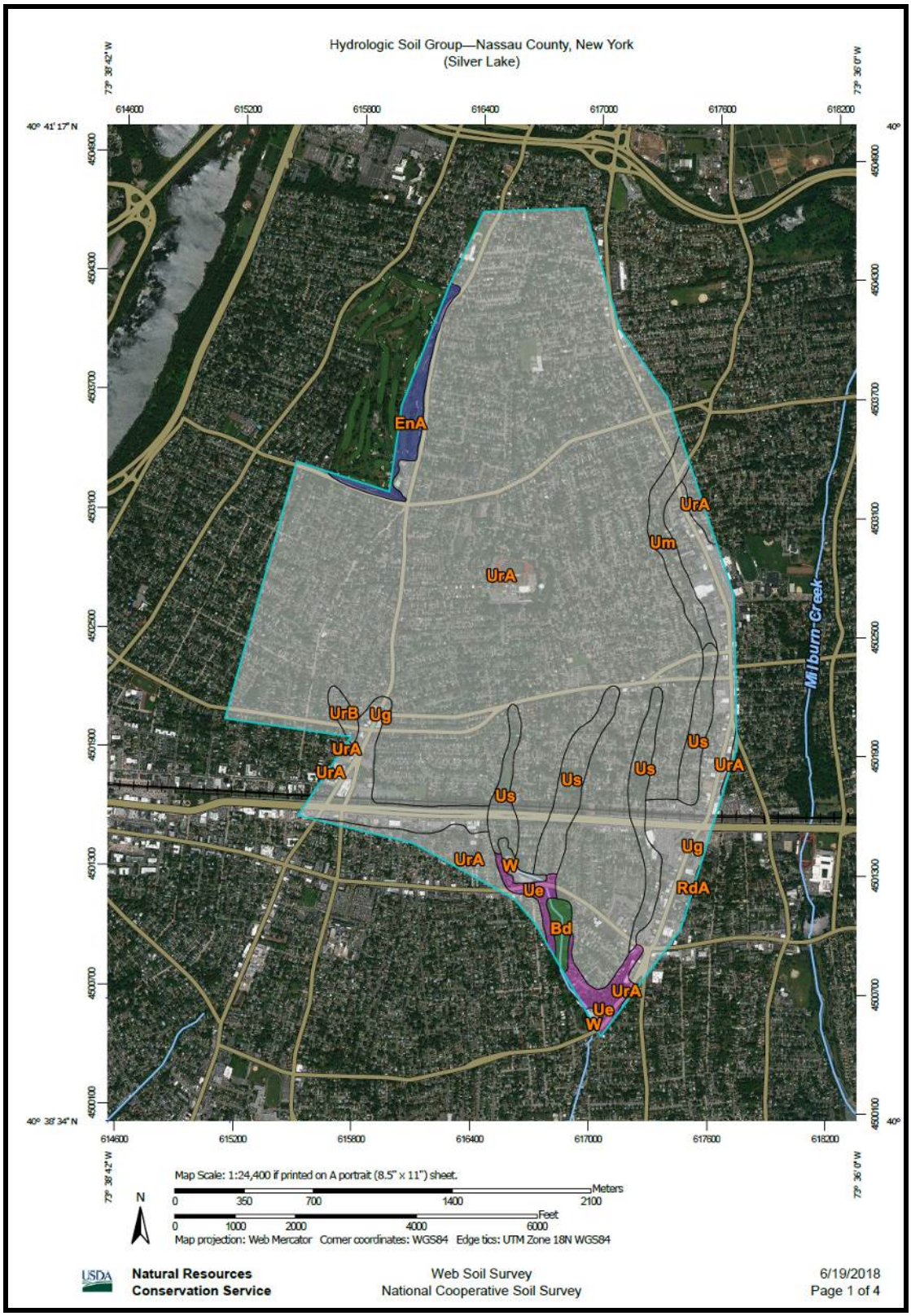


Figure III-7. USDA Natural Resources Conservation Service – Web Soil Survey

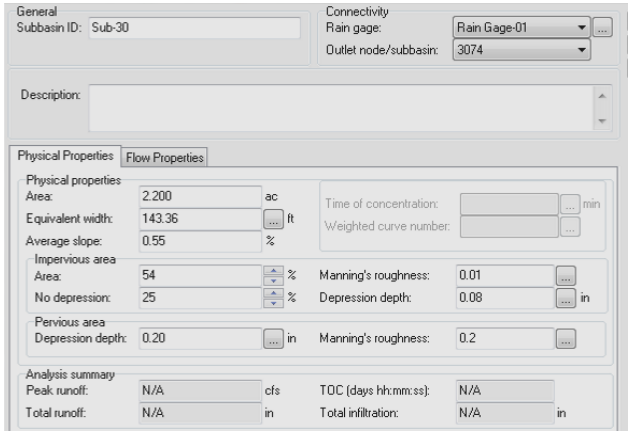


Figure III-8. Screenshot depicting typical sub-watershed runoff parameters entered into the drainage model.

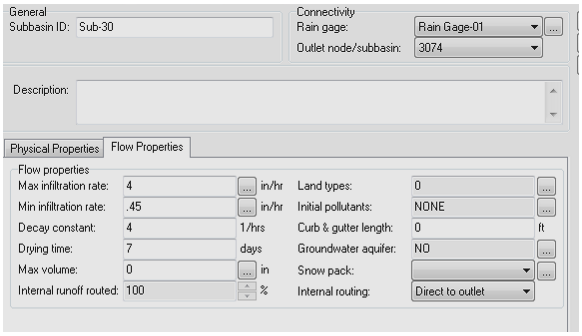


Figure III-9. Typical values input for Horton infiltration equations

GIS applications were used to efficiently estimate the impervious percentage for each of the 997 sub-watersheds and calculate the overall sub-watershed acreage. Using the Nassau County GIS database, the "V_Parcel" data layer was utilized to identify information regarding each tax map parcel's land use category in the various sub-watersheds. The area of land in each of the various land use categories was quantified and used to estimate the percentage of impervious cover within the sub-watersheds by correlating the mean impervious cover factors for land use presented in Table III-1.

Table III-1. Impervious Cover Factor based on Land Use Category
From NYS Stormwater Management Design Manual, Chapter 4, Section 4.2

Land Use Category	Mean Impervious Cover Factor Used
Commercial	0.72
Community Services	0.41
Industrial	0.72
Public Services	0.41
Recreation and Entertainment	0.33
Residential	0.33
Vacant Land	0.09
Wild, Conservation Lands and Public Parks	0.09
Roadway	1.0
Sidewalk / Curb Line areas	0.62

Using GIS application tools, the tax map parcels were intersected with each of the 997 sub-watershed boundaries. In addition, the Nassau County Roadway layer was also intersected with the sub-watershed boundaries. Any gap areas between the tax map parcel line and the roadway were considered sidewalk/curb line areas. The resulting GIS layer produced summarized the total area of each sub-watershed and respective land use categories. The area of each category was

then multiplied by the factor provided in Table III-1, calculating the impervious percentage relative to that category. The total impervious area for each sub-watershed was summed and then divided by the total area of the entire sub-watershed creating a weighted percentage of impervious coverage. Figure III-10 shows the study area colored by land use classifications based on the provided parcel data.

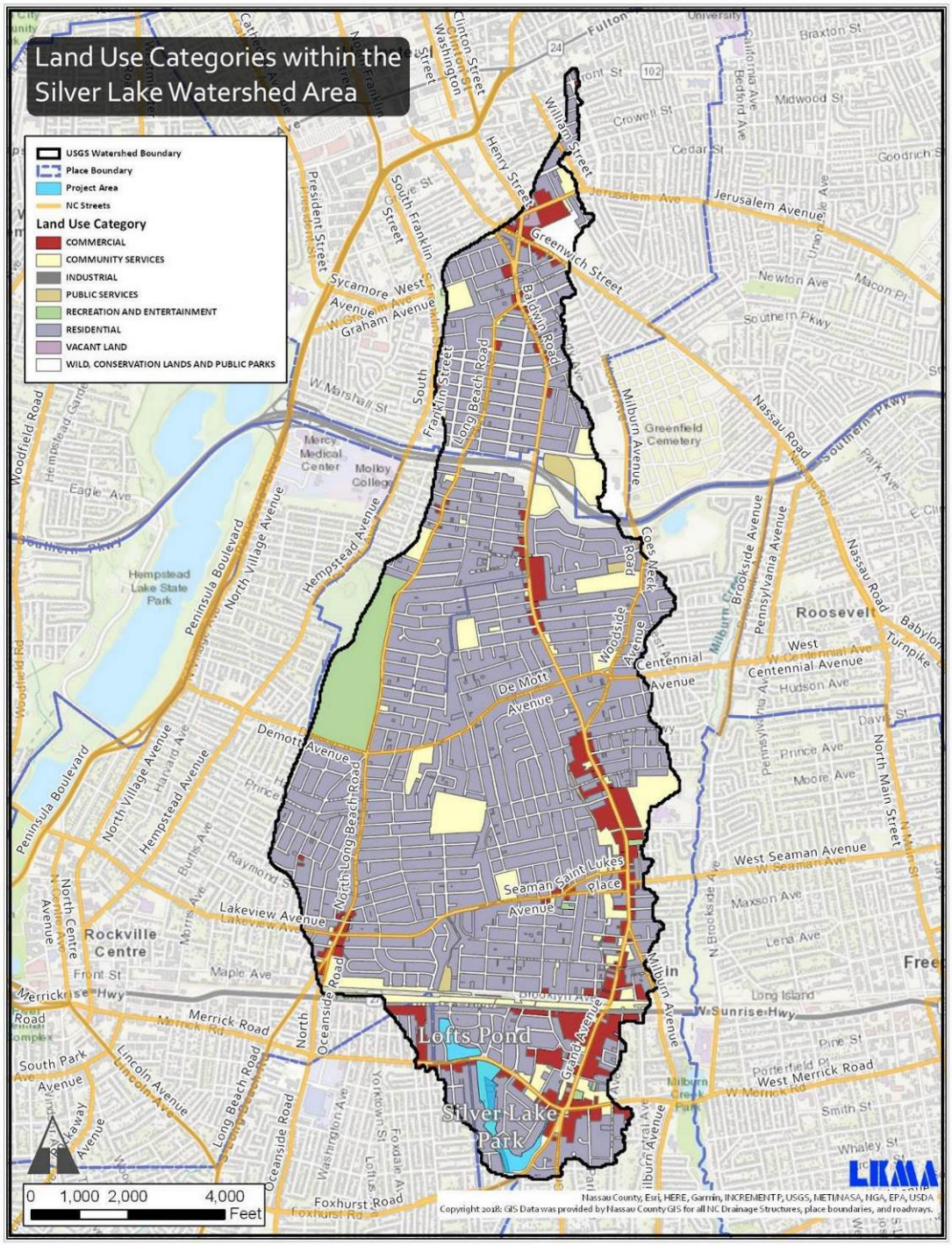


Figure III-10. Land Usage within Silver Lake Watershed Area

3. Hydraulic Systems

As described under Chapter II.A. Base Map Generation, almost every drainage structure, and pipe/culvert in the upland watershed north of Silver Lake was located via a variety of available sources such as Nassau County GIS information, record plans or field inspections so that the components of the existing upland drainage systems north of Silver Lake Park could be identified, located, and uploaded into an ArcView GIS drainage inventory.

Within the limits of Silver Lake Park, topographical survey and mapping was performed on the lake's hydraulic systems and general features in the park (Appendix C). Existing features which were surveyed include:

- Culverts: inverts, size material
- Weirs: Silver Lake, Lofts Pond and Caroline's Pond
- Perimeter bulkhead top of wall elevations around Silver Lake
- Parsonage Creek and Baldwin Creek Cross Sections
- Centerline and northern sidewalk area of Foxhurst Road
- Caroline's Pond Perimeter and water surface elevation
- Drainage system carrying base flow from Lofts Pond to Parsonage Creek
- Park features: paths, trees, benches, vegetated areas, pedestrian bridges, control gate valve, etc.

Once this drainage inventory was complete, the hydraulic data contained in the GIS drainage inventory was exported into AutoDesk Storm and Sanitary Analysis Software™ format, allowing the complete and identical drainage network stored in the GIS database to be created in the drainage modeling software.

C. Significant Findings of Drainage Study

Stormwater Conveyance Capacity of Silver Lake Weir and Outfall

Silver Lake Weir Capacity Analysis

The existing Silver Lake weir is a 52 foot wide single stage weir with a crest elevation of 2.0' (NAVD88). The existing top of bulkhead elevation around the perimeter of the lake is 3.00' (NAVD88). This allows the system only 1 foot of freeboard before the lake overtops the bulkhead and perimeter walkway. The existing weir with a one foot depth of flow only has the design capacity to carry approximately 170 cfs of flow. A 10-year rainfall event will generate an inflow into Silver Lake of approximately 600 cfs. In order to convey 600 cfs over the existing weir, the depth of water over the weir will be approximately 2.5 feet. A 100-year rainfall event will generate an inflow into Silver Lake of approximately 800 cfs. In order to pass 800 cfs over the existing weir, the depth of water over the weir crest will be approximately 2.9 ft. This indicates that even without considerations of the downstream culvert capacity and tailwater elevations both a 10-year rainfall and a 100-year rainfall will elevate the surface water of the lake to an elevation between 4.5' (NAVD88) and 4.9' (NAVD88).

Silver Lake Outfall Capacity Analysis

The existing 6'x6' box culvert outfall has a design capacity of approximately 330 cfs flowing full. However, since the top of the existing 6'x6' box culvert is at elevation 3.63 (NAVD88), in order for that culvert to be flowing full, the lake's bulkheads would already be overtopped by a height of 0.63. This reduces the effective capacity of the existing outfall system by approximately 10% or 33 cfs. The adjusted capacity of the 6'x6' box culvert is therefore approximately 300 cfs.

The existing 5'x10' box culvert outfall has a design capacity of approximately 360 cfs flowing full. Therefore, the combined outfall capacity of the two culverts is approximately 660 cfs (not taking into account any tailwater condition). This capacity is approximately equal to the flow necessary to convey a 10-year rainfall event.

(See Appendix A for results of Existing Conditions Analysis)

Surface Waters of Silver Lake and Caroline's Pond

The significant findings below are based on the results of the existing conditions analysis presented in Table III-2 below.

Table III-2. Existing Conditions Analysis - Maximum Water Surface Elevations

Table of Maximum Water Surface Elevation (NAVD 88)			
Tide	Rainfall Event	Existing Condition Silver Lake Maximum Water Surface Elevation (Depth Flooded above Perimeter Pathway El. 3.0)	Existing Condition Carolines Pond Maximum Water Surface Elevation
Normal Tide (Max Tidal El. = 2.682' NAVD 88)	Dry Condition	2.67 (0.00)	3.32
	1-Yr Rainfall	4.05 (1.05)	5.93
	10-Yr Rainfall	5.11 (2.11)	6.66
	100-Yr Rainfall	6.29 (3.29)	7.00
Highest Annual Tidal Cycle from Sandy Hook, NJ (2017) (Max Tidal El.=4.42' NAVD 88)	Dry Condition	4.42 (1.42)	4.44
	1-Yr Rainfall	5.03 (2.03)	5.94
	10-Yr Rainfall	6.05 (3.05)	6.56
	100-Yr Rainfall	6.53 (3.53)	7.00
Maximum Tide Before Overtopping Foxhurst Rd. (Max Tidal El.=5.90' NAVD 88)	Dry Condition	5.88 (2.88)	5.92
	1-Yr Rainfall	6.32 (3.32)	6.61
	10-Yr Rainfall	6.67 (3.67)	7.00
	100-Yr Rainfall	6.74 (3.74)	7.16
10 Yr. Stillwater (Max Tidal El.=6.40' NAVD 88)	Dry Condition	6.39 (3.39)	6.41
	1-Yr Rainfall	6.59 (3.59)	6.84
	10-Yr Rainfall	6.74 (3.74)	7.07
	100-Yr Rainfall	6.89 (3.89)	7.19

Silver Lake Surface Water

The existing conditions drainage model analysis indicates that even under normal tide conditions, a 1-year rainfall will result in the surface water of Silver Lake overtopping the existing bulkhead elevation of 3.0 (NAVD88) by approximately 1-foot. Additionally under normal tide conditions, a 10-year rainfall will result in 2 feet of flooding and a 100-year rainfall will result in just over 3 feet of flooding.

The analysis also indicates that if these design rainfalls were to occur simultaneously with a significant 10-year Stillwater elevation tidal surge (elevation 6.40' NAVD88) the flooding would be further exacerbated and the lake surface waters would be elevate to a range between 6.59' – 6.89' (NAVD88). It is evident from the results of the "dry condition" scenario that since there is no existing backflow protection, the potential of significant park flooding is possible even in the case when there is little to no rainfall. This type of event can be prevented via the installation of tidal gates. (See table below for results of existing drainage model analysis)

Caroline's Pond Surface Water

Caroline's Pond has a normal dry weather elevation of 3.32' (NAVD88). A review of the results of the existing conditions analysis indicates that the water surface elevations in Caroline's Pond are influenced by both the magnitude of the rainfall event and tidal surge. However, when comparing the results for both the normal tide scenarios and the 10-year Stillwater scenarios it is evident that the area surrounding Silver Lake Park is susceptible to flooding up to an elevation of approximately 7.0' (NAVD88) for the design scenarios analyzed. The analysis indicates that this magnitude of

flooding can occur as a result of either heavy rainfall greater than a 10-year rainfall with a normal tide or just a dry-conditions 10-year Stillwater tidal surge.

In order to identify the potential impact a flood up to elevation 7.0' (NAVD88) would have on the adjacent residential properties east of Caroline's Pond, the Inundation Map below (Figure III-11) was created to depict the approximate area of flooding. As consistent with the conversations of residents on Lakeside Drive that attended the Public Meeting, the Inundation Map identifies that floodwaters would encroach on a majority of the back yards of the residences on Lakeside Drive. It also indicates that the homes most susceptible to the potential of flooding are immediately to the east of Caroline's Pond.

Figure III-11. Inundation Map Showing Approximate Flooding Limits at A Surface Water Elevation of 7.0' (NAVD88)

Parsonage Creek Bulkhead Elevations and Foxhurst Road Elevations

As discussed in Chapter II. Existing Conditions of this report (see Figure II-8), it is apparent from the topographical survey information that bulkhead elevations in the canal vary from approximately 3.42 to 8.20 (NAVD88) with a majority of the bulkheads being in the range of elevation 4.0' – 5.5' (NAVD88). It is evident that when tidal waters elevate above the elevation of approximately 5.0' (NAVD88) flooding will begin to occur on West End Avenue.

Additionally, topographical survey on Foxhurst Road indicates that the low point in the roadway is located approximately 200 feet east of West End Avenue and is at elevation 6.13 (NAVD88). Since the intersection of West End Avenue and Foxhurst Road is at an elevation of approximately 6.25 (NAVD88), it is evident any tidal surges in excess of elevation 6.25 (NAVD88) will overtop Foxhurst Road and spill over into Silver Lake Park. It is notable, that this elevation is 0.15 feet lower than the FEMA 10-year Stillwater elevation of 6.4 (NAVD88) and 1.65 feet lower than the FEMA 10-year Stillwater elevation of 7.9 (NAVD88).

Fish Passage

From our three Public Outreach Meetings and one Public Meeting, the design team was informed that the ability to provide fish passage for river herring and American Eel from the Parsonage Canal to Caroline's Pond was a desirable ecological improvement. From analyzing the existing conditions with regard to fish passage and information provided by a representative from Seatuck Environmental Association, it was determined that as a result of the normal tidal range, which is above the Silver Lake weir elevation by 8 inches at normal high-tide, no additional means of fish passage into Silver Lake is required. However, it was determined that if fish passage was going to be provided to Caroline's Pond, modifications to the existing trapezoidal channel which controls the pond's surface water elevation would be required. This is because base flows from Caroline's Pond through the trapezoidal channel are only approximately 2" deep and are not an adequate depth for passage. For this reason, a conceptual fish passage design alternative at Caroline's Pond has been developed and is detailed later in this report.

Additionally, since proposed tidal gates at the Silver Lake outfall culverts are a potential consideration for mitigating some of the flooding scenarios related to tidal surges, an "ecologically friendly" tidal gate is preferable. In this case, an ecological tidal gate means that the tidal gate would remain open for the normal tidal range and only close at an elevation that has the potential to cause upstream flooding.

Stormwater Quality

Stormwater quality of Silver Lake was a concern of residents who attended the public meeting. They cited that a high level of floatables and sediment enters the Silver Lake waters from upland positive drainage systems. As a component of this project, it was requested that proposed alternatives include provisions for capturing floatables and debris and pollutants prior to entering Silver Lake.

Chapter IV. Alternative Improvements

The drainage analysis indicates that developing alternative improvements that will mitigate flooding for all potential storm scenarios that can occur is not possible within the project's available construction budget. The available CDBG-DR funds for constructing the project is approximately $2 million. However, if you assume that engineering design and construction inspection will require approximately 15% - 20% of the construction cost, the estimated funds available for construction is approximately $1.7 million.

For example, as an initial design criteria, we set out to design a system that could eliminate flooding around Silver Lake for a 10-year rainfall occurring simultaneously with a peak 1-year tailwater elevation. However, the drainage model indicates that in addition to the feasible alternatives described below, which would install tide gates on the outfalls and elevate the perimeter walls of Silver Lake 2 feet, significant capacity improvements to the lake's outfall system would need to also be provided to reduce the hydraulic grade line jump that currently occurs north of the outfall weir as a result of both the weir and twin outfall culverts' limited capacity. The drainage model indicates that the existing weir would need to be increased from 52 feet to 65 feet wide at the crest and the existing 6'x6' and 7'-3"x10' culvert would need to be replaced with twin 6'x15' culverts for additional capacity. These outfall capacity improvements alone would far exceed this project's construction budget and would also require partial reconstruction of the Parsonage Creek Bulkhead, full reconstruction of a portion of Foxhurst Road, potential utility relocations, and alterations to the drainage easement located on the private properties south of Foxhurst Road. This scope of construction would be in excess of $3 million. For this reason, replacement of the outfall culverts and weir are not included as a feasible alternative.

The drainage model indicates that even with the significant weir and outfall capacity improvements described above, the water surface elevations at Silver Lake will still elevate to approximately elevation 5.0' (NAVD88) during the 10-year rainfall / 1-year tailwater design scenario. With this in mind, the highest priority improvement (Component 1) is to elevate the perimeter walkway of Silver Lake to Elevation 5.0' (NAVD88). This improvement is feasible within the project's construction budget and the drainage model indicates that it will provide a level of protection for Silver Lake Park up to a 1-year rainfall (peak intensity) occurring simultaneously with a 1-year tailwater elevation of 4.42' (NAVD88).

As further described below under Feasible Design Components Considered, the second highest priority improvement (Component 2) is to provide tide gates at the Silver Lake outfall. The drainage analysis indicates that although the tide gates do not provide a significant improvement when a tidal surge occurs simultaneously with a significant rainfall event (> 1-year rainfall), it will provide significant protection to the upstream Silver Lake and Caroline's Pond areas in the event that a tidal surge occurs during a period of dry weather or low intensity rainfall. Since there are many times when "dry" storms cause coastal flooding, this component is recommended.

It is notable, that Design Components 1 & 2 are the only components that were determined to provide a level of flood protection. The remaining components described below are included to address other design issues that need to be resolved and are related to stormwater quality and fish passage.

Table IV-1 and IV-2 below show the results of the drainage analysis with respect to the maximum water surface elevations in Silver Lake and Caroline's Pond for a variety of design scenarios. The

results are presented for the feasible design alternatives developed during this study. Feasible design alternatives are described on the following pages and consist of a variety of design components which have the potential to fit within the allocated construction budget for the project.

Table IV-1

Silver Lake - Table of Maximum Water Surface Elevation (NAVD 88)				
Tide	Rainfall Event	Existing Condition Silver Lake Maximum Water Surface Elevation (Depth Flooding above Perimeter Pathway El. 3.0)	Alternative 1* Silver Lake Maximum Water Surface Elevation (Depth Flooded above Perimeter Pathway El. 5.0)	Alternative 2** - Silver Lake Maximum Water Surface Elevation (Depth Flooding above Perimeter Pathway El. 5.0)
Normal Tide (Max Tidal El. = 2.682' NAVD 88)	Dry Condition	2.67 (0.00)	2.41 (0.00)	1.2 (0.00)
	1-Yr Rainfall	4.05 (1.05)	4.03 (0.00)	3.89 (0.00)
	10-Yr Rainfall	5.11 (2.11)	5.00 (0.00)	5.0 (0.00)
	100-Yr Rainfall	6.29 (3.29)	6.32 (1.32)	6.32 (1.32)
Highest Annual Tidal Cycle from Sandy Hook, NJ (2017) (Max Tidal El.=4.42' NAVD 88)	Dry Condition	4.42 (1.42)	3.03 (0.00)	1.2 (0.00)
	1-Yr Rainfall	5.03 (2.03)	5.00 (0.00)	4.98 (0.00)
	10-Yr Rainfall	6.05 (3.05)	6.09 (1.09)	6.05 (1.05)
	100-Yr Rainfall	6.53 (3.53)	6.54 (1.54)	6.52 (1.52)
Maximum Tide Before Overtopping Foxhurst Rd. (Max Tidal El.=5.90' NAVD 88)	Dry Condition	5.88 (2.88)	3.4 (0.00)	1.61 (0.00)
	1-Yr Rainfall	6.32 (3.32)	6.34 (1.34)	6.32 (1.32)
	10-Yr Rainfall	6.67 (3.67)	6.68 (1.68)	6.67 (1.67)
	100-Yr Rainfall	6.74 (3.74)	6.74 (1.74)	6.74 (1.74)
10 Yr. Stillwater (Max Tidal El.=6.40' NAVD 88)	Dry Condition	6.39 (3.39)	4.15 (0.00)	2.75 (0.00)
	1-Yr Rainfall	6.59 (3.59)	6.59 (1.59)	6.58 (1.58)
	10-Yr Rainfall	6.74 (3.74)	6.74 (1.74)	6.74 (1.74)
	100-Yr Rainfall	6.89 (3.89)	6.90 (1.90)	6.89 (1.89)

*Alternative 1-Tide gates implemented on both culverts exiting Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88)
**Alternative 2-Tide gates implemented on both culverts exiting Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88). Silver Lake lowered by 2' prior to storm via control gate.
Red Result Indicate Flooding
Green Results Indicate No Flooding

Table IV-2

Caroline's Pond Table of Maximum Water Surface Elevation (NAVD 88)				
Tide	Rainfall Event	Existing Condition Caroline's Pond Maximum Water Surface Elevation in Feet (Depth of Flooding above Bulkhead El. 5.0 in Feet)	Alternative 1* Caroline's Pond Maximum Water Surface Elevation in Feet (Depth of Flooding above Bulkhead El. 5.0 in Feet)	Alternative 2** Caroline's Pond Maximum Water Surface Elevation in Feet (Depth of Flooding above Bulkhead El. 5.0 in Feet)
Normal Tide (Max Tidal El. = 2.682' NAVD 88)	Dry Condition	3.32 (0.00)	3.32 (0.00)	3.32 (0.00)
	1-Yr Rainfall	5.93 (0.93)	5.93 (0.93)	5.93 (0.93)
	10-Yr Rainfall	6.66 (1.66)	6.66 (1.66)	6.66 (1.66)
	100-Yr Rainfall	7.00 (2.00)	7.00 (2.00)	7.00 (2.00)
Highest Annual Tidal Cycle from Sandy Hook, NJ (2017) (Max Tidal El.=4.42' NAVD 88)	Dry Condition	4.44 (0.00)	3.32 (0.00)	3.32 (0.00)
	1-Yr Rainfall	5.94 (0.94)	5.94 (0.94)	5.94 (0.94)
	10-Yr Rainfall	6.56 (1.56)	6.58 (1.58)	6.55 (1.55)
	100-Yr Rainfall	7.00 (2.00)	7.00 (2.00)	7.01 (2.01)
Maximum Tide Before Overtopping Foxhurst Rd. (Max Tidal El.=5.90' NAVD 88)	Dry Condition	5.92 (0.92)	3.42 (0.00)	3.32 (0.00)
	1-Yr Rainfall	6.61 (1.61)	6.62 (1.62)	6.60 (1.60)
	10-Yr Rainfall	7.00 (2.00)	7.00 (2.00)	7.00 (2.00)
	100-Yr Rainfall	7.16 (2.16)	7.16 (2.16)	7.16 (2.16)
10 Yr. Stillwater (Max Tidal El.=6.40' NAVD 88)	Dry Condition	6.41 (1.41)	4.15 (0.00)	3.32 (0.00)
	1-Yr Rainfall	6.84 (1.84)	6.84 (1.84)	6.83 (1.83)
	10-Yr Rainfall	7.07 (2.07)	7.08 (2.08)	7.07 (2.07)
	100-Yr Rainfall	7.19 (2.19)	7.19 (2.19)	7.19 (2.19)

*Alternative 1-Tide gates implemented on both culverts exiting Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88)
**Alternative 2-Tide gates implemented on both culverts exiting Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88). Silver Lake lowered by 2' prior to storm via control gate.
Red Result Indicate Flooding
Green Results Indicate No Flooding

Feasible Design Components Considered

The feasible design components described below comprise the two proposed Alternatives Considered. Drainage model results for these Alternatives are located in Appendix A. These alternatives are:

- Alternative 1 includes Design Components: 1, 2, 3, 4,
- Alternative 2 includes Design Components: 1, 2, 3, 4, 5

The only component that is different between the two design scenarios is that Alternative 2 includes Design Component 5, which uses the existing control gate to lower the Silver Lake water surface elevation 2 feet prior to the storm.

Component 1. Elevate Perimeter Walkway of Silver Lake to Elevation 5.0' (NAVD88)

This design component would require raising the top of bulkhead elevation to a minimum of 4.0 (NAVD88) and elevating the perimeter walkway to an elevation of approximately 5.0' (NAVD88). Existing conditions observations, local resident accounts from the Public Meeting, and the drainage model indicate that that the existing bulkhead and walkway which are at elevation 3.0' (NAVD88) flood on a regular basis as a result of either heavy rainfalls, tidal surges or a combination of both.

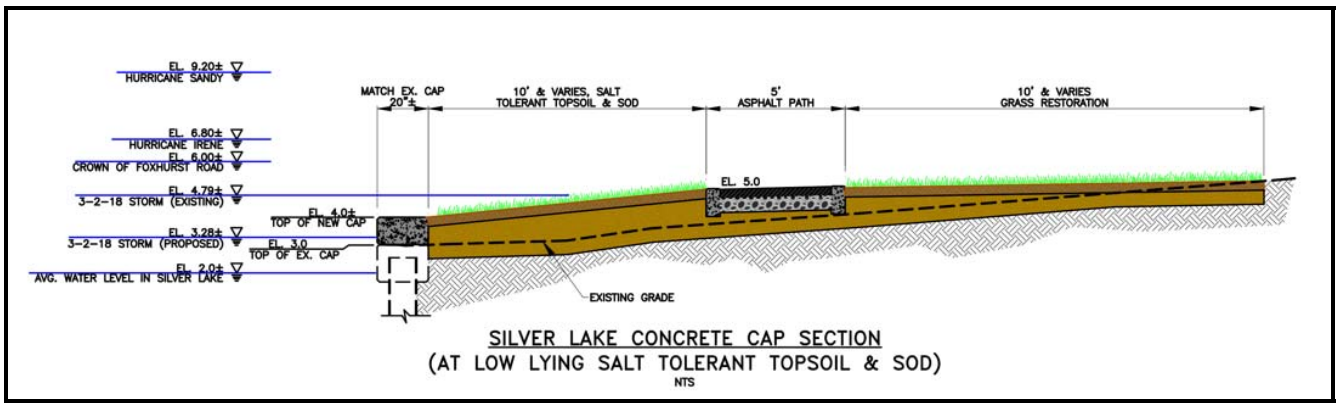


Figure IV-1. Conceptual Sections at Elevated Perimeter Walkway

Since the proposed design will be raising the walkway approximately 2 feet higher than existing, the conceptual design section above offsets the pathway approximately 10 feet from the edge of the lake so that pedestrians aren't walking next to a 3 foot drop without a protective railing. In order to provide safe access to the edge of the lake, overlook areas with railings can be provided at key locations around the perimeter (see Conceptual Plan in Appendix D). This treatment would be applied where there are existing bulkhead (Figure IV-2).

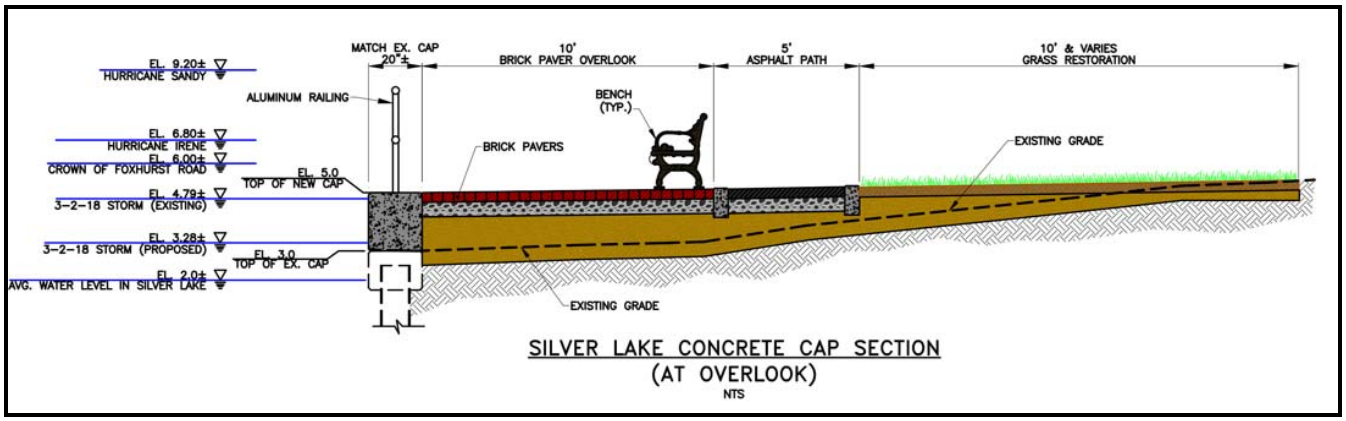


Figure IV-2. Conceptual Sections at Proposed Overlook Areas.

Alternatively to the overlook area with railings above, a design section has been developed to provide an overlook area with a sitting wall. This design would have an overlook landing at elevation 4.0' (NAVD88) and would therefore not require a railing (Figure IV-3). The perimeter walkway would be constructed behind the sitting wall and would be above elevation 5.0' (NAVD88).

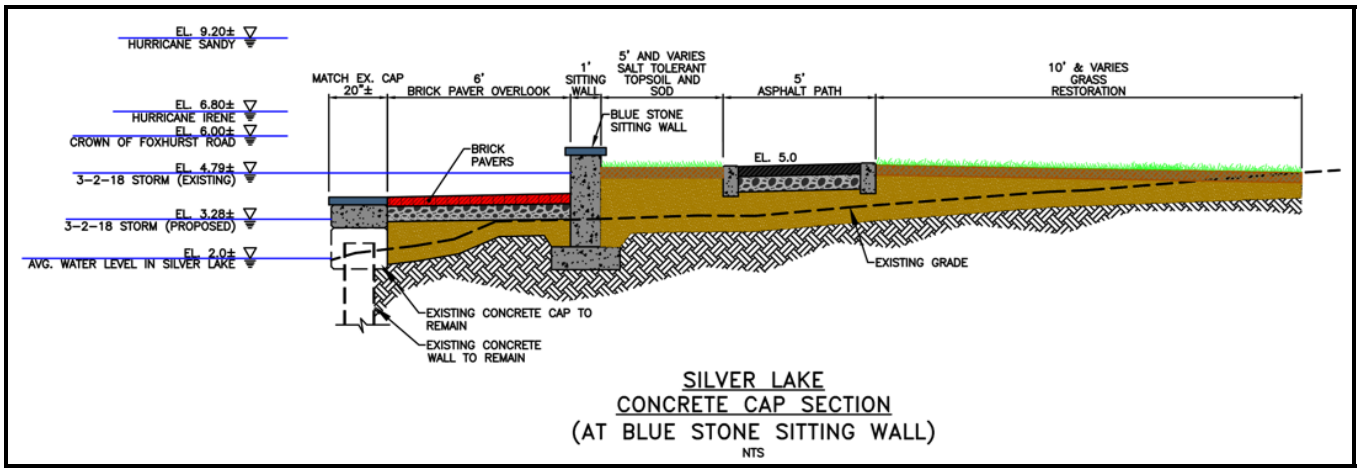


Figure IV-3. Conceptual Sections at Proposed Overlook Area with Sitting Wall.

Where the existing shoreline is natural but not heavily vegetated immediately west of the Parsonage Creek footbridge, the proposed design section will elevate the perimeter walkway to elevation 5.0' (NAVD88) and will install a small natural boulder revetment to hold back the additional fill (Figure IV-4).

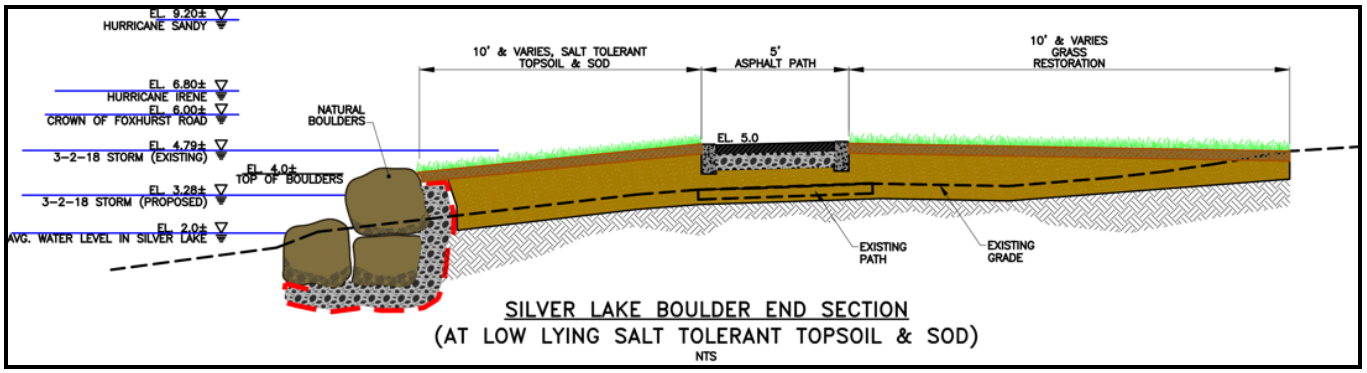


Figure IV-4. Conceptual Section Natural Shoreline on Westside of Parsonage Creek Footbridge.

Where the existing shoreline of the lake is natural, existing vegetation which is mostly invasive species, will be removed and the shoreline will be reshaped with fill to raise the landward pathway area above the elevation of 5.0' (NAVD88). The reshaped shoreline will be planted with native wetland species appropriate for the salinity levels in the lake (Figure IV-5).

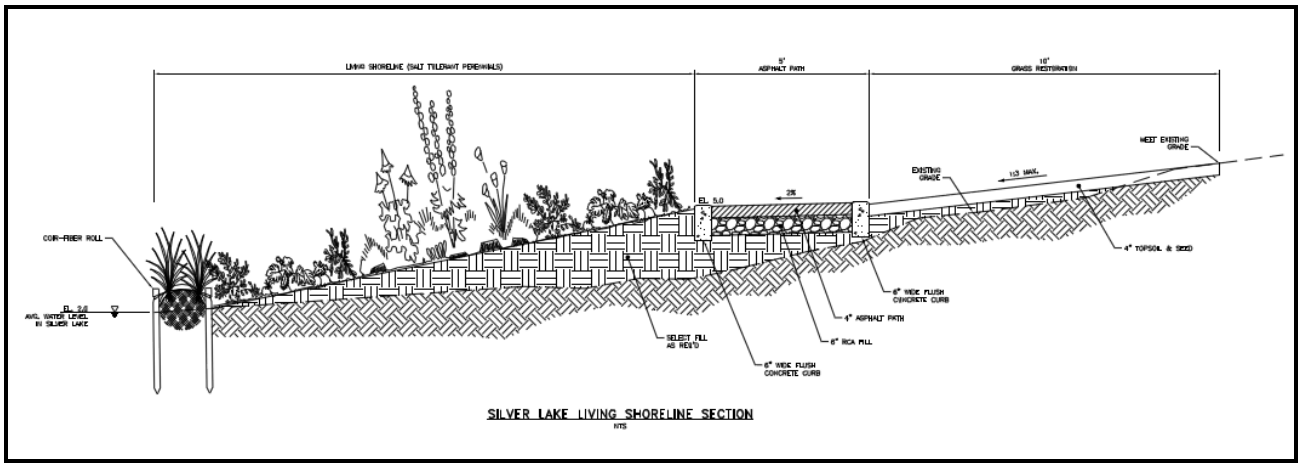


Figure IV-5. Conceptual Sections at Perimeter Walkway Adjacent to Natural Shoreline. Proposed Perimeter Walkway to be elevated to El. 5.0 (NAVD88)

On the east side of the Lake, the shallow vegetated area inside the perimeter walls will be excavated to remove the invasive vegetation and regraded to re-establish an appropriate water depth. Excavated material from the lake will need to be disposed of at an appropriate upland area approved by the NYSDEC Materials Division.

The Estimated Construction Cost for this design component is **$797,000** – *(See Appendix E for Engineer's Estimates)*

See Photo-simulations of Component 1 on the next pages.

Figure IV-6. Photo-simulation of Component 1 looking west from Silver Lake Weir.

Figure IV-7. Component 1 - Photo-simulation looking east from Silver Lake Weir east of Baldwin Creek Footbridge. Existing Invasive vegetation in lake to be removed.

Figure IV-8. Component 1 - Photo-simulation looking towards northwest area of Lake west of Parsonage Creek footbridge. Proposed sitting wall area and natural stone shoreline.

Component 2. Install Tide Gates on Silver Lake Outfalls (See Appendix D for Plans and Details)

This component includes the installation of tidal gates on the Silver Lake outfalls to reduce the occurrence of flooding as a result of tidal surges. From field investigations, it was determined that although there is space to fit a tidal gate on the existing 10' x 7.3' eastern culvert, there is not enough space to install a tide gate on the existing 6'x6' western culvert (Figure IV-9) without reconfiguring the bulkhead on the west side of the canal.

Figure IV-9. Tide Gate Photo-Simulation at Parsonage Canal Outfall

As a result of the limited space at the outfall, an alternative would be to install the tide gate at a point between the inlet and the outlet. The conceptual plan in Appendix D identifies a potential location in the park where a chamber for the tide gate can be installed just north of Foxhurst Avenue. Since fish passage and normal tidal flushing of the lake are desired to be maintained, the conceptual design proposes the use of an "ecologically friendly" self-regulating tide gate (SRT) that stays open during the normal tide cycle and only closes when the tailwater elevation reaches an elevation that would cause upstream flooding. It is estimated that this elevation would be approximately 3.5' (NAVD88). These type of tide gates utilize a system of floats to close the gate at the desired elevation (Figure IV-10).

Figure IV-10. SRT Tide Gate Photo-Simulation at Parsonage Canal Outfall

The Estimated Construction Cost for this design component is **$711,000** *(See Appendix E for Engineer's Estimates)*

Component 3. Install a Stormwater Treatment Device between Lofts Pond and the Natural Channel of Parsonage Creek Located South of Merrick Road

The purpose of this component is to improve water quality by capturing floatables, oils, and sediment coming from the Lofts Pond and the positive drainage system collecting runoff from the roadways in the vicinity of Coventry Road, Coventry Drive, and Surrey Lane. The proposed stormwater treatment system can be installed in a grass island located near the intersection of Surrey Lane, Coventry Road, and Merrick Road (Figure IV-11).

The Estimated Construction Cost for this design component is **$174,000** *(See Appendix E for Engineer's Estimates).*

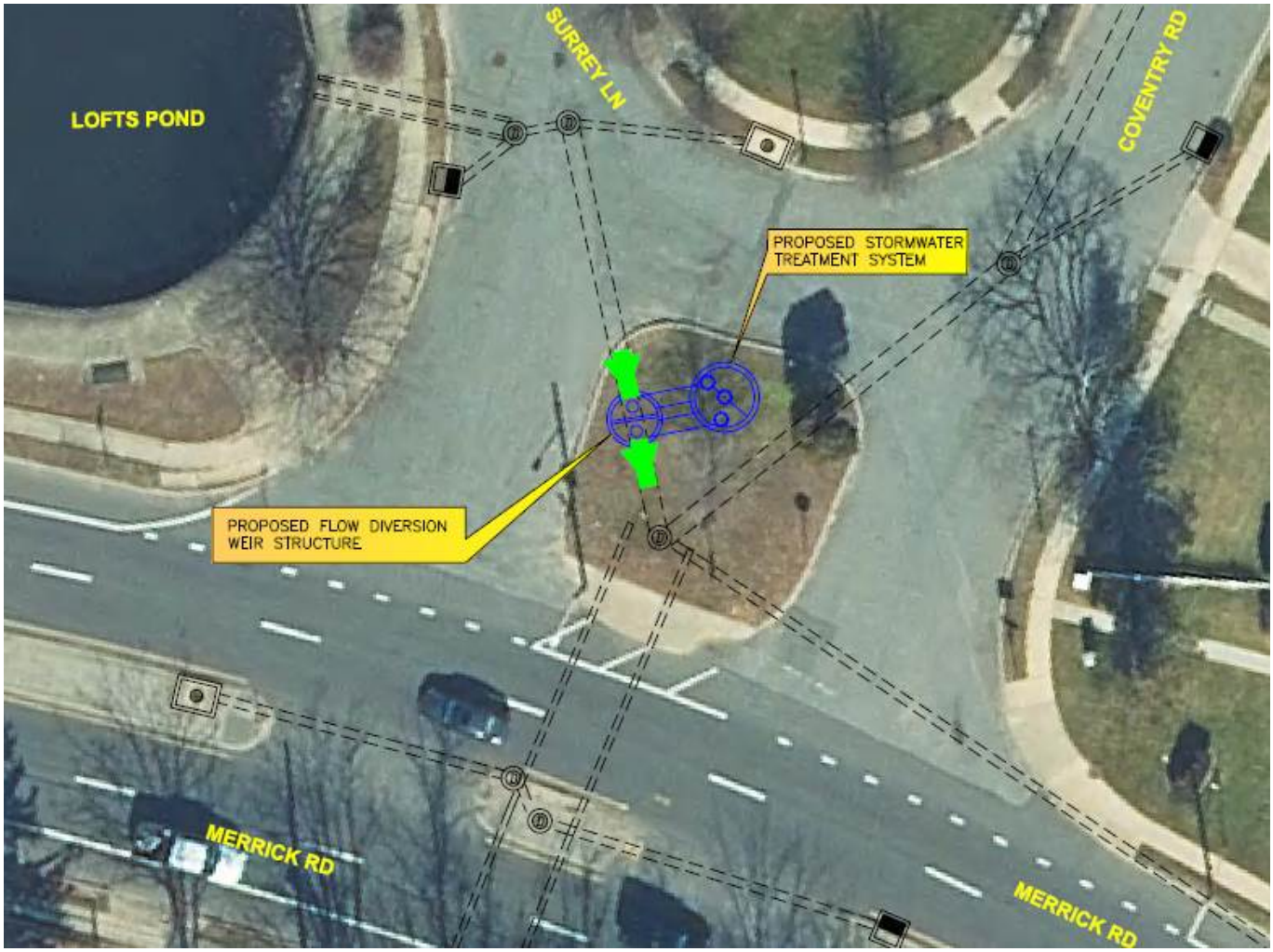


Figure IV-11. Conceptual Plan for Proposed Stormwater Treatment System

Component 4. Provide Fish Passage to Caroline's Pond

Providing fish passage up to Caroline's Pond was a topic discussed at the Public Outreach and one Public Meeting. Currently the existing trapezoidal channel north of Wateredge Avenue, restricts fish passage during normal flow conditions as a result of inadequate depth of flow. This design component would address the condition by constructing a low flow channel below the invert of the existing trapezoidal channel. The fish passage channel would be sized to handle the measured base flow under dry weather conditions and would require a depth of approximately 12" for fish passage (Figure IV-12).

Figure IV-12. Trapezoid Channel south of Caroline's Pond Currently Restricting Fish Passage. Proposed Location of Low Flow Channel for Fish Passage Depicted

In addition to the modifications to the trapezoidal channel, a small weir would need to be constructed across Parsonage Creek just south of the Wateredge Avenue culvert in order to increase the minimum depth of base flow during dry-weather conditions.

The Estimated Construction Cost for this design component is **$97,000** *(See Appendix E for Engineer's Estimates).*

Component 5. Using Control Gates to Lower Silver Lake Prior to a Storm Event

In an attempt to reduce surface water elevations in Silver Lake during rainfall events, a design scenario was analyzed that would use the existing control gate located on the east side of the weir to lower the Silver Lake surface water elevations by 2 feet prior to the storm event. The purpose of this design component would be to provide additional impoundment capacity in an effort to alleviate flooding. The drainage model analysis indicates that this design component would have no significant benefit for any rainfall event equal to or greater than a 1-year rainfall (See Appendix A – Table of Water Surface Elevations). It also indicates that the additional storage attained from lowering the lake is quickly filled in the initial hours of the 24-hour design rainfall events prior to the peak intensities of the rainfall. This component was a part of the Alternative 2 computer drainage model results.

The design component has no cost associated with it and assumes the existing control gate is in working condition.

Benefits of Proposed Design Alternatives 1 & 2

The only component that is different between Alternative 1 and Alternative 2 includes Design Component 6, which uses the existing control gate to lower the Silver Lake water surface elevation 2 feet prior to the storm. Since the drainage model results indicate that there is no significant benefit to lowering the Silver Lake water surface elevation prior to a storm, the alternative benefits below would apply to both Alternatives.

- Historical rainfall and tidal data from storms over the past 10-years were gathered and it was determined that over that past 10 years only five (5) storm events would have been severe enough to flood the Alternative 1 Conditions at Silver Lake. These are:
    - 3/13/10 (St. Patrick's Day Nor'easter; Peak Tide Elevation 6.21 with 1.74" rainfall)
    - 8/28/11 (Hurricane Irene)
    - 8/14/11 (Historic Long Island Flash Flooding; 7.8" Rainfall)
    - 10/29/12 (Superstorm Sandy)
    - 1/10/16 (January 10th Rain and Wind Event; Peak Tide Elevation 5.20 with 1.28" rainfall)

- Raising the perimeter walkway elevation above elevation 5.0' (NAVD88) and the installation of tidal gates will significantly reduce the occurrence of flooding as a result of regularly occurring tide surges that occur during the full moon, new moon and coastal storms. Elevation 5.0' (NAVD88) is significant because even if a 10-year peak rainfall occurs concurrently with the low tide period, the elevation in Silver Lake will rise to elevation 5.0' (NAVD88) as a result of the existing weir and culvert outfall capacity limitations.

- The alternative will mitigate flooding at Silver Lake for a design scenario that includes a 1-year rainfall (2.8" 24-hour storm) peak intensity occurring simultaneously with a 1-year tailwater elevation (Elevation 4.42' NAVD88). The design alternatives will reduce walkway flooding compared to existing conditions by a depth of 2 feet for this scenario.

- The design alternative will mitigate flooding at Silver for a design scenario that includes a 10-year rainfall (5.3" 24-hour storm) peak intensity combined with a normal high tide of 2.62' (NAVD88). The design alternatives will reduce walkway flooding compared to existing conditions by a depth of 2 feet for this scenario.

- The installation of tide gates will significantly reduce the potential of flooding for Silver Lake and Caroline's Lake from a tidal surge up to a 10-year Stillwater elevation during dry weather or low intensity rainfalls.

- The design alternatives will remove existing invasive plants at the existing natural shoreline areas and create sections of living shoreline with native plant species. This will improve the natural habitat of Silver Lake.

- The new walkways will replace the existing deteriorated asphalt walkways and address ADA / PROWAG compliance.

- The overall aesthetics of Silver Lake Park will be significantly improved as a result of the new landscaped lake perimeter, overlooks and reconstructed walkway.

- The proposed stormwater treatment device, Component 3, will reduce the amount of floatables, oils and sediment entering the Parsonage Creek natural channel south of Merrick Road.

- The SRT Tidal Gate (Component 2) will maintain fish passage at Silver Lake by allowing the normal tide cycle range to continue to backflow over the outfall weir and into the lake. Additionally, the proposed fish passage design at Caroline's Pond (Component 6) will provide new fish passage to the Caroline's Pond habitat.

- The proposed fish passage, Component 4, south of Caroline's Pond will increase the natural habitat for ecologically important fish species such as river herring (alewife).

- Elevating the perimeter walkway around Silver Lake to elevation 5.0' (NAVD) from its existing elevation of 3.0' will help alleviate future issues that may occur as a result of potential sea-level rise. The NYSDEC has estimated that the Long Island Region can expect to be impacted by a rise in sea-level of approximately 8 inches to 30 inches by the 2050s.

Other Design Components Considered Determined to Have No Significant Benefit

Increase the Capacity of the Silver Lake Weir

Since the existing conditions model indicates that a 10-year rainfall will result in the surface waters of Silver Lake rising to elevation 5.0' (NAVD88) even when the peak rainfall coincides with a normal low tide, a design alternative was considered to increase the length of the weir in an attempt to lower the surface water elevation in Silver Lake during a 10-year rainfall. The results of the analysis indicated that even if the length of the weir was increased from 52 feet to 75 feet, the improvement in the maximum surface water elevation of Silver Lake would only result in a surface water elevation of 4.75' (NAVD) and would still overtop the existing perimeter bulkhead elevation by 1.75 feet (a 3" improvement). For this reason, it is clear that increasing the length of the outfall weir does not have a significant benefit. In order to create a significant hydraulic improvement at the outfall, the existing culverts would need to be replaced with higher capacity culverts that could pass the 100-year rainfall event (approximately 800 cfs). The cost of replacing the culverts is not feasible within the existing project budget.

Use Existing Control Gates at Lofts Pond Weir to Lower Loft Pond Prior to a Storm

Similarly to the idea of lowering the water elevation prior to a storm at Silver Lake, the possible benefit of lowering the elevation of Lofts Pond prior to a storm was evaluated in an attempt to identify a solution to reduce peak flows released downstream from the pond under design storm conditions. The drainage model analysis indicates that this alternative would also have no significant benefit for any rainfall event equal to or greater than a 1-year rainfall. The drainage model indicates that the additional storage attained from lowering the pond is quickly filled in the initial hours of the 24-hour design rainfall events prior to the peak intensities of the rainfall. This component would have no significant benefit for reducing the downstream surface water elevations.

Utilize Existing Recharge Basin 500 north of Lofts Pond to Detain Additional Stormwater

North of Lofts Pond and immediately north of NYS Route 27 and the LIRR, exists Nassau County Recharge Basin 500 (Figure IV-13). In its existing condition, stormwater from the large upland urban watershed discharges into this basin and flows southerly to the outlet on the south side. Currently, there is no weir control structure at the outlet and the stormwater is permitted to flow into the outlet without any impoundment. The potential of installing a new weir structure 4 feet higher than the basin invert, to provide impoundment and detain the stormwater for a longer period of time was evaluated with the drainage model. The model indicates that there is no significant downstream benefit to the additional impoundment; the additional storage is filled in the early stages of the 24-hour storm event prior to the peak intensities of the rainfall.

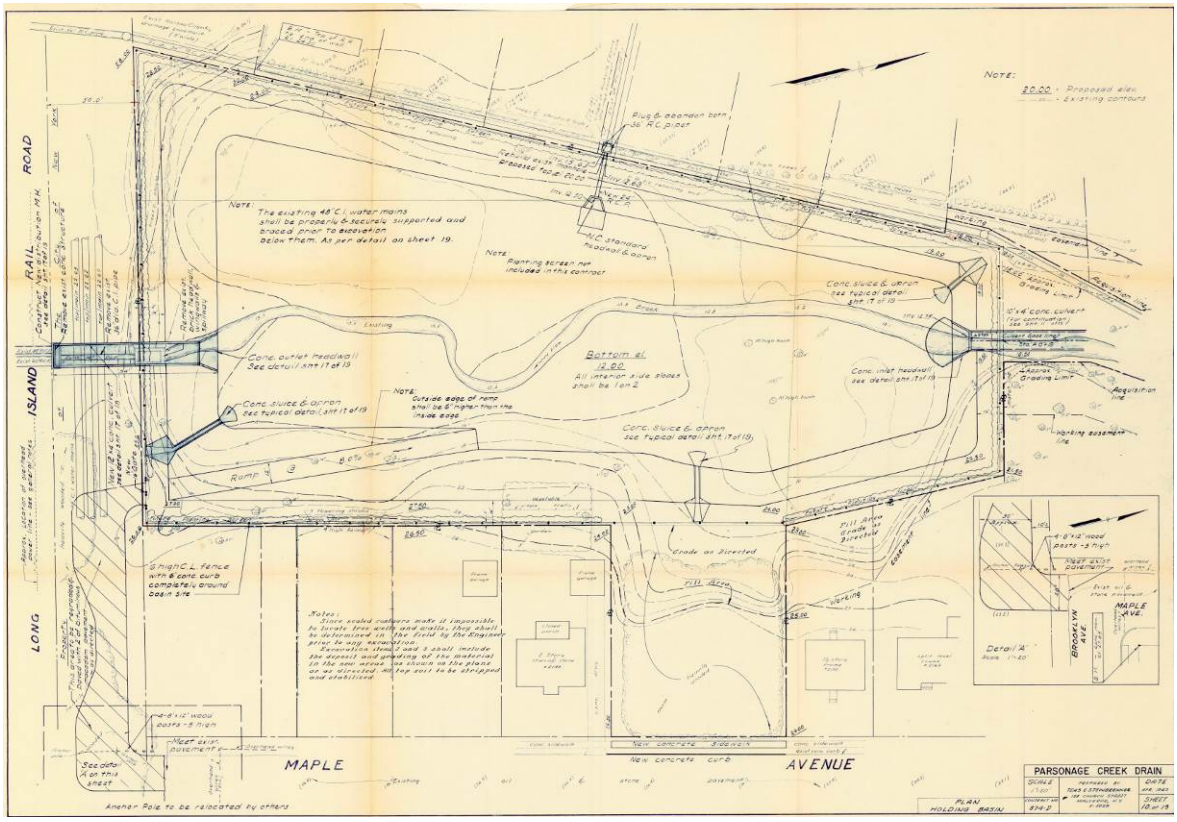


Figure IV-13. Record Plan of Nassau County Recharge Basin 500

Installing Trash Racks at the Lofts Pond Weir

This component was considered for the purposes of preventing floatables from Lofts Pond from overflowing the weir and entering the Caroline's Pond / Silver Lake waterbodies. This component is not recommended because of the potential negative aesthetic impact at Lofts pond, and the potential difficulty maintenance crews would have when trying to remove the debris from the trash rack at that location. An Alternative means of capturing floatables prior to entering Silver Lake is recommended.

Chapter V. Prioritization

The available funds for the construction project is approximately $2 million. However, this includes the cost of final design, and construction inspection & administration (CI/CA). Assuming that Engineering costs for final design and CI/CA are approximately 15% of the overall project budget, this leaves approximately **$1.7 million for construction**. Since construction costs can fluctuate, the following is our recommended prioritization of design components for the future Silver Lake Drainage Improvements.

Table V-1.
Silver Lake Drainage Improvements – Prioritization Matrix

	Flood Mitigation Level of Protection Provided by Component	**Construction Cost***
Component 1 - Elevate Perimeter Walkway of Silver Lake to Elevation 5.0' (NAVD88)	1-yr Rainfall Event with 1-yr Tailwater & 10-yr Rainfall Event with normal high tide	$797,000
Component 2. Install Tide Gates on Silver Lake Outfalls (See Appendix D for Plans and Details)	Dry Condition with up to a 10-year Tailwater	$711,000
Component 3. Install a Stormwater Treatment Device between Lofts Pond and the Natural Channel of Parsonage Creek Located South of Merrick Road	NA	$174,000
Component 4. Provide Fish Passage to Caroline's Pond	NA	$97,000
	Total Cost =	**$1,779,000**

- ***Costs above include a 20% contingency and do not include final design and construction inspection.**

Chapter VI. Considerations for Future Conditions

When looking into the future to try and determine what man-made or natural trends by impact the workings of the Silver Lake drainage system, there are three main variables that should be considered. These include future development in the upland watershed, rises in future sea-level elevations, and increases in the severity of rainfall events.

Potential Upland Development

This variable is important to consider when evaluating a drainage system because upland development in the watershed can drastically increase the impervious percentage of the ground cover, and result in a significant increase in peak runoff flows and volumes. In the case of the Silver Lake watershed, it is evident by looking at the Upland Land Usage Map (Figure VI-1) that almost the entire watershed is already developed. Therefore, we can estimate that, in this case, upland development is not a concern. However, steps should be taken by Nassau County, the Village of Rockville Centre, and the Town of Hempstead to review onsite stormwater retention requirements to reduce runoff from entering the Silver Lake Tributary area. Properties that are undergoing redevelopment offer an opportunity to reduce the volume of runoff entering the Silver Lake drainage system.

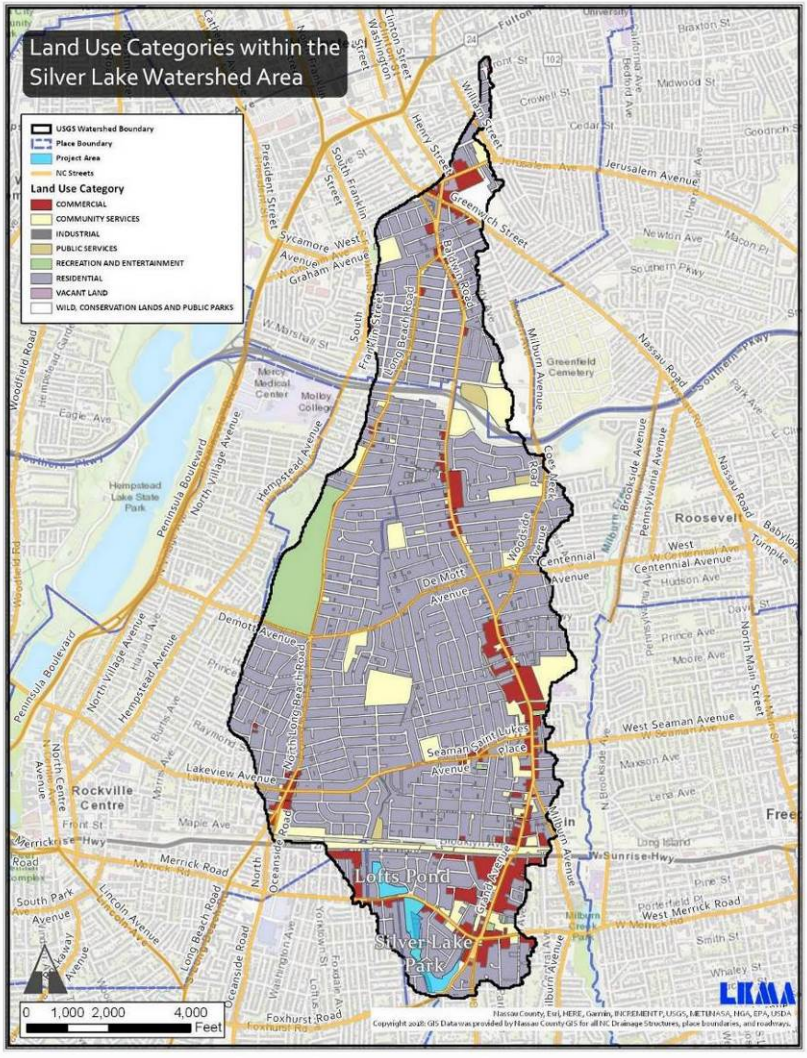


Figure VI-1. Land Usage within Silver Lake Watershed Area

Potential Rise in Sea-Levels

The trend for rising sea-level is a concern for Silver Lake Park, and for the entire south shore of Long Island. NYSDEC projections indicate that Sea-levels in this area may increase between 8 inches to 30 inches by the 2050s (Figure VI-2). This is a wide margin to plan and prepare for. If we assume that the actual rise in sea-levels will be somewhere in the middle, then the Long Island Region can expect to be impacted by a rise in sea-level of approximately 16 inches by the 2050s.

The ramifications of a potential 16 inch rise would be a severe issue that would need to be addressed at almost every location on Long Island's south shore. Mean high tide elevations would increase from elevation 2.68' (NAVD88) to elevation 4.0' (NAVD88), which would overtop the existing conditions Silver Lake top of bulkhead by approximately 1 foot at every tidal cycle, and the park would become unusable even in dry-weather conditions.

Based on these projects, the proposed design alternatives to raise the existing walkway from elevation 3.0' (NAVD88) to 5.0' (NAVD88) will be money well-spent to begin to address the potentially challenging trend of rising sea-levels.

(c) Long Island Region

Time Interval	Low Projection	Low-Medium Projection	Medium Projection	High-Medium Projection	High Projection
2020s	2 inches	4 inches	6 inches	8 inches	10 inches
2050s	8 inches	11 inches	16 inches	21 inches	30 inches
2080s	13 inches	18 inches	29 inches	39 inches	58 inches
2100	15 inches	21 inches	34 inches	47 inches	72 inches

Figure VI-2. NYSDEC 6 NYCRR Part 490 Projects for Sea-Level Rise in the Long Island Region

Potential of Increased Severity of Rainfalls

In recent years, more extreme weather contributed to climate change has been occurring. Trends in hydrological design values, based on empirical data collected, have been increasing. This indicates that rainfall volumes and peak intensities are on the rise. It is difficult to predict this trend or determine whether correction in human behavior can one-day reverse the course.

As a result of the limited construction budget, all of the existing hydraulic deficiencies of the Silver Lake drainage system are not able to be addressed by this project. Specifically, if the budget on this project was unlimited, providing a capacity improvement of the existing weir and twin box culverts to pass a minimum 10-year rainfall event without causing a three foot rise over normal pond elevations would be recommended. Although this work is not feasible at this time, the other proposed components that we are proposing, including raising the perimeter of the park and walkways 2 feet is a positive step towards the necessary hydraulic improvements that will be required in this watershed.

APPENDIX A

DRAINAGE MODEL ANALYIS RESULTS

Table of Maximum Water Surface Elevation (NAVD 88)							
Tide	Rainfall Event	Existing Condition Silver Lake Maximum Water Surface Elevation in Feet (Depth of Flooding above Perimeter Pathway El. 3.0 in Feet)	Existing Condition Carolines Pond Maximum Water Surface Elevation in Feet (Depth of Flooding above Bulkhead El. 5.0 in Feet)	Alternative 1* Silver Lake Maximum Water Surface Elevation in Feet (Depth of Flooding above Perimeter Pathway El. 5.0 in Feet)	Alternative 1* Carolines Pond Maximum Water Surface Elevation in Feet (Depth of Flooding above Bulkhead El. 5.0 in Feet)	Alternative 2** - Silver Lake Maximum Water Surface Elevation in Feet (Depth of Flooding above Perimeter Pathway El. 5.0 in Feet)	Alternative 2** Carolines Pond Maximum Water Surface Elevation in Feet (Depth of Flooding Above Bulkhead El. 5.0 in Feet)
Normal Tide (Max Tidal El. = 2.682' NAVD 88)	Dry Condition	2.67 (0.00)	3.32 (0.00)	2.41 (0.00)	3.32 (0.00)	1.2 (0.00)	3.32 (0.00)
	1-Yr Rainfall	4.05 (1.05)	5.93 (0.93)	4.03 (0.00)	5.93 (0.93)	3.89 (0.00)	5.93 (0.93)
	10-Yr Rainfall	5.11 (2.11)	6.66 (1.66)	5.00 (0.00)	6.66 (1.66)	5.0 (0.00)	6.66 (1.66)
	100-Yr Rainfall	6.29 (3.29)	7.00 (2.00)	6.32 (1.32)	7.00 (2.00)	6.32 (1.32)	7.00 (2.00)
Highest Annual Tidal Cycle from Sandy Hook, NJ (2017) (Max Tidal El.=4.42' NAVD 88)	Dry Condition	4.42 (1.42)	4.44 (0.00)	3.03 (0.00)	3.32 (0.00)	1.2 (0.00)	3.32 (0.00)
	1-Yr Rainfall	5.03 (2.03)	5.94 (0.94)	5.00 (0.00)	5.94 (0.94)	4.98 (0.00)	5.94 (0.94)
	10-Yr Rainfall	6.05 (3.05)	6.56 (1.56)	6.09 (1.09)	6.58 (1.58)	6.05 (1.05)	6.55 (1.55)
	100-Yr Rainfall	6.53 (3.53)	7.00 (2.00)	6.54 (1.54)	7.00 (2.00)	6.52 (1.52)	7.01 (2.01)
Maximum Tide Before Overtopping Foxhurst Rd. (Max Tidal El.=5.90' NAVD 88)	Dry Condition	5.88 (2.88)	5.92 (0.92)	3.4 (0.00)	3.42 (0.00)	1.61 (0.00)	3.32 (0.00)
	1-Yr Rainfall	6.32 (3.32)	6.61 (1.61)	6.34 (1.34)	6.62 (1.62)	6.32 (1.32)	6.60 (1.60)
	10-Yr Rainfall	6.67 (3.67)	7.00 (2.00)	6.68 (1.68)	7.00 (2.00)	6.67 (1.67)	7.00 (2.00)
	100-Yr Rainfall	6.74 (3.74)	7.16 (2.16)	6.74 (1.74)	7.16 (2.16)	6.74 (1.74)	7.16 (2.16)
10 Yr. Stillwater (Max Tidal El.=6.40' NAVD 88)	Dry Condition	6.39 (3.39)	6.41 (1.41)	4.15 (0.00)	4.15 (0.00)	2.75 (0.00)	3.32 (0.00)
	1-Yr Rainfall	6.59 (3.59)	6.84 (1.84)	6.59 (1.59)	6.84 (1.84)	6.58 (1.58)	6.83 (1.83)
	10-Yr Rainfall	6.74 (3.74)	7.07 (2.07)	6.74 (1.74)	7.08 (2.08)	6.74 (1.74)	7.07 (2.07)
	100-Yr Rainfall	6.89 (3.89)	7.19 (2.19)	6.90 (1.90)	7.19 (2.19)	6.89 (1.89)	7.19 (2.19)

*Alternative 1-Tide gates implemented on both culverts exiting Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88)

**Alternative 2-Tide gates implemented on both culverts exiting Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88). Silver Lake lowered by 2' prior to storm via control gate.

Red Result Indicate Flooding

Green Results Indicate No Flooding

Peak Flows & Velocities Upstream of Silver Lake												
Tide	Rainfall Event	Existing Conditions Parsonage Creek		Existing Conditions Baldwin Creek		Alternative 1* Parsonage Creek		Alternative 1* Baldwin Creek		Alternative 2** Parsonage Creek		Alternative 2** Baldwin Creek	
		Flow (cfs)	Velocity (fps)	Flow (cfs)	Velocity (fps)	Flow (cfs)	Velocity (fps)	Flow (cfs)	Velocity (fps)	Flow (cfs)	Velocity (fps)	Flow (cfs)	Velocity (fps)
Normal Tide (Max Tidal El. = 2.682' NAVD 88)	Dry Condition	8.25	0.04	7.97	0.08	16.04	0.09	5.54	0.07	6.96	0.09	3.15	0.06
	1-Yr Rainfall	162.3	0.59	278.67	2.11	161.43	0.59	273.67	2.08	161.86	0.62	274.17	2.14
	10-Yr Rainfall	212.69	0.67	387.63	2.41	212.65	0.68	387.14	2.39	213.03	0.7	387.48	2.48
	100-Yr Rainfall	314.05	0.96	483.83	2.5	374.9	0.89	485.12	2.45	354.6	0.99	482.56	2.48
Highest Annual Tidal Cycle from Sandy Hook, NJ (2017) (Max Tidal El.=4.42' NAVD 88)	Dry Condition	25.56	0.08	16.75	0.13	16.04	0.09	12.97	0.13	8.51	0.1	5.11	0.1
	1-Yr Rainfall	165.59	0.57	276.89	1.59	165.56	0.57	271.98	1.55	165.68	0.58	271.39	1.58
	10-Yr Rainfall	280.34	0.92	381.8	2.08	268.26	0.92	382.53	2.11	287.64	1.05	385.27	2.17
	100-Yr Rainfall	281.29	0.96	488.44	2.46	281.22	0.95	489.59	2.47	305.56	1.06	490.81	2.47
Maximum Tide Before Overtopping Foxhurst Rd. (Max Tidal El.=5.90' NAVD 88)	Dry Condition	44.2	0.11	36.67	0.19	16.66	0.09	19.88	0.18	10.02	0.09	6	0.11
	1-Yr Rainfall	198.21	0.52	276.99	1.4	199.33	0.52	277.2	1.4	200.75	0.53	277.67	1.4
	10-Yr Rainfall	292.15	0.96	384.37	1.94	283.84	0.96	384.71	1.97	291.72	1.06	384.8	2.04
	100-Yr Rainfall	291.3	0.93	492.16	2.48	312.47	0.95	492.12	2.48	300.5	1.02	492.91	2.48
10 Yr. Stillwater (Max Tidal El.=6.40' NAVD 88)	Dry Condition	54.66	0.13	43.58	0.23	34.26	0.12	26.17	0.21	11.72	0.11	14.08	0.15
	1-Yr Rainfall	196.52	0.5	274.63	1.38	196.46	0.5	274.59	1.38	199.62	0.51	275.03	1.39
	10-Yr Rainfall	385.04	1	331.56	1.94	280.58	1.01	387.6	1.95	287.06	0.92	384.64	1.94
	100-Yr Rainfall	322.67	0.97	492.17	2.48	303	0.92	492.39	2.48	305.18	0.98	493.89	2.49

*Alternative 1-Tide gates implemented on both culverts downstream of Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88)

**Alternative 2-Tide gates implemented on both culverts downstream of Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88). Silver Lake lowered by 2' prior to storm via control gate.

Peak Flows and Velocities Downstream of Silver Lake												
Tide	Rainfall Event	Existing Conditions 10' Wide by 7'-3'' High Box Culvert		Existing Conditions 6' Wide by 6' High Box Culvert		Alternative 1* 10' Wide by 7'-3'' High Box Culvert		Alternative 1* 6' Wide by 6' High Box Culvert		Alternative 2** 10' Wide by 7'-3'' High Box Culvert		Alternative 2** 6' Wide by 6' High Box Culvert	
		Flow (cfs)	Velocity (fps)	Flow (cfs)	Velocity (fps)	Flow (cfs)	Velocity (fps)	Flow (cfs)	Velocity (fps)	Flow (cfs)	Velocity (fps)	Flow (cfs)	Velocity (fps)
Normal Tide (Max Tidal El. = 2.682' NAVD 88)	Dry Condition	22.38	0.55	15.14	0.43	15.68	0.55	9.06	0.36	18.14	0.77	9.3	0.51
	1-Yr Rainfall	289.58	5.41	157.47	4.62	285.16	4.52	155.38	5.29	286.25	5.32	156.01	4.55
	10-Yr Rainfall	393.69	6.76	253.6	7.04	394.91	6.76	258.87	7.19	395.64	6.75	256.06	7.11
	100-Yr Rainfall	463.12	7.79	315.04	8.75	465.82	7.76	320.29	8.9	472.56	7.76	324.29	9.01
Highest Annual Tidal Cycle from Sandy Hook, NJ (2017) (Max Tidal El.=4.42' NAVD 88)	Dry Condition	46.94	2.03	23.89	1.46	35.5	2.03	21.14	1.46	26.19	2.25	13.6	1.59
	1-Yr Rainfall	308.9	4.38	153.17	4.25	308.43	4.37	152.9	4.25	304.22	4.42	151.73	4.21
	10-Yr Rainfall	443.01	6.92	228.97	6.86	442.31	6.91	222.81	6.83	447.21	6.92	224.29	6.83
	100-Yr Rainfall	480.12	7.76	288.43	8.01	479.35	7.72	286.65	7.96	488.36	7.74	289.57	8.04
Maximum Tide Before Overtopping Foxhurst Rd. (Max Tidal El.=5.90' NAVD 88)	Dry Condition	74.37	1.03	36.6	1.02	53.86	0.92	29.88	0.83	29.5	1.22	15.23	0.73
	1-Yr Rainfall	311.46	4.3	309.49	6.19	304.88	4.21	154.23	4.28	307.94	4.25	155.87	4.33
	10-Yr Rainfall	417.65	6.66	209.47	8.24	407.4	6.65	202.84	6.32	406.83	6.66	204.68	6.33
	100-Yr Rainfall	451.98	7.51	440.8	8.82	451.2	7.49	273.34	7.57	455.1	7.52	273.07	7.59
10 Yr. Stillwater (Max Tidal El.=6.40' NAVD 88)	Dry Condition	80.19	1.11	41.22	1.15	73.03	1.07	36.23	1.01	41.55	0.94	23.58	0.73
	1-Yr Rainfall	298.05	4.19	150.73	4.19	290.91	4.03	147.6	4.1	291.64	4.06	147.2	4.09
	10-Yr Rainfall	415.04	6.39	207.31	5.97	408.01	6.38	202.72	5.96	407.59	6.39	203.94	5.97
	100-Yr Rainfall	451.09	7.38	270.75	7.52	450.08	7.37	264.82	7.36	454.23	7.39	265.78	7.38

*Alternative 1-Tide gates implemented on both culverts downstream of Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88).

**Alternative 2-Tide gates implemented on both culverts downstream of Silver Lake. Pathway around Silver Lake raised to El. 5.0' (NAVD 88). Silver Lake lowered by 2' prior to storm via control gate.

APPENDIX B

MINUTES OF COMMUNITY MEETINGS

Public Meeting’s

SILVER LAKE PARK DRAINAGE IMPROVEMENTS

OBSERVED FLOODING LOCATIONS

Place a colored dot near the approximate location of observed flooding conditions (overlapping dots are okay) or draw directly on the map. Picture references indicate the color to use.

Governor's Office of Storm Recovery

SILVER LAKE PARK DRAINAGE IMPROVEMENTS

OBSERVED FLOODING LOCATIONS

Place a colored dot near the approximate location of observed flooding conditions (overlapping dots are okay) or draw directly on the map. Picture references indicate the color to use.

Office of Storm Recovery

Please mark on the map the location of flooding conditions that you have experienced. In addition, please provide the following:

Date:

Time:

Location: 694 LAKESIDE DRIVE

Photos? Yes / No

Description: ENTIRE BACKYARD FLOODS DURING EVERY STORM THAT LASTS 2 DAYS OR MORE OF RAIN. INCLUDING STORMS KATRINA, IRENE, SANDY

~~6~~ 6 ft of water in home - Sandy Storm

~~water~~ Pools in front of house in the street during storms

May we contact you with any follow up questions?

Name: AMY FINK

E-mail or Phone: 516 606-8867

Please submit to:

Joe Cuomo
Planning Division, NC DPW
1194 Prospect Ave.
Westbury, NY 11590

or via email: **jcuomo@nassaucountyny.gov**

Please mark on the map the location of flooding conditions that you have experienced. In addition, please provide the following:

Date: 4/12/18

Time:

Location: 644 Foxhurst RD

Photos? (Yes) / No

Description: Concern of high volume flow my bulkhead is failing due to water flows.

May we contact you with any follow up questions?

Name:

E-mail or Phone:

Please submit to:

Joe Cuomo
Planning Division, NC DPW
1194 Prospect Ave.
Westbury, NY 11590

or via email: **jcuomo@nassaucountyny.gov**

Please mark on the map the location of flooding conditions that you have experienced. In addition, please provide the following:

Date: 4-12-18

Time: 9PM

Location:

Photos? Yes / No

Description: Concerns re: flow of Lake under Foxhurst Rd into canal

May we contact you with any follow up questions?

Name: Van Wickler

E-mail or Phone: MVWRPAC97@aol.com 5162234728

Please submit to:

Joe Cuomo
Planning Division, NC DPW
1194 Prospect Ave.
Westbury, NY 11590

or via email: **jcuomo@nassaucountyny.gov**

Please mark on the map the location of flooding conditions that you have experienced. In addition, please provide the following:

Date: 4/13/18

Time:

Location:

Photos? Yes / No Chris Tomasello

Description:

2980 Lakeside Dr

516-233-7944

May we contact you with any follow up questions?

Name:

E-mail or Phone:

Please submit to:

Joe Cuomo
Planning Division, NC DPW
1194 Prospect Ave.
Westbury, NY 11590

or via email: **jcuomo@nassaucountyny.gov**

Please mark on the map the location of flooding conditions that you have experienced. In addition, please provide the following:

Date:

Time: Heavy Rains Above 2

Location: Rain Flooding on

Photos? Yes / No Lakeside Dr

Description:

May we contact you with any follow up questions?

Name: Maurer

E-mail or Phone: 395 7720

Please submit to:

Joe Cuomo
Planning Division, NC DPW
1194 Prospect Ave.
Westbury, NY 11590

or via email: **jcuomo@nassaucountyny.gov**

Please mark on the map the location of flooding conditions that you have experienced. In addition, please provide the following:

Date: August 2011, Oct. 2012, multiple other dates

Time:

Location: Hillside Ct + Foxhurst Ave. (not Road)

Photos? (Yes) / No

Description: Silver Lake often overflows its banks. We live on Hillside Ct. so it is directly across the street from our home.

May we contact you with any follow up questions?

Name: Steve Kirsch

E-mail or Phone: slaudio@aol.com

Please submit to:

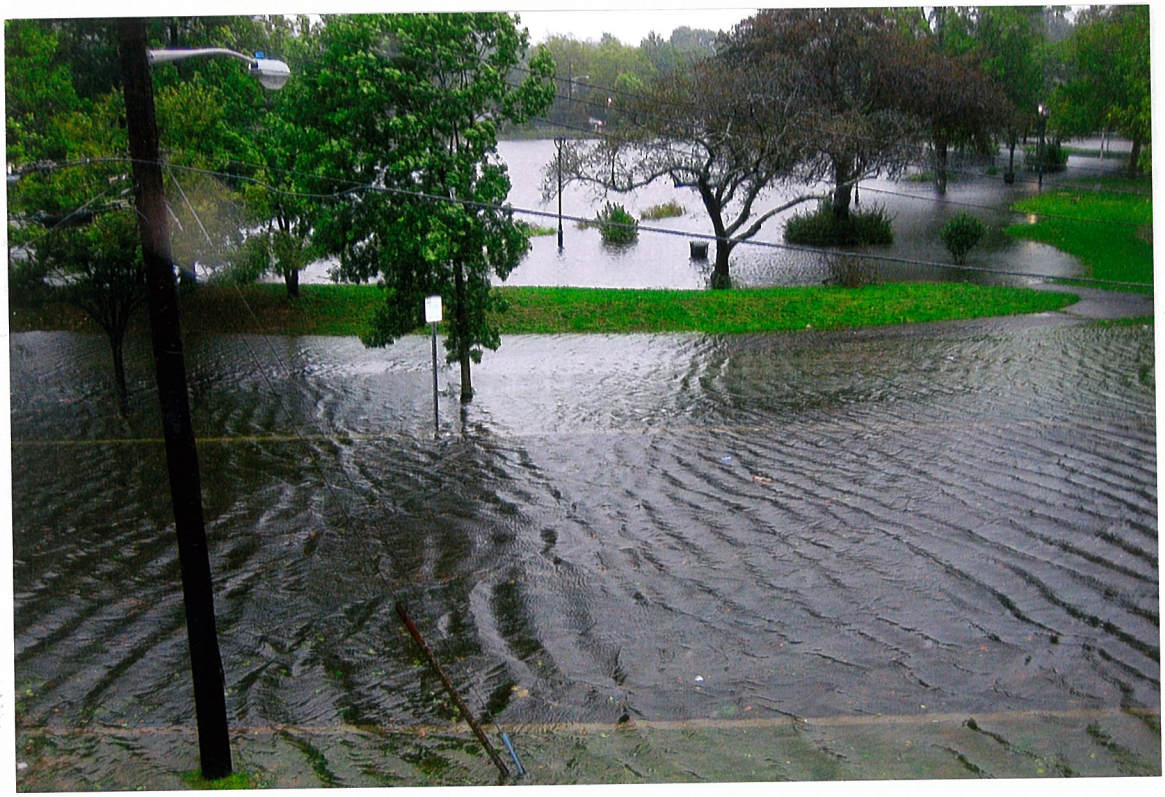
Joe Cuomo
Planning Division, NC DPW
1194 Prospect Ave.
Westbury, NY 11590

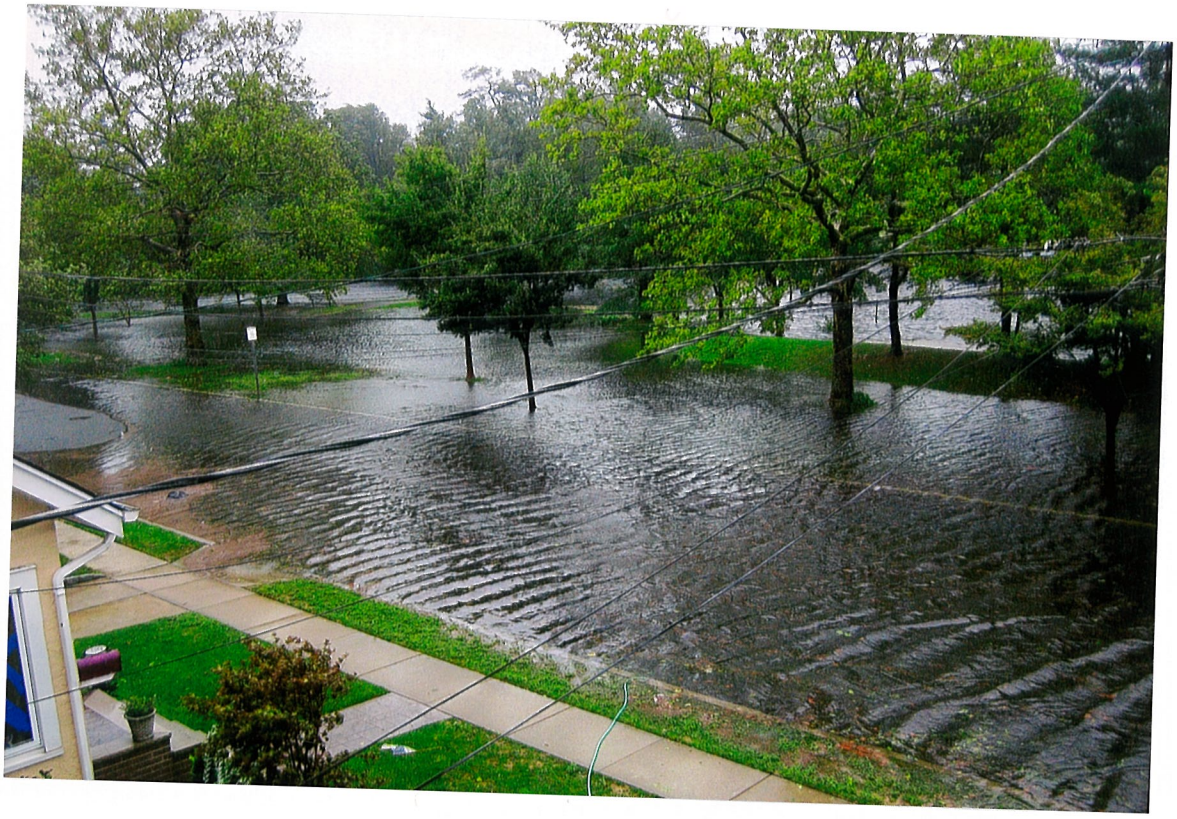
or via email: **jcuomo@nassaucountyny.gov**


6-24-17 836AM

2492 Lakeside Drive


Rain Storm
2492 Lakeside Drive





STORM SANDY

My Backyard filled with Water

Amy Fink
694 Lakeside Drive
Baldwin NY 11510

See 54
Block 190

Lot 0247

- ~~Detent~~ Upstream Recharge Basin has a stream in it and does not store any water
  rechage Basin #500

- new drainage system up right side and is now where the flooding is occuring

egnardone
@ seatuck.org

SNOW RUN-OFF & EXCESSIVE RAIN POOLING IN & AROUND LAKE & LOCAL ROADS

* 6-24-17
6-17-17

POOR CATCHMENT WELLS CAUSING CLOGS & OVERFLOWS

Outreach Meetings

MINUTES OF MEETING

DATE: March 14, 2018

TIME: 2:00 PM

LOCATION: NCDPW, 1194 Prospect Ave, Westbury, NY 11590

PROJECT: Silver Lake Park Drainage Improvements

IN ATTENDANCE:

Keith Masseria	LKMA	631-286-8668
Rob Nielsen	LKMA	631286-8668
Joe Cuomo	NCDPW	516-571-9489
Jerry Ennis	NCDPW	516-571-7522
Debra Mule	NC Leg.	5816-571-6205
Kiana Bierria	NC Leg.	516-571-6205
Dwain Welcome	HGA	781-415-5980
Bill Spitz	HGA	631-806-4264
Casey Ferber	GOSR	718-568-4744
James McAllister	GOSR	646-256-9485
Sean Sallie	NCDPW	561-571-9342
David Viana	NCCE	516-571-6691

PURPOSE OF MEETING: Design Update Meeting

DISCUSSION:

1. Sean Sallie opened the meeting and project team introductions were made. Joe Cuomo then gave a brief recap of the kickoff meeting that took place on February 14th, 2018.
2. LKMA updated the group on the work performed to date. Work performed to date includes:
    - Site Visit during Winter Storm Riley
    - Preliminary Watershed Mapping
    - Obtained record plans from NCDPW and TOH
    - Obtained access to NCDPW's GIS system and available data
    - LKMA is setting up a GIS database for data collection
3. Observations of Winter Storm Riley were discussed, it was noted that during the storm the surrounding roadways experienced no flooding. It was noted that there was concern regarding the flooding that took place in the park on the asphalt pathways in the vicinity of the bridge.
4. It was stated that the first public meeting is to take place on April 12th, 2018 at the Baldwin High School. Joe Cuomo will be coordinating this event and it may be in conjunction with the monthly civic meeting that takes place on the same date.

5. It was stated that the purpose of this public meeting is to identify local residents and community members concerns regarding flooding and that LKMA will just give a brief description of the project but it is more of a meeting for us to gather information from the public.
6. LKMA will draft a letter for NCDPW addressed to the Baldwin community members stating the meeting time, location and purpose of the meeting. It was also stated that the letter will ask residents and community members to bring any photo evidence of flooding in or around Silver Lake Park so that LKMA may better understand the flooding issues that have been experienced.
7. The legislators office stated that they will hand deliver the above mentioned letter to local residents and e-mail the letter to all residents of Baldwin.
8. It was stated that the meeting will not be very technical or discuss any solutions to flooding issues in or around Silver Lake Park. The goal of the first public meeting is to gather information and public input on flooding issues in or around Silver Lake Park.
9. LKMA will provide a few stations which will have an Aerial on display of Silver Lake Park and the surrounding areas so that community members may come up to the stations to share their knowledge of past flooding events.
10. A follow up meeting after the first public meeting between the project teams and local community stakeholders was discussed and tentatively will take place April 25th, 2018 at 2pm and be held at the NCDPW.

These minutes reflect our understanding of the issues discussed. Please bring to my attention any corrections and/or comments.

Minutes prepared by L.K. McLean Associates

MINUTES OF MEETING

DATE: April 25, 2018

TIME: 2:00 PM

LOCATION: Baldwin Public Library, 2385 Grand Ave, Baldwin, NY 11510

PROJECT: Silver Lake Park Drainage Improvements

IN ATTENDANCE:

Keith Masseria	LKMA	631-286-8668
Rob Nielsen	LKMA	631286-8668
Sean Sallie	NCDPW	561-571-9342
Joe Cuomo	NCDPW	516-571-9489
Jerry Ennis	NCDPW	516-571-7522
Debra Mule	NC Leg.	5816-571-6205
Kiana Bierria	NC Leg.	516-571-6205
David Viana	NCCE	516-571-6691
Erik Mahler	BCC	516-395-7720
Douglas Wiedmann	Baldwin Sanitary	516-860-4797
Lemvel Peterpz	Armand	646-789-9141
Jana Foster	Armand	646-543-7880
Karen Montalbano	BCA	516-728-8189
Enrico Nardome	Seatuck	631-487-0071

PURPOSE OF MEETING: Design Update Meeting

DISCUSSION:

1. Sean Sallie opened the meeting by giving a brief overview of the project and discussed introduced potential improvements including Flood Mitigation, Aesthetic and Environmental improvements and project team introductions were made.
2. Joe Cuomo updated the group on the work performed to date. Work performed to date includes:
    - Project Kickoff Meeting on February 21, 2018
    - NCDPW provided the design team with all available GIS drainage information
    - Obtained record plans from NCDPW and TOH
    - LKMA and Gedeon met to discuss how the drainage inventory would be conducted
    - Public Meeting on April 12th, 2018
    - LKMA and Gedeon began the drainage inventory by entering record plan drainage information into ArcGIS Online

3. Joe Cuomo spoke about the next steps moving forward and stated that LKMA and Gedeon will continue with the drainage inventory. LKMA will begin the modeling process by delineating watersheds using drainage record plan information and GIS Lidar Contours. Gayron De Bruin is to complete survey by the end of May.
4. The project budget was discussed and it was stated that the project budget is $2M for final design and construction.
5. Keith Masseria of LKMA gave a presentation on several different conceptual alternative ideas to mitigate flooding and improve water quality and park aesthetics. The conceptual alternative ideas presented included:
    - Installation of trash racks at culvert entrances north of Silver Lake
    - Installation of catch basin inserts throughout the positive drainage systems
    - Replacement of existing control gate at the weir
    - Increasing the impoundment of silver lake and creating a living shoreline
    - Installation of tide gate at the downstream end of the culvert connecting silver lake to parsonage canal
    - Installation of a fish ladder to pass river herring over the weir at the upstream end of the culvert connecting parsonage canal and silver lake at low tide.
6. Douglas Wiedmann and Erik Mahler brought up issues about maintenance, they were concerned that if trash racks or catch basin inserts were implemented throughout the area that they would not be maintained.
7. It was stated that in the past the existing control gate was used to drain Silver Lake about once a year and helped improve water quality, Enrico Nardome was supportive of this idea and stated that it would help bring sediment to the marshes to the south which in their current state are deprived of sediment.
8. Enrico Nardome stated that the river herring have no issue passing over the weir at Silver Lake at high tide and suggested that instead of installing a fish passage at this location that a fish passage could be installed in the culvert between Silver Lake and Caroline's Lake so that river herring can get upstream to Caroline's Lake.
9. Installation of a tide gate in the culvert between parsonage canal and silver lake was discussed. This would mitigate flooding of Silver Lake Park. It was noted that an elevation needs to be established for when the tide gate would shut.
10. Increasing the impoundment of Silver Lake was discussed. It was stated that in the past a similar project was implemented and was not extremely effective and required significant maintenance. Erik Mahler and Douglas Wiedmann specifically were concerned about the proposed wetlands not being maintained and suggested a solution incorporating raising the height of the existing bulkhead surrounding Silver Lake. Enrico Nardome was in favor of the creation of the living shoreline and felt it would be beneficial for the environment.
11. Another alternative that was discussed was increasing the impoundment of recharge basin 500 to reduce peak flows. It was also stated there is an existing trash rack on the downstream side of recharge basin 500 which is located in the vicinity of Lofts Pond just north of the LIRR. A field visit was tentatively planned to recharge basin 500 with NCDPW and LKMA for the following week.
12. The project schedule was discussed, LKMA and the design team are on track to hit all upcoming deadlines.

13. The next meeting was tentatively scheduled to be on June 21st at 2pm at the Baldwin Public Library.

These minutes reflect our understanding of the issues discussed. Please bring to my attention any corrections and/or comments.

Minutes prepared by L.K. McLean Associates

MINUTES OF MEETING

DATE: June 21, 2018

TIME: 2:00 PM

LOCATION: Baldwin Public Library, 2385 Grand Ave, Baldwin, NY 11510

PROJECT: Silver Lake Park Drainage Improvements

IN ATTENDANCE:

Keith Masseria	LKMA	631-286-8668
Bob Steele	LKMA	631-286-8668
Sean Sallie	NCDPW	561-571-9342
Joe Cuomo	NCDPW	516-571-9489
Jerry Ennis	NCDPW	516-571-7522
Debra Mule	NC Leg.	5816-571-6205
Kiana Bierria	NC Leg.	516-571-6205
David Viana	NCCE	516-571-6691
Erik Mahler	BCC	516-395-7720
Douglas Wiedmann	Baldwin Sanitary	516-860-4797
Lemuel Peterson	Armand	646-789-9141
Jania Foster	Armand	646-543-7880
Karen Montalbano	BCA	516-728-8189
Enrico Nardone	Seatuck	631-487-0071
Dwaine Welcome	HGA	516-571-9489
Casey Ferber	GOSR	718-415-5900
Nicole Barnes	GOSR	

PURPOSE OF MEETING: Design Update Meeting

DISCUSSION:

1. Joe Cuomo updated the group on the work performed to date (see attached agenda from meeting).
2. Bob Steele from LKMA described the watershed map and the work performed to date pertaining to the drainage inventory.
3. LKMA indicated that they are getting close to completing the existing conditions drainage model.
4. LKMA will work with NCDPW to determine the design storm event (rainfall and storm surge).
5. LKMA explained that there are two different conceptual tide gates ideas. There will be one normal flap tide gate and one self-regulating tide gate.
6. LKMA indicated that the drainage model will tell us if it is necessary to elevate the perimeter of the pond and if so how high.

7. LKMA stated that areas already vegetated surrounding Silver Lake Pond will be enhanced and restored with new wetland plantings. Invasive plant species such as phragmites will be removed and disposed of.
8. If additional funds remain after all desired alternatives have been implemented, blue stone capping may be installed along the top of the Silver Lake Wall.
9. A potential solution is to install a hydrodynamic separation unit down stream of Lofts Pond and upstream of the Parsonage Creek which runs through the residents backyards. This will capture debris, sediment and floatables prior to making it to this creek which ultimately discharges to Carolines Pond.
10. LKMA indicated that the control gate at Silver Lake will be refurbished or replaced if required by the drainage model.
11. LKMA described the fish passage alternative which is to retrofit the existing trapezoidal channel directly south of Carolines Pond.
12. LKMA will limit catch basin inserts to Town of Hempstead Roadways.
13. NC expressed concern about debris entering Silver Lake from Grand Avenue.
14. LKMA will check handicap accessibility surrounding Silver Lake.
15. A planter or grate is desired at the self-regulating tide gate to prevent/deter the disposal of trash into the basin.
16. The residents liked the concept of being able to see the tide gate and using it as an educational sign location.

These minutes reflect our understanding of the issues discussed. Please bring to my attention any corrections and/or comments.

Minutes prepared by L.K. McLean Associates

MINUTES OF MEETING

DATE: September 18, 2018

TIME: 2:00 PM

LOCATION: 2385 Grand Ave. Baldwin, NY 11510

PROJECT: Silver Lake Park Drainage Improvements

IN ATTENDANCE:

Doug Wiedmann	BFD	516-860-4797
Jania Foster	Armand	212-542-4179
Karen Montalbano	BCA	516-728-8189
E. Mahler	BCC	516-395-7720
Dwaine Welcome	HGA	516-571-9489
Jerry Ennis	NCDPW	516-571-7522
Kianna Bierria	Legislature Mule	516-572-6205
Debra Mule	NC Legislature	516-572-6205
David Vianna	NC Exec.	516-572-6205
Sean Sallie	NCDPW	561-571-9342
Joe Cuomo	NCDPW	516-571-9489
Keith Masseria	LKMA	631-286-8668
Bob Steele	LKMA	631-286-8668

PURPOSE OF MEETING: September progress and shareholders meeting.

DISCUSSION:

1. LKMA presented the findings of the design report in a power point presentation.
2. NCDPW stated that they will be clean out the downstream defender if it is installed.
3. LKMA explained that a high flow bypass will be installed in conjunction with the downstream defender to prevent any flooding that may occur in the event that it was not maintained.
4. The community members would like for the trash booms to be installed directly south of Wateredge Avenue (on the west branch) and west of the memorial (on the east branch).
5. The trash booms can be placed on a schedule so that they can be cleaning periodically by the County.
6. The community members expressed maintenance concerns at the living shoreline locations.
7. LKMA explained that the overall budget is $2.5M and the construction budget is $1.7M.
8. LKMA explained that the goal of the project was to provide the maximum amount of protection at Silver Lake Park within the available funding.

9. The community asked if more funding is available from other projects to move towards this project. GOSR explained that there was not additional funding available.
10. The community members recommended that LKMA leave out the tables when presenting this information to the public at the next meeting.
11. LKMA will include a summary with known storm events.
12. The community confirmed that the houses north of Carolines Pond adjacent to the creek do not flood, just the yards.
13. The community recommended keeping the presentation simple and leaving out the detailed analysis.
14. The next public meeting will be in mid October.
15. The BCA meeting is on October 11th. The public meeting can't be on this date.
16. NCDPW will check for school board meetings to ensure that there are no conflicts with the proposed meeting date.
17. LKMA will create a section which shows tidal elevations from known storm events.

These minutes reflect our understanding of the issues discussed. Please bring to my attention any corrections and/or comments.

Minutes prepared by L.K. McLean Associates

MINUTES OF MEETING

DATE: October 22, 2018

TIME: 7:30 PM

LOCATION: NCDPW, 1194 Prospect Ave, Westbury, NY 11590

PROJECT: Silver Lake Park Drainage Improvements

IN ATTENDANCE:

Keith Masseria	LKMA	631-286-8668	
Bob Steele	LKMA	631-286-8668	
Rob Nielsen	LKMA	631-286-8668	
Sabrina Harrison	LKMA	631-286-8668	
Jerry Ennis	NCDPW	516-572-7522	
Joe Cuomo	NCDPW	516-571-9489	
Sean Sallie	NCDPW	516-571-9342	
Anthony O'Reilly	LI Herald	516-564-4000	aoreilly@liherald.com
Maria Schulz	Resident	516-546-3944	
Richard Van Wickler	Resident	631-774-7951	thedad3@aol.com
Aaron Miner	State Senate Todd Kaminsky		
		516-642-6904	aaronqminer@gmail.com
John McDermot	Resident	516-347-0614	
			johnmcdermot28@gmail.com
Maggie		516-546-8854	
Ding Lee		516-379-0435	dignlee3450@gmail.com
John Muser		516-576-8854	
Shanice Talley	Armand	212-542-4179	stalley@armondcon.com
Bill Maniace			bmani13@verizon.net
Karen Montalbano	BCA	516-728/-8189	baldwincivic@gmail.com
Jeanette Valentin	Resident	646-685-6090	sweetjeannie23@yahoo.com
Louise Inglese		516-650-1702	linglese65@optonline.net
Doug Wiedmann		860-4797	
Laura Munafo	GOSR		
Nicole Barnes	GOSR		
Hargsh	Baldwin	917-371-6349	
Meta J. Meredan	VEDI, INC		meemee12@msn.com
Susan Bisberg			
Alex Fox	Sen. Kaminsky	516-766-8383	afox@nysenate.gov
Stephen Kirsch		516-223-8878	staudio@aol.com
Steven Rolston	Resident	917-589-4451	srolston@optonline.net
Amy Fink	Resident	516-606-8867	spchteach2@optonline.net
Gary T. Farkash	Resident	516-377-3521	thewineguy35@hotmail.com
Lary Mlawski	Resident	516-815-0023	lmlawski@gmail.com
Rob Weisser	Resident	516-263-6460	robweisser@gmail.com
Amado Valentin		516-792-6907	avalentin0206@gmail.com

PURPOSE OF MEETING: Design Update Meeting

DISCUSSION:

1. The meeting began with the project poster board exhibit. Three of the boards had proposed improvements and one board presented an opportunity for community members to voice complaints/concerns with park maintenance.
2. Following the poster board exhibit, NCDPW introduced the design team.
3. LKMA presented the proposed project alternatives in a power point presentation.
4. Discussed in the power point presentation was the following:
    - Observed Flooding Events
    - Public Outreach
    - Proposed Design Components:
        i. Elevate perimeter walkway to elevation 5.0 (NAVD88)
        ii. Install Tide Gates on Silver Lake Outfalls
        iii. Install stormwater treatment device between Lofts Pond and Natural Channel to the South of Merrick Road
        iv. Provide Fish Passage to Caroline's Pond
    - Discussion of local storm events within the past 10 years
    - Benefits of Design Alternatives
    - Priority Matrix and associated construction costs
    - Next Steps
5. A resident asked if it would be possible to replace the proposed asphalt pavement with concrete sidewalk. Subsequent to the meeting, the resident sent an email agreeing that the proposed asphalt walks with concrete curbing was the best design for the perimeter walkway.
6. A resident asked what impact the tide gates would have on Parsonage Canal during a storm surge. Subsequent to the meeting, LKMA investigated the impact of the proposed tide gates on the Parsonage Canal during a tidal surge via adding the segment of Parsonage Canal between Foxhurst Road and the Parsonage Cove to the drainage model. The model indicated that the addition of tide gates will not result in a condition that elevates the water surface in the canal during a tidal surge higher than existing conditions.
7. LKMA and NCDPW will schedule a site visit to 2512 Lakeside Drive to view catch basin in backyard.
    - LKMA to review record plans and GIS
    - Inspect the backyard at 2464 Lakeside Drive for similar drainage issues Subsequent to the meeting, LKMA visited the backyard of the property at 2464 Lakeside Drive and observed that a drainage inlet that collects stormwater runoff from the property and adjacent properties exists and likely drains to an outfall located on the western wall of the culvert below Wateredge Avenue. LKMA to consider installing a check valve in the system to prevent backflow of the Parsonage Creek into the private property.

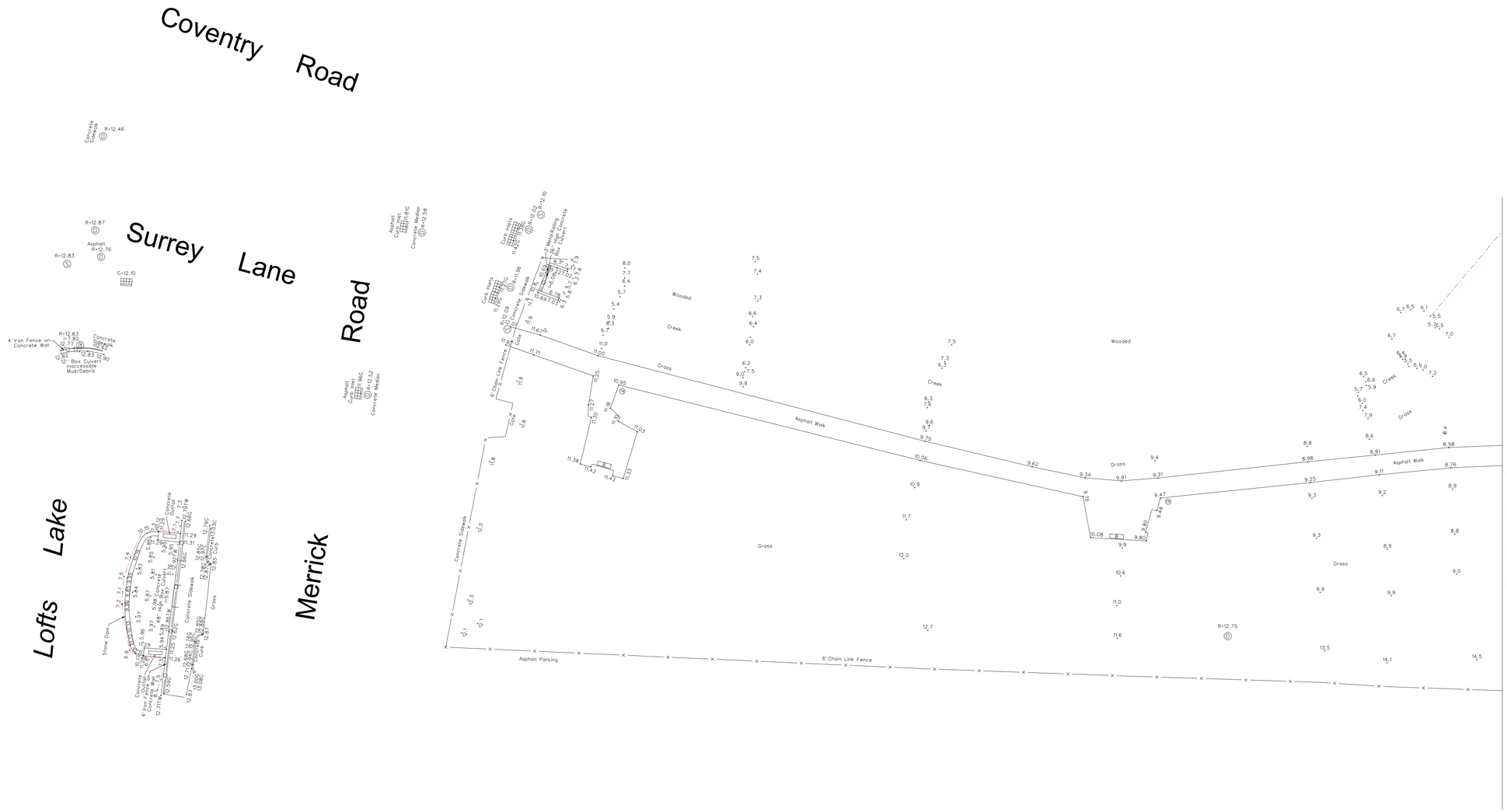
8. NCDPW will review potential for tree plantings in Silver Lake Park to screen 694 Lakeside Drive property (rear yard).
9. The following maintenance comments were left on the board during the poster board exhibit:
    - Why are the lights at Silver Lake Park not turned on at night? This is a safety issue.
    - Please schedule cleaning of new water treatment system at Lofts Pond more frequently than usual.
    - Clean it more often
    - Keep it clean install more trash bins
    - Turn the aerator pumps back on

These minutes reflect our understanding of the issues discussed. Please bring to my attention any corrections and/or comments.

Minutes prepared by L.K. McLean Associates

APPENDIX C

TOPOGRAPHICAL SURVEY OF SILVER LAKE PARK



N

Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

0 10' 20' 30' 40'

SCALE: 1" = 20'

LEGEND

MANHOLES
CATV (C), DRAIN (D), ELECTRIC (E), GAS (G), SEWER (S), SEWER CLEANOUT (SC), TRAFFIC (TR), TELEPHONE (T), UNKNOWN (?), WATER (W)

UTILITY HARDWARE
ELECTRIC VAULT (E), GAS MAIN VALVE, GAS METER (G), GAS SERVICE VALVE, GAS VENT (G_V), HYDRANT, HYDRANT VALVE, IRRIGATION VALVE, OIL FILLER VALVE (O_{FV}), POLE RISER - ELECTRIC (P_{EL}), MONITORING WELL, POLE RISER - TELEPHONE (P_T), ROOF DRAIN (R_D), SEWER VENT (S_V), TRAFFIC DETECTOR, TRAFFIC LOOP, UNIDENTIFIED VAULT (V), UNKNOWN VALVE (?), WATER MAIN VALVE, WATER METER (W_M), WATER SERVICE VALVE

UTILITY POLES
LIGHT POLE BASE, METAL POLE W/LIGHT, METAL POLE WITH TRAFFIC, WOODEN UTILITY POLE, WOODEN UTILITY POLE W/LIGHT

FENCES
GUARD RAIL, CHAIN LINK FENCE, WOODEN FENCE, METAL FENCE, VINYL FENCE

VEGETATION
BUSH, HEDGE, TREE (WITH SIZE), TREELINE

CATCH BASINS
TYPE "A", TYPE 1, FLUSH GRATE, ROUND GRATE

MISCELLANEOUS
CELLAR DOOR (CD), GUARDPOST, GUYWIRE & ANCHOR, HANDICAP RAMP, MAILBOX (MB), PARK BENCH, PARKING METER, SIGN - SINGLE POST, SIGN - DOUBLE POST, TELEPHONE BOOTH (TB)

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=6.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

TOPOGRAPHIC SURVEY
Silver Lake Drainage Improvement & Design

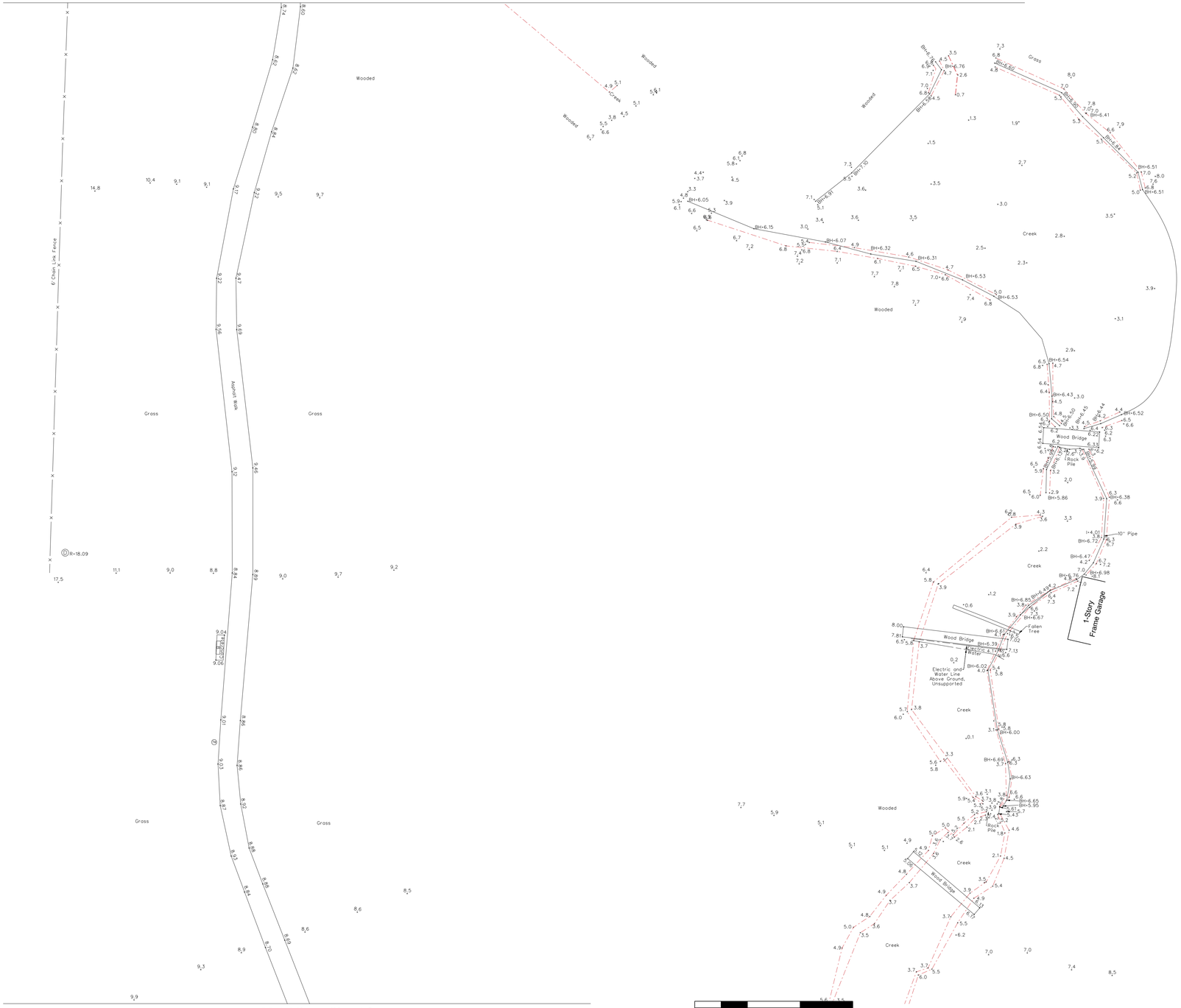
BALDWIN, TOWN OF HEAMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO.	7856
DRAWING DATE	06/26/2018
FIELD WORK DATE	05/2018
DRAWING NO.	D-10941
DRAWN BY	T.B.
CHECKED BY	M.L.

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
Gayron@Bruin.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

P:\7856\Survey\CAD\7856 Basemap.dgn 6/26/2018 12:53:05 PM tbunch

Matchline - Sheet 1



Matchline - Sheet 3

N

Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

LEGEND

MANHOLES
- CATV
- DRAIN
- ELECTRIC
- GAS
- SEWER
- SEWER CLEANOUT
- TRAFFIC
- TELEPHONE
- UNKNOWN
- WATER

UTILITY HARDWARE
- ELECTRIC VAULT
- GAS MAIN VALVE
- GAS METER
- GAS SERVICE VALVE
- GAS VENT
- HYDRANT
- HYDRANT VALVE
- IRRIGATION VALVE
- OIL FILLER VALVE
- POLE RISER - ELECTRIC
- MONITORING WELL
- POLE RISER - TELEPHONE
- ROOF DRAIN
- SEWER VENT
- TRAFFIC DETECTOR
- TRAFFIC LOOP
- UNIDENTIFIED VAULT
- UNKNOWN VALVE
- WATER MAIN VALVE
- WATER METER
- WATER SERVICE VALVE

UTILITY POLES
- LIGHT POLE BASE
- METAL POLE W/LIGHT
- METAL POLE WITH TRAFFIC
- WOODEN UTILITY POLE
- WOODEN UTILITY POLE W/LIGHT

FENCES
- GUARD RAIL
- CHAIN LINK FENCE
- WOODEN FENCE
- METAL FENCE
- VINYL FENCE

VEGETATION
- BUSH
- HEDGE
- TREE (WITH SIZE)
- TREELINE

CATCH BASINS
- TYPE "A"
- TYPE 1
- FLUSH GRATE
- ROUND GRATE

MISCELLANEOUS
- CELLAR DOOR
- GUARDPOST
- GUYWIRE & ANCHOR
- HANDICAP RAMP
- MAILBOX
- PARK BENCH
- PARKING METER
- SIGN - SINGLE POST
- SIGN - DOUBLE POST
- TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=6.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

TOPOGRAPHIC SURVEY
Silver Lake
Drainage Improvement & Design

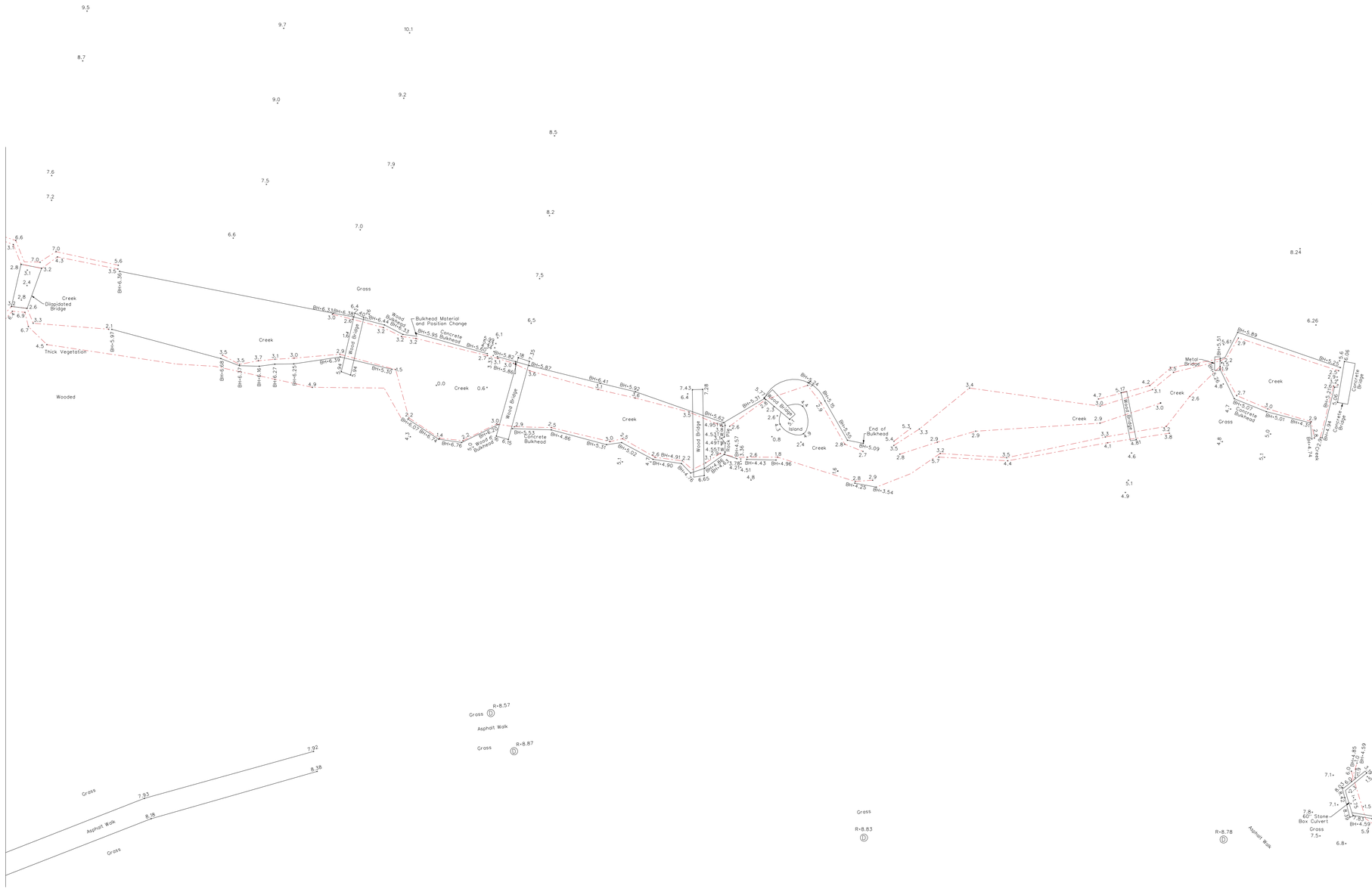
BALDWIN, TOWN OF HEAMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO.	7856
DRAWING DATE	06/26/2018
FIELD WORK DATE	05/2018

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
Gayron@dbsle.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

DRAWING NO.	D-10941
DRAWN BY	T.B.
CHECKED BY	M.L.

P:\7856\Survey\CAD\7856 Basemap.dgn tbunch 6/26/2018 12:53:11 PM



Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

0 10' 20' 30' 40'

SCALE: 1" = 20'

LEGEND

MANHOLES
CATV (C), DRAIN (D), ELECTRIC (E), GAS (G), SEWER (S), SEWER CLEANOUT (SC), TRAFFIC (TR), TELEPHONE (T), UNKNOWN (?), WATER (W)

UTILITY HARDWARE
ELECTRIC VAULT, GAS MAIN VALVE, GAS METER, GAS SERVICE VALVE, GAS VENT, HYDRANT, HYDRANT VALVE, IRRIGATION VALVE, OIL FILLER VALVE, POLE RISER - ELECTRIC, MONITORING WELL, POLE RISER - TELEPHONE, ROOF DRAIN, SEWER VENT, TRAFFIC DETECTOR, TRAFFIC LOOP, UNIDENTIFIED VAULT, UNKNOWN VALVE, WATER MAIN VALVE, WATER METER, WATER SERVICE VALVE

UTILITY POLES
LIGHT POLE BASE, METAL POLE W/LIGHT, METAL POLE WITH TRAFFIC, WOODEN UTILITY POLE, WOODEN UTILITY POLE W/LIGHT

FENCES
GUARD RAIL, CHAIN LINK FENCE, WOODEN FENCE, METAL FENCE, VINYL FENCE

VEGETATION
BUSH, HEDGE, TREE (WITH SIZE), TREELINE

CATCH BASINS
TYPE "A", TYPE 1, FLUSH GRATE, ROUND GRATE

MISCELLANEOUS
CELLAR DOOR, GUARDPOST, GUYWIRE & ANCHOR, HANDICAP RAMP, MAILBOX, PARK BENCH, PARKING METER, SIGN - SINGLE POST, SIGN - DOUBLE POST, TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=6.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

TOPOGRAPHIC SURVEY
Silver Lake
Drainage Improvement & Design

BALDWIN, TOWN OF HEAMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO.	7856
DRAWING DATE	06/26/2018
FIELD WORK DATE	05/2018
DRAWING NO.	D-10941
DRAWN BY	T.B.
CHECKED BY	M.L.

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
GayrondeBruin.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.2111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

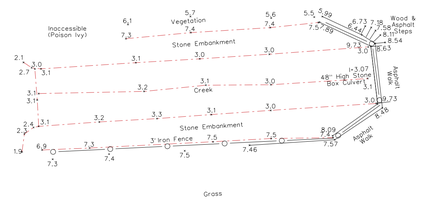
Lakeside Drive

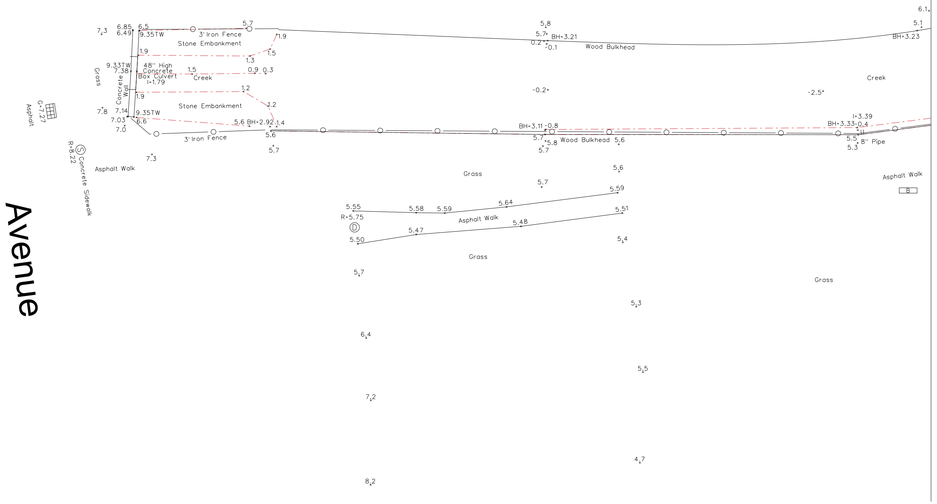
Wateredge Avenue

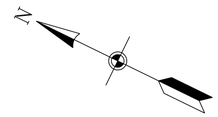
Carolines Lake

Matchline - Sheet 3

Matchline - Sheet 5







Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

0 10' 20' 30' 40'

SCALE: 1" = 20'

LEGEND

MANHOLES
- CATV
- DRAIN
- ELECTRIC
- GAS
- SEWER
- SEWER CLEANOUT
- TRAFFIC
- TELEPHONE
- UNKNOWN
- WATER

UTILITY HARDWARE
- ELECTRIC VAULT
- GAS MAIN VALVE
- GAS METER
- GAS SERVICE VALVE
- GAS VENT
- HYDRANT
- HYDRANT VALVE
- IRRIGATION VALVE
- OIL FILLER VALVE
- POLE RISER - ELECTRIC
- MONITORING WELL
- POLE RISER - TELEPHONE
- ROOF DRAIN
- SEWER VENT
- TRAFFIC DETECTOR
- TRAFFIC LOOP
- UNIDENTIFIED VAULT
- UNKNOWN VALVE
- WATER MAIN VALVE
- WATER METER
- WATER SERVICE VALVE

UTILITY POLES
- LIGHT POLE BASE
- METAL POLE W/LIGHT
- METAL POLE WITH TRAFFIC
- WOODEN UTILITY POLE
- WOODEN UTILITY POLE W/LIGHT

FENCES
- GUARD RAIL
- CHAIN LINK FENCE
- WOODEN FENCE
- METAL FENCE
- VINYL FENCE

VEGETATION
- BUSH
- HEDGE
- TREE (WITH SIZE)
- TREELINE

CATCH BASINS
- TYPE "A"
- TYPE 1
- FLUSH GRATE
- ROUND GRATE

MISCELLANEOUS
- CELLAR DOOR
- GUARDPOST
- GUYWIRE & ANCHOR
- HANDICAP RAMP
- MAILBOX
- PARK BENCH
- PARKING METER
- SIGN - SINGLE POST
- SIGN - DOUBLE POST
- TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=6.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

TOPOGRAPHIC SURVEY
Silver Lake
Drainage Improvement & Design

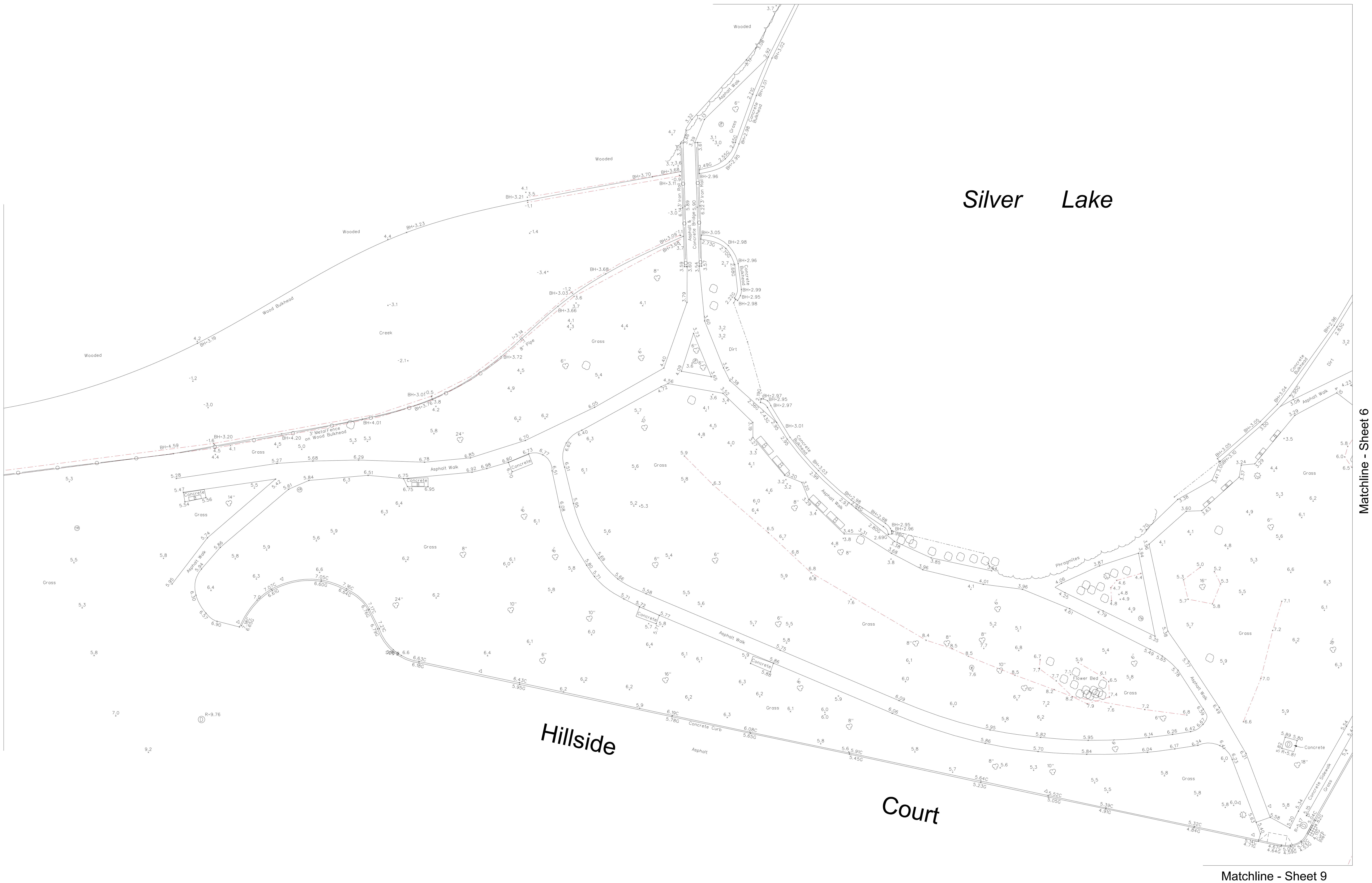
BALDWIN, TOWN OF HEAMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO. 7856
DRAWING DATE 06/26/2018
FIELD WORK DATE 05/2018

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
GayrondeBruin.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

DRAWING NO. D-10941
DRAWN BY T.B.
CHECKED BY M.L.

P:\7856\Survey\CAD\7856_Basemap.dgn 6/26/2018 12:53:29 PM tbusch



Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

0 10' 20' 30' 40'
SCALE: 1" = 20'

LEGEND

MANHOLES
- CATV
- DRAIN
- ELECTRIC
- GAS
- SEWER
- SEWER CLEANOUT
- TRAFFIC
- TELEPHONE
- UNKNOWN
- WATER

UTILITY HARDWARE
- ELECTRIC VAULT
- GAS MAIN VALVE
- GAS METER
- GAS SERVICE VALVE
- GAS VENT
- HYDRANT
- HYDRANT VALVE
- IRRIGATION VALVE
- OIL FILLER VALVE
- POLE RISER - ELECTRIC
- MONITORING WELL
- POLE RISER - TELEPHONE
- ROOF DRAIN
- SEWER VENT
- TRAFFIC DETECTOR
- TRAFFIC LOOP
- UNIDENTIFIED VAULT
- UNKNOWN VALVE
- WATER MAIN VALVE
- WATER METER
- WATER SERVICE VALVE

UTILITY POLES
- LIGHT POLE BASE
- METAL POLE W/LIGHT
- METAL POLE WITH TRAFFIC
- WOODEN UTILITY POLE
- WOODEN UTILITY POLE W/LIGHT

FENCES
- GUARD RAIL
- CHAIN LINK FENCE
- WOODEN FENCE
- METAL FENCE
- VINYL FENCE

VEGETATION
- BUSH
- HEDGE
- TREE (WITH SIZE)
- TREELINE

CATCH BASINS
- TYPE "A"
- TYPE 1
- FLUSH GRATE
- ROUND GRATE

MISCELLANEOUS
- CELLAR DOOR
- GUARDPOST
- GUYWIRE & ANCHOR
- HANDICAP RAMP
- MAILBOX
- PARK BENCH
- PARKING METER
- SIGN - SINGLE POST
- SIGN - DOUBLE POST
- TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=6.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

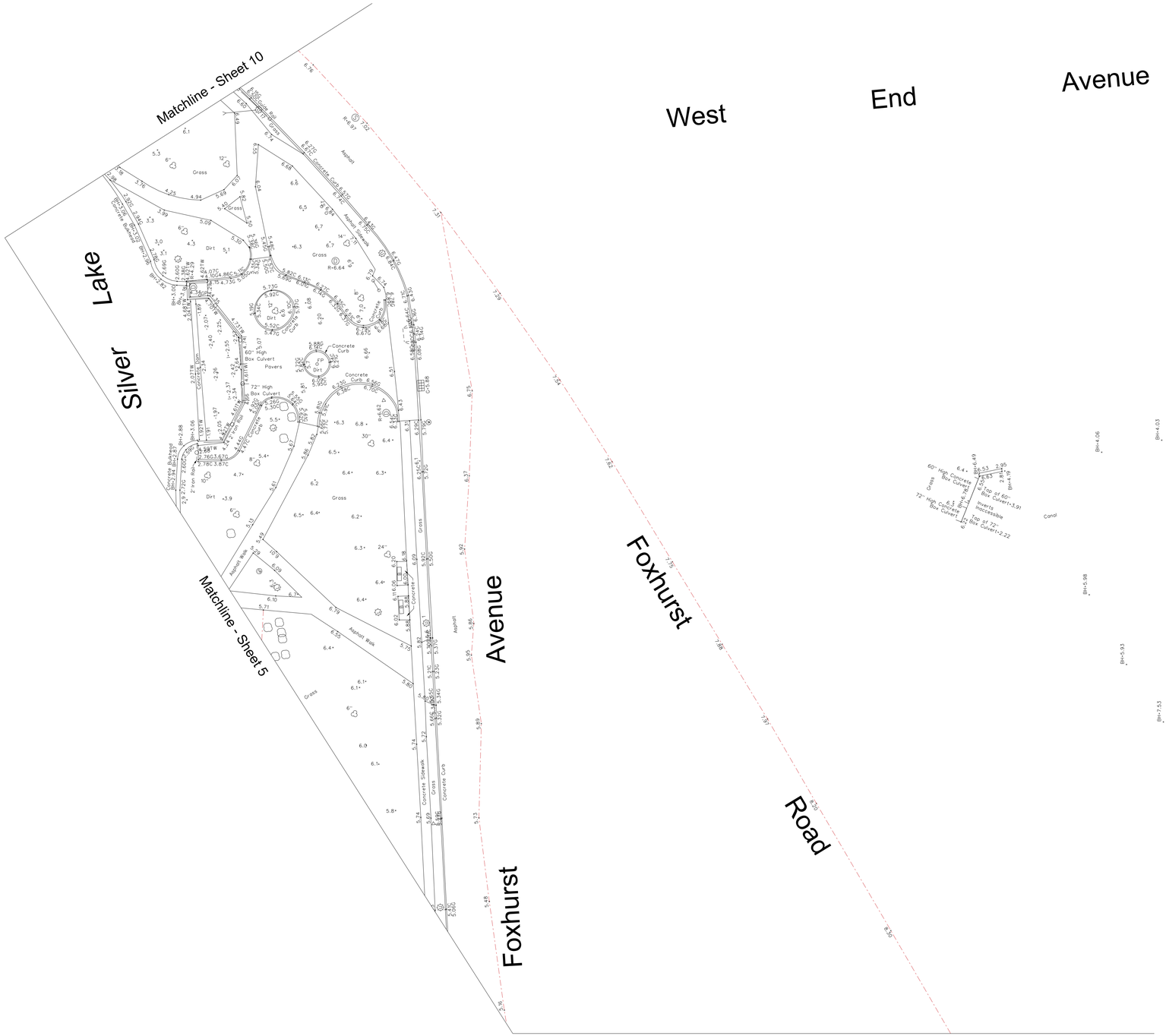
TOPOGRAPHIC SURVEY
Silver Lake
Drainage Improvement & Design

BALDWIN, TOWN OF HEAMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO. 7856
DRAWING DATE 06/26/2018
FIELD WORK DATE 05/2018

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
GayrondeBruIn.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

DRAWING NO. D-10941
DRAWN BY T.B.
CHECKED BY M.L.



N

Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

0 10' 20' 30' 40'
SCALE: 1" = 20'

LEGEND

MANHOLES
CATV, DRAIN, ELECTRIC, GAS, SEWER, SEWER CLEANOUT, TRAFFIC, TELEPHONE, UNKNOWN, WATER

UTILITY HARDWARE
ELECTRIC VAULT, GAS MAIN VALVE, GAS METER, GAS SERVICE VALVE, GAS VENT, HYDRANT, HYDRANT VALVE, IRRIGATION VALVE, OIL FILLER VALVE, POLE RISER - ELECTRIC, MONITORING WELL, POLE RISER - TELEPHONE, ROOF DRAIN, SEWER VENT, TRAFFIC DETECTOR, TRAFFIC LOOP, UNIDENTIFIED VAULT, UNKNOWN VALVE, WATER MAIN VALVE, WATER METER, WATER SERVICE VALVE

UTILITY POLES
LIGHT POLE BASE, METAL POLE W/LIGHT, METAL POLE WITH TRAFFIC, WOODEN UTILITY POLE, WOODEN UTILITY POLE W/LIGHT

FENCES
GUARD RAIL, CHAIN LINK FENCE, WOODEN FENCE, METAL FENCE, VINYL FENCE

VEGETATION
BUSH, HEDGE, TREE (WITH SIZE), TREELINE

CATCH BASINS
TYPE "A", TYPE 1, FLUSH GRATE, ROUND GRATE

MISCELLANEOUS
CELLAR DOOR, GUARDPOST, GUYWIRE & ANCHOR, HANDICAP RAMP, MAILBOX, PARK BENCH, PARKING METER, SIGN - SINGLE POST, SIGN - DOUBLE POST, TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=6.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

TOPOGRAPHIC SURVEY
Silver Lake Drainage Improvement & Design

BALDWIN, TOWN OF HEAMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO.	7856
DRAWING DATE	06/26/2018
FIELD WORK DATE	05/2018

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
Gayron@dbuin.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

DRAWING NO.	D-10941
DRAWN BY	T.B.
CHECKED BY	M.L.

P:\7856\Survey\CAD\7856 Basemap.dgn 6/26/2018 2:01:41 PM tbunch

N

Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

LEGEND

MANHOLES

CATV	C
DRAIN	D
ELECTRIC	E
GAS	G
SEWER	S
SEWER CLEANOUT	SCO
TRAFFIC	TR
TELEPHONE	T
UNKNOWN	?
WATER	W

UTILITY HARDWARE

ELECTRIC VAULT	E
GAS MAIN VALVE	G
GAS METER	GM
GAS SERVICE VALVE	G
GAS VENT	GV
HYDRANT	
HYDRANT VALVE	
IRRIGATION VALVE	
OIL FILLER VALVE	OFV
POLE RISER - ELECTRIC	EL
MONITORING WELL	
POLE RISER - TELEPHONE	T
ROOF DRAIN	RD
SEWER VENT	SV
TRAFFIC DETECTOR	
TRAFFIC LOOP	
UNIDENTIFIED VAULT	V
UNKNOWN VALVE	
WATER MAIN VALVE	
WATER METER	WM
WATER SERVICE VALVE	

UTILITY POLES

- LIGHT POLE BASE
- METAL POLE W/LIGHT
- METAL POLE WITH TRAFFIC
- WOODEN UTILITY POLE
- WOODEN UTILITY POLE W/LIGHT

FENCES

- GUARD RAIL
- CHAIN LINK FENCE
- WOODEN FENCE
- METAL FENCE
- VINYL FENCE

VEGETATION

- BUSH
- HEDGE
- TREE (WITH SIZE)
- TREELINE

CATCH BASINS

- TYPE "A"
- TYPE 1
- FLUSH GRATE
- ROUND GRATE

MISCELLANEOUS

- CELLAR DOOR
- GUARDPOST (GP)
- GUYWIRE & ANCHOR
- HANDICAP RAMP
- MAILBOX (MB)
- PARK BENCH
- PARKING METER
- SIGN - SINGLE POST
- SIGN - DOUBLE POST
- TELEPHONE BOOTH (TB)

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=6.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

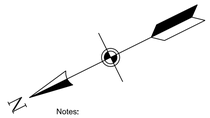
TOPOGRAPHIC SURVEY
Silver Lake
Drainage Improvement & Design

BALDWIN, TOWN OF HEAMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO.	7856
DRAWING DATE	06/26/2018
FIELD WORK DATE	05/2018

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
Gayron@dbsln.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

DRAWING NO.	D-10941
DRAWN BY	T.B.
CHECKED BY	M.L.



Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

Matchline - Sheet 7

BH=5.29

BH=5.20

BH=4.55

BH=5.17

BH=5.25

BH=4.64

BH=5.13

BH=5.10

BH=5.03

Parsonage

Canal

Cheshire Drive

0 10' 20' 30' 40'

SCALE: 1" = 20'

LEGEND

MANHOLES
CATV (C), DRAIN (D), ELECTRIC (E), GAS (G), SEWER (S), SEWER CLEANOUT (SC), TRAFFIC (TR), TELEPHONE (T), UNKNOWN (?), WATER (W)

UTILITY HARDWARE
ELECTRIC VAULT (E), GAS MAIN VALVE, GAS METER (GM), GAS SERVICE VALVE, GAS VENT (GV), HYDRANT, HYDRANT VALVE, IRRIGATION VALVE, OIL FILLER VALVE (OFV), POLE RISER - ELECTRIC (EL), MONITORING WELL, POLE RISER - TELEPHONE (T), ROOF DRAIN (RD), SEWER VENT (SV), TRAFFIC DETECTOR, TRAFFIC LOOP, UNIDENTIFIED VAULT (V), UNKNOWN VALVE (?), WATER MAIN VALVE, WATER METER (WM), WATER SERVICE VALVE

UTILITY POLES
LIGHT POLE BASE, METAL POLE W/LIGHT, METAL POLE WITH TRAFFIC, WOODEN UTILITY POLE, WOODEN UTILITY POLE W/LIGHT

FENCES
GUARD RAIL, CHAIN LINK FENCE, WOODEN FENCE, METAL FENCE, VINYL FENCE

VEGETATION
BUSH, HEDGE, TREE (WITH SIZE), TREELINE

CATCH BASINS
TYPE "A", TYPE 1, FLUSH GRATE, ROUND GRATE

MISCELLANEOUS
CELLAR DOOR (CD), GUARDPOST (GP), GUYWIRE & ANCHOR, HANDICAP RAMP, MAILBOX (MB), PARK BENCH (B), PARKING METER, SIGN - SINGLE POST, SIGN - DOUBLE POST, TELEPHONE BOOTH (TB)

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=8.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

TOPOGRAPHIC SURVEY
Silver Lake
Drainage Improvement & Design

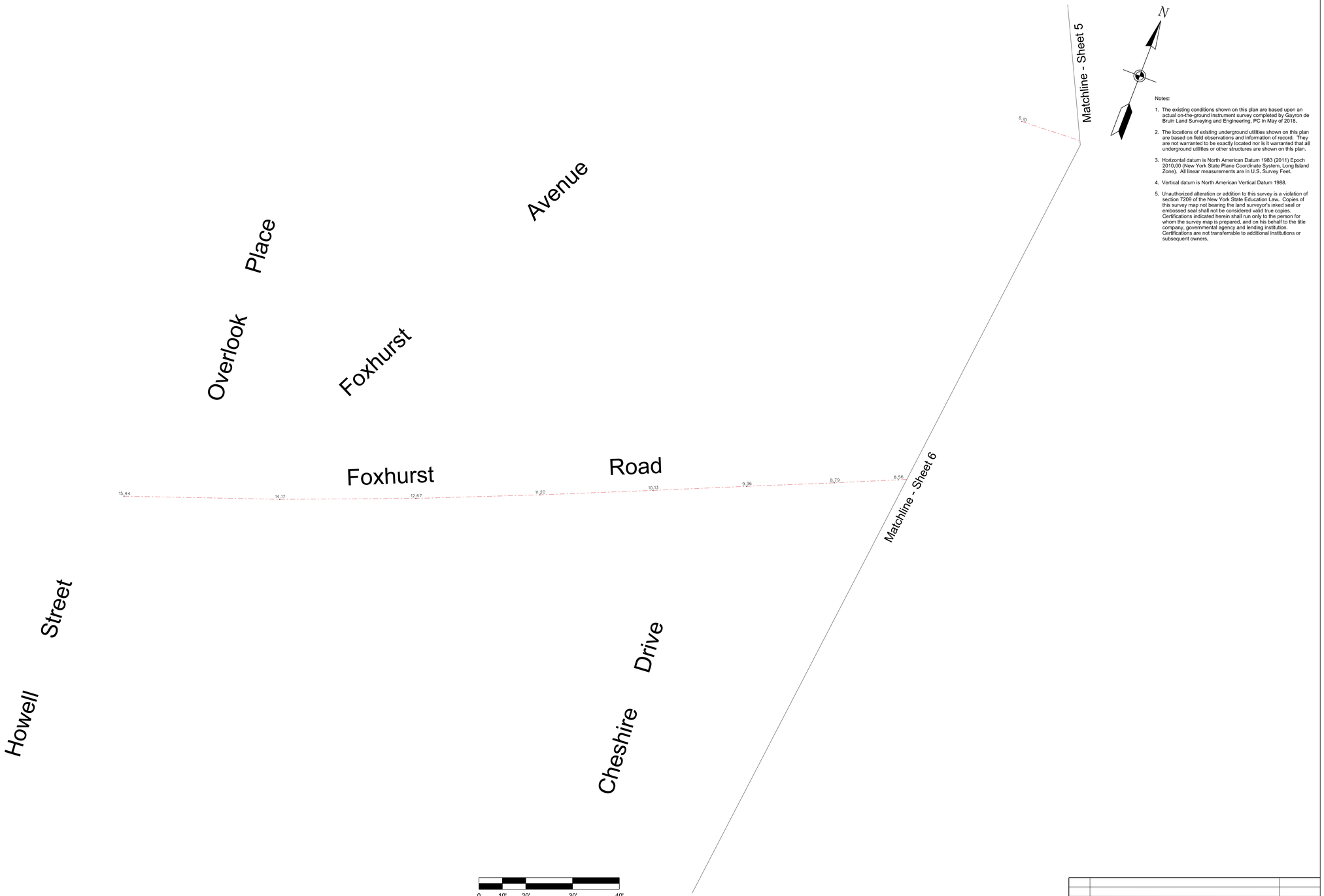
BALDWIN, TOWN OF HEMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO. 7856
DRAWING DATE 06/26/2018
FIELD WORK DATE 05/2018

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
GayrondeBruin.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

DRAWING NO. D-10941
DRAWN BY T.B.
CHECKED BY M.L.

P:\7856\Survey\CAD\7856 Basemap.dgn 6/26/2018 12:54:56 PM tbunch



Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

LEGEND

MANHOLES
- CATV
- DRAIN
- ELECTRIC
- GAS
- SEWER
- SEWER CLEANOUT
- TRAFFIC
- TELEPHONE
- UNKNOWN
- WATER

UTILITY HARDWARE
- ELECTRIC VAULT
- GAS MAIN VALVE
- GAS METER
- GAS SERVICE VALVE
- GAS VENT
- HYDRANT
- HYDRANT VALVE
- IRRIGATION VALVE
- OIL FILLER VALVE
- POLE RISER - ELECTRIC
- MONITORING WELL
- POLE RISER - TELEPHONE
- ROOF DRAIN
- SEWER VENT
- TRAFFIC DETECTOR
- TRAFFIC LOOP
- UNIDENTIFIED VAULT
- UNKNOWN VALVE
- WATER MAIN VALVE
- WATER METER
- WATER SERVICE VALVE

UTILITY POLES
- LIGHT POLE BASE
- METAL POLE W/LIGHT
- METAL POLE WITH TRAFFIC
- WOODEN UTILITY POLE
- WOODEN UTILITY POLE W/LIGHT

FENCES
- GUARD RAIL
- CHAIN LINK FENCE
- WOODEN FENCE
- METAL FENCE
- VINYL FENCE

VEGETATION
- BUSH
- HEDGE
- TREE (WITH SIZE)
- TREELINE

CATCH BASINS
- TYPE "A"
- TYPE 1
- FLUSH GRATE
- ROUND GRATE

MISCELLANEOUS
- CELLAR DOOR
- GUARDPOST
- GUYWIRE & ANCHOR
- HANDICAP RAMP
- MAILBOX
- PARK BENCH
- PARKING METER
- SIGN - SINGLE POST
- SIGN - DOUBLE POST
- TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=6.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

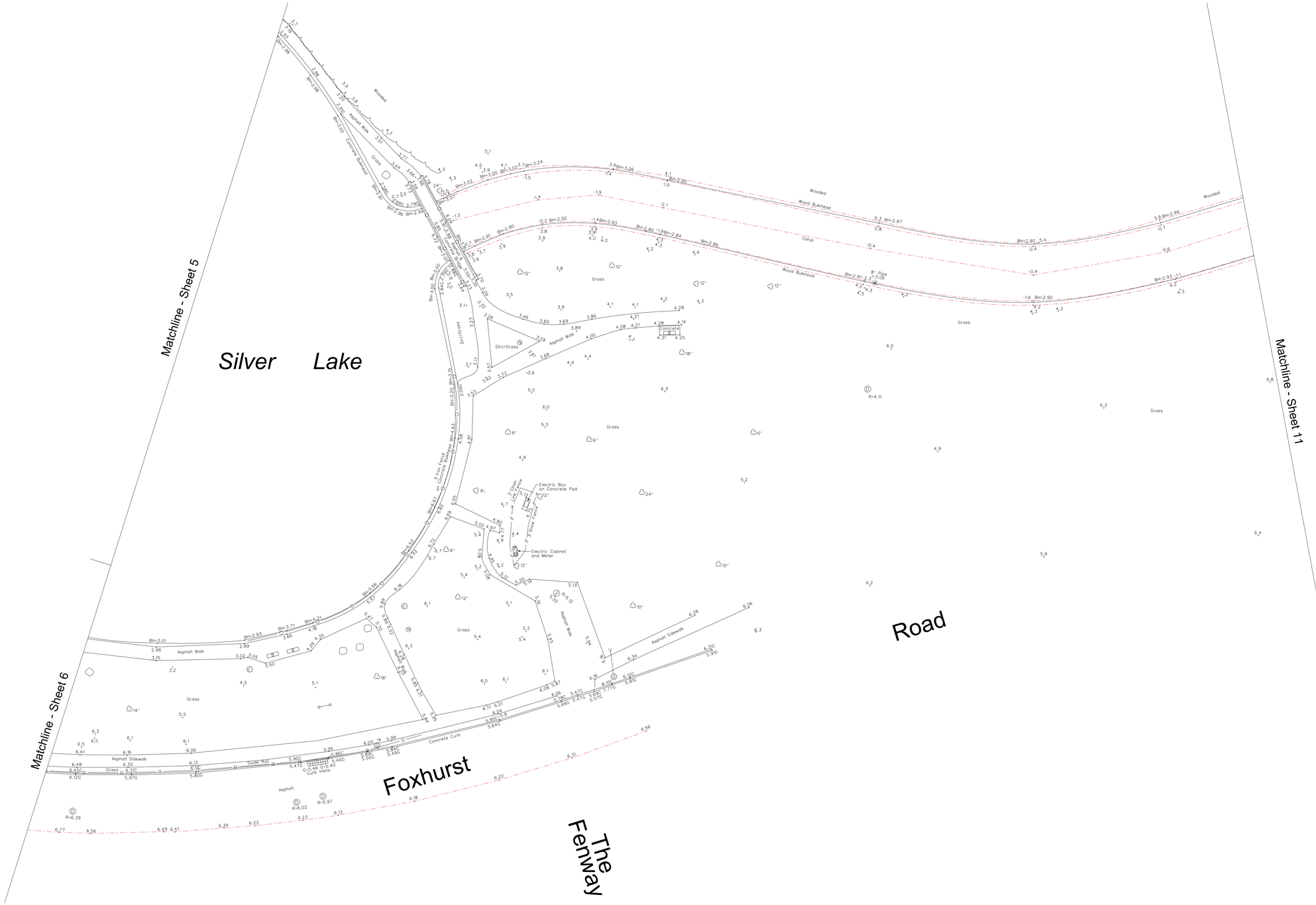
TOPOGRAPHIC SURVEY
Silver Lake Drainage Improvement & Design

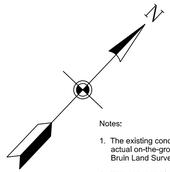
BALDWIN, TOWN OF HEAMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO.	7856
DRAWING DATE	06/26/2018
FIELD WORK DATE	05/2018
DRAWING NO.	D-10941
DRAWN BY	T.B.
CHECKED BY	M.L.

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
Gayrondebruin.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

P:\7856\Survey\CAD\7856 Basemap.dgn 6/26/2018 12:55:06 PM tbunch





Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

0 10' 20' 30' 40'

SCALE: 1" = 20'

LEGEND

MANHOLES

CATV	C
DRAIN	D
ELECTRIC	E
GAS	G
SEWER	S
SEWER CLEANOUT	SC
TRAFFIC	TR
TELEPHONE	T
UNKNOWN	?
WATER	W

UTILITY HARDWARE

ELECTRIC VAULT	E
GAS MAIN VALVE	G
GAS METER	G_M
GAS SERVICE VALVE	G
GAS VENT	G_V
HYDRANT	
HYDRANT VALVE	
IRRIGATION VALVE	
OIL FILLER VALVE	O_{FV}
POLE RISER - ELECTRIC	O^{EL}
MONITORING WELL	
POLE RISER - TELEPHONE	O^{T}
ROOF DRAIN	O^{RD}
SEWER VENT	S_V
TRAFFIC DETECTOR	
TRAFFIC LOOP	
UNIDENTIFIED VAULT	V
UNKNOWN VALVE	
WATER MAIN VALVE	
WATER METER	W_M
WATER SERVICE VALVE	

UTILITY POLES

- LIGHT POLE BASE
- METAL POLE W/LIGHT
- METAL POLE WITH TRAFFIC
- WOODEN UTILITY POLE
- WOODEN UTILITY POLE W/LIGHT

FENCES

- GUARD RAIL
- CHAIN LINK FENCE
- WOODEN FENCE
- METAL FENCE
- VINYL FENCE

VEGETATION

- BUSH
- HEDGE
- TREE (WITH SIZE)
- TREELINE

CATCH BASINS

- TYPE "A"
- TYPE 1
- FLUSH GRATE
- ROUND GRATE

MISCELLANEOUS

- CELLAR DOOR
- GUARDPOST
- GUYWIRE & ANCHOR
- HANDICAP RAMP
- MAILBOX
- PARK BENCH
- PARKING METER
- SIGN - SINGLE POST
- SIGN - DOUBLE POST
- TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=6.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

TOPOGRAPHIC SURVEY
Silver Lake Drainage Improvement & Design

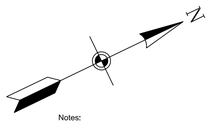
BALDWIN, TOWN OF HEAMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO.	7856
DRAWING DATE	06/26/2018
FIELD WORK DATE	05/2018

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
Gayron@dbsln.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.0100

DRAWING NO.	D-10941
DRAWN BY	T.B.
CHECKED BY	M.L.

P:\7856\Survey\CAD\7856 Bsnmap.dgn 6/26/2018 12:55:32 PM tbunch



Matchline - Sheet 12

Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

0 10' 20' 30' 40'

SCALE: 1" = 20'

LEGEND

MANHOLES
- CATV
- DRAIN
- ELECTRIC
- GAS
- SEWER
- SEWER CLEANOUT
- TRAFFIC
- TELEPHONE
- UNKNOWN
- WATER

UTILITY HARDWARE
- ELECTRIC VAULT
- GAS MAIN VALVE
- GAS METER
- GAS SERVICE VALVE
- GAS VENT
- HYDRANT
- HYDRANT VALVE
- IRRIGATION VALVE
- OIL FILLER VALVE
- POLE RISER - ELECTRIC
- MONITORING WELL
- POLE RISER - TELEPHONE
- ROOF DRAIN
- SEWER VENT
- TRAFFIC DETECTOR
- TRAFFIC LOOP
- UNIDENTIFIED VAULT
- UNKNOWN VALVE
- WATER MAIN VALVE
- WATER METER
- WATER SERVICE VALVE

UTILITY POLES
- LIGHT POLE BASE
- METAL POLE W/LIGHT
- METAL POLE WITH TRAFFIC
- WOODEN UTILITY POLE
- WOODEN UTILITY POLE W/LIGHT

FENCES
- GUARD RAIL
- CHAIN LINK FENCE
- WOODEN FENCE
- METAL FENCE
- VINYL FENCE

VEGETATION
- BUSH
- HEDGE
- TREE (WITH SIZE)
- TREELINE

CATCH BASINS
- TYPE "A"
- TYPE 1
- FLUSH GRATE
- ROUND GRATE

MISCELLANEOUS
- CELLAR DOOR
- GUARDPOST
- GUYWIRE & ANCHOR
- HANDICAP RAMP
- MAILBOX
- PARK BENCH
- PARKING METER
- SIGN - SINGLE POST
- SIGN - DOUBLE POST
- TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=8.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

TOPOGRAPHIC SURVEY
Silver Lake
Drainage Improvement & Design

BALDWIN, TOWN OF HEMPSTEAD, NASSAU COUNTY, N.Y.

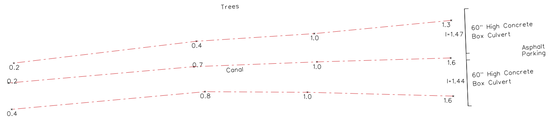
JOB NO. 7856
DRAWING DATE 06/26/2018
FIELD WORK DATE 05/2018

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
GayrondeBruin.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

DRAWING NO. D-10941
DRAWN BY T.B.
CHECKED BY M.L.

P:\7856\Survey\CAD\7856 Basemap.dgn 6/26/2018 12:55:43 PM tbunch

Matchline - Sheet 11



Road

Merrick

Foxhurst

Road

Avenue

Grand

0 10' 20' 30' 40'

SCALE: 1" = 20'

Notes:

1. The existing conditions shown on this plan are based upon an actual on-the-ground instrument survey completed by Gayron de Bruin Land Surveying and Engineering, PC in May of 2018.
2. The locations of existing underground utilities shown on this plan are based on field observations and information of record. They are not warranted to be exactly located nor is it warranted that all underground utilities or other structures are shown on this plan.
3. Horizontal datum is North American Datum 1983 (2011) Epoch 2010.00 (New York State Plane Coordinate System, Long Island Zone). All linear measurements are in U.S. Survey Feet.
4. Vertical datum is North American Vertical Datum 1988.
5. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

LEGEND

MANHOLES
- CATV
- DRAIN
- ELECTRIC
- GAS
- SEWER
- SEWER CLEANOUT
- TRAFFIC
- TELEPHONE
- UNKNOWN
- WATER

UTILITY HARDWARE
- ELECTRIC VAULT
- GAS MAIN VALVE
- GAS METER
- GAS SERVICE VALVE
- GAS VENT
- HYDRANT
- HYDRANT VALVE
- IRRIGATION VALVE
- OIL FILLER VALVE
- POLE RISER - ELECTRIC
- MONITORING WELL
- POLE RISER - TELEPHONE
- ROOF DRAIN
- SEWER VENT
- TRAFFIC DETECTOR
- TRAFFIC LOOP
- UNIDENTIFIED VAULT
- UNKNOWN VALVE
- WATER MAIN VALVE
- WATER METER
- WATER SERVICE VALVE

UTILITY POLES
- LIGHT POLE BASE
- METAL POLE W/LIGHT
- METAL POLE WITH TRAFFIC
- WOODEN UTILITY POLE
- WOODEN UTILITY POLE W/LIGHT

FENCES
- GUARD RAIL
- CHAIN LINK FENCE
- WOODEN FENCE
- METAL FENCE
- VINYL FENCE

VEGETATION
- BUSH
- HEDGE
- TREE (WITH SIZE)
- TREELINE

CATCH BASINS
- TYPE "A"
- TYPE 1
- FLUSH GRATE
- ROUND GRATE

MISCELLANEOUS
- CELLAR DOOR
- GUARDPOST
- GUYWIRE & ANCHOR
- HANDICAP RAMP
- MAILBOX
- PARK BENCH
- PARKING METER
- SIGN - SINGLE POST
- SIGN - DOUBLE POST
- TELEPHONE BOOTH

ABBREVIATIONS

ABANDONED	ABAND.	GARAGE FLOOR ELEVATION	GF=18.30
ALUMINUM	ALUM	GRATE ELEVATION	11.96G
BELGIAN BLOCK	B. BLK	INVERT ELEVATION	I=1.6
TOP OF BULKHEAD ELEVATION	BH=6.52	MANHOLE RIM ELEVATION	R=32.65
BLACKTOP	B.T.	OVER ALL	O.A.
BLOCK	BLK	POINT OF BEGINNING	P.O.B.
BRICK	BRK	POST AND RAIL	RAIL FE.
CONCRETE	CONC.	STOCKADE FENCE	STOCK FE.
CHAIN LINK FENCE	CH. LK. FE.	STORY	STY
FIRST FLOOR ELEVATION	FF=7.25	VACANT	VAC.
FRAME	FR	WOOD	WD

NO.	REVISIONS	DATE
-	-	-

TOPOGRAPHIC SURVEY
Silver Lake Drainage Improvement & Design

BALDWIN, TOWN OF HEAMPSTEAD, NASSAU COUNTY, N.Y.

JOB NO.	7856
DRAWING DATE	06/26/2018
FIELD WORK DATE	05/2018
DRAWING NO.	D-10941
DRAWN BY	T.B.
CHECKED BY	M.L.

PREPARED BY:
Gayron de Bruin
Land Surveying and Engineering, PC
GayrondeBruin.com
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
12 N Main Street, Suite 100 | Honeoye Falls, NY 11714 | 585.484.8100

APPENDIX D

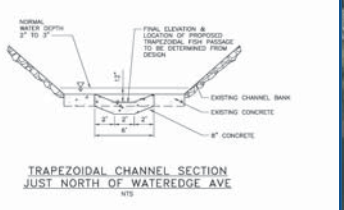
CONCEPTUAL DRAWINGS OF PROPOSED ALTERNATIVES

SILVER LAKE PARK CONCEPTUAL IMPROVEMENTS

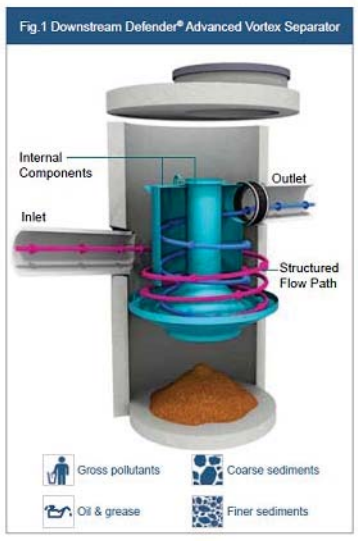
Governor's Office of Storm Recovery

A project funded by and conceived through the NY Rising Community Reconstruction Program of the Governor's Office of Storm Recovery.

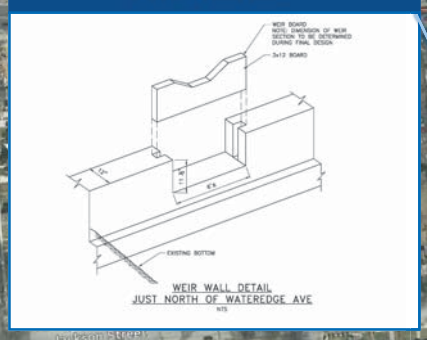
2. Fish Channel Sluiceway Section



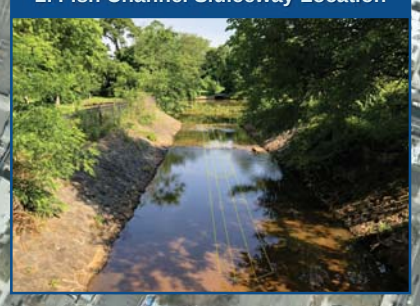
Downstream Defender



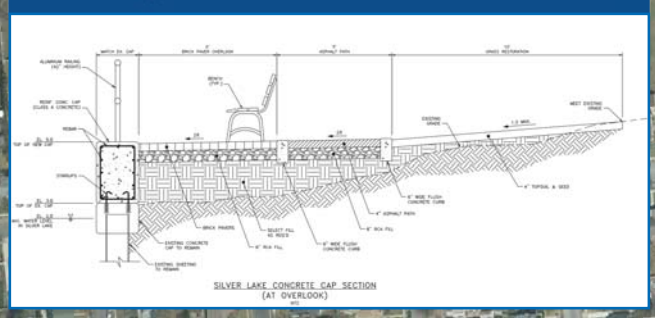
1. Weir Wall Detail



2. Fish Channel Sluiceway Location

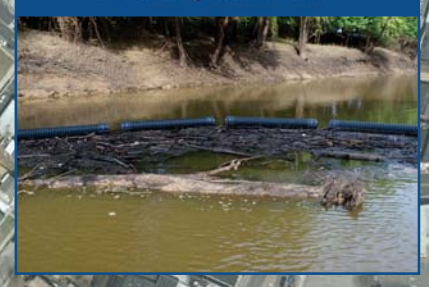


Raise Cap to El. 5.0 & Create Overlook Area

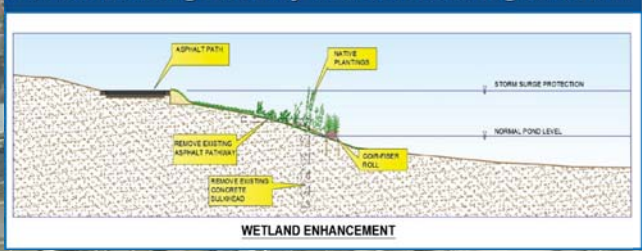


3. Catch Basin Inserts

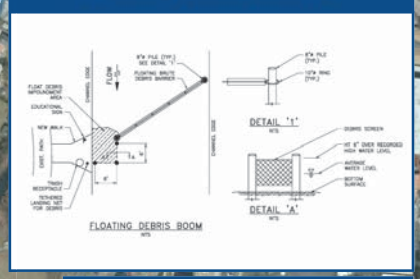
4. Floating Debris Boom



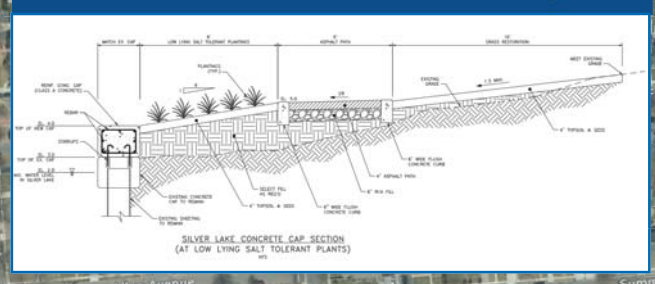
Elevate Existing Pathway and Create Living Shoreline



4. Floating Debris Boom Plan



Raise Wall to El. 4.0 & Elevate Pathway to El.



Refurbish or Replace Existing Control Gate at Weir

Culvert Flap Gate (before and after)

SRT Tide Gate

SRT Tide Gate

LEGEND

- PROPOSED PATHWAY
- PROPOSED NATURAL SHORELINE WITH NATIVE WETLAND PLANTING
- LAWN RESTORATION AREA
- PROPOSED BRICK PAVERS (PLAZA AREA)
- PROPOSED BRICK PAVERS (OVERLOOK AREA)
- LOW LYING SALT TOLERANT TOPSOIL AND SOD
- PROPOSED PARK BENCH
- REMOVE EXISTING INVASIVE PLANT SPECIES AND OVER DREDGE TO A DEPTH OF 1' BELOW AVERAGE WATER DEPTH

GRAPHIC SCALE

30 0 15 30 60 90

(IN FEET)
1 INCH = 30 FT.

DATE	BY	DESCRIPTION	APPROV. BY

REVISIONS

LKMA

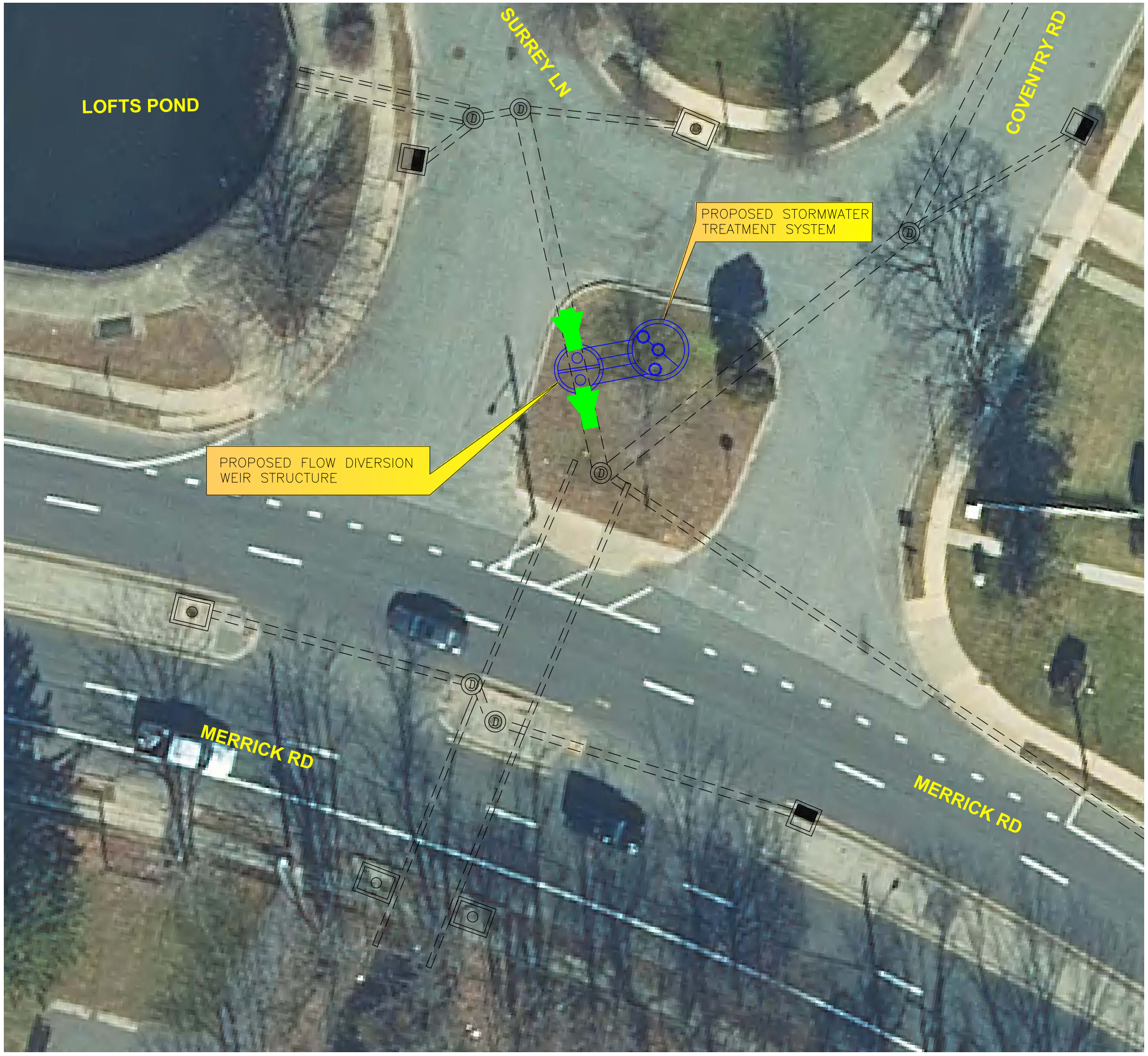
NASSAU COUNTY
DEPARTMENT OF PUBLIC WORKS
SILVER LAKE PARK DRAINAGE IMPROVEMENTS
BALDWIN, NEW YORK

CONCEPTUAL PLAN-ALT.2
ELEVATE BANKS OF SILVER LAKE

L. K. McLEAN ASSOCIATES, P.C.
CONSULTING ENGINEERS 437 SOUTH COUNTRY RD., BROOKHAVEN, NEW YORK 11719

				Sheet No.
Designed By:	RAS	Scale:	AS NOTED	CP-2
Drawn By:	MC	Date:	OCTOBER 2018	
Approved By:	RGD	File No.	18023.000	

Oct 12, 2018 - 08:15am
P:\18023.000 Silver Lake Drainage\civil dwg\Conceptual Plans\General Plan - Alt 2.dwg



NORTH

LEGEND

- EXISTING DRAINAGE
- PROPOSED DRAINAGE PIPE
- PROPOSED STORMWATER TREATMENT SYSTEM
- PROPOSED FLOW DIVERSION WEIR STRUCTURE
- PROPOSED HDPE DRAINAGE PIPE

GRAPHIC SCALE

10 0 5 10 20 30

(IN FEET)

1 INCH = 10 FT.

DATE	BY	DESCRIPTION	APPROV. BY

REVISIONS

LKMA

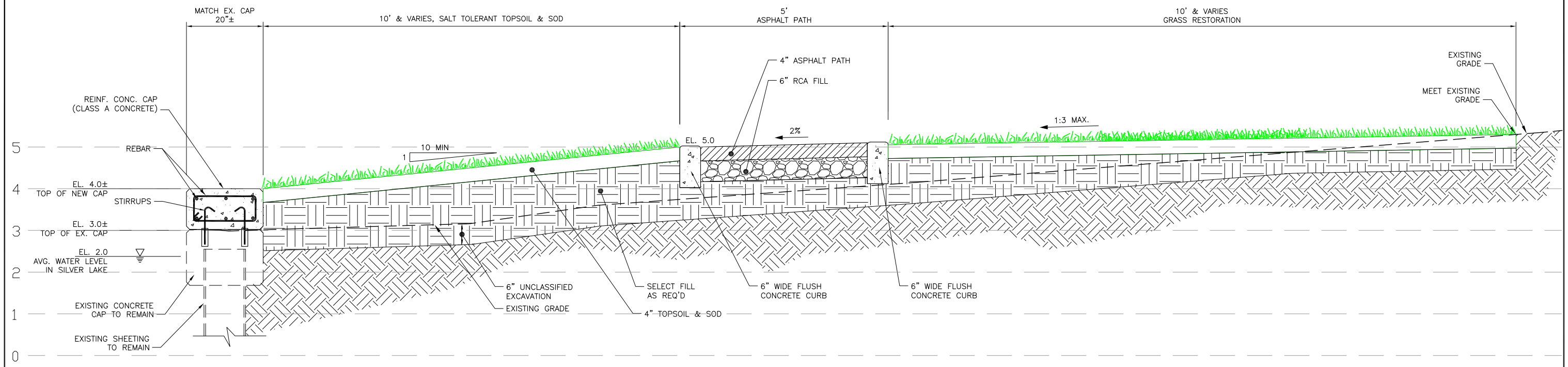
NASSAU COUNTY
DEPARTMENT OF PUBLIC WORKS
SILVER LAKE PARK DRAINAGE IMPROVEMENTS
BALDWIN, NEW YORK

CONCEPTUAL PLAN
STORMWATER TREATMENT SYSTEM

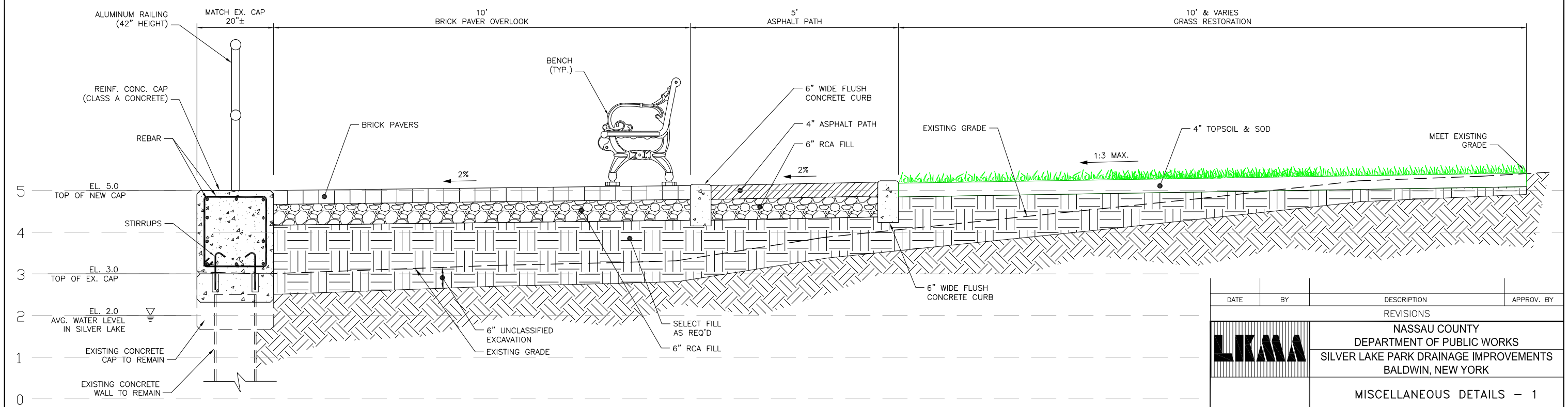
L. K. McLEAN ASSOCIATES, P.C.
CONSULTING ENGINEERS 437 SOUTH COUNTRY RD., BROOKHAVEN, NEW YORK 11719

				Sheet No.
Designed By:	RAS	Scale:	AS NOTED	CP-2
Drawn By:	SJ	Date:	AUGUST 2018	
Approved By:	RGD	File No.	18023.000	

Aug 16, 2018 - 06:24pm
P:\18023.000 Silver Lake Drainage\civil dwg\Conceptual Plans\Downstream Defender.dwg



SILVER LAKE CONCRETE CAP SECTION
(AT LOW LYING SALT TOLERANT TOPSOIL AND SOD)
NTS



SILVER LAKE CONCRETE CAP SECTION
(AT OVERLOOK)
NTS

DATE	BY	DESCRIPTION	APPROV. BY

REVISIONS

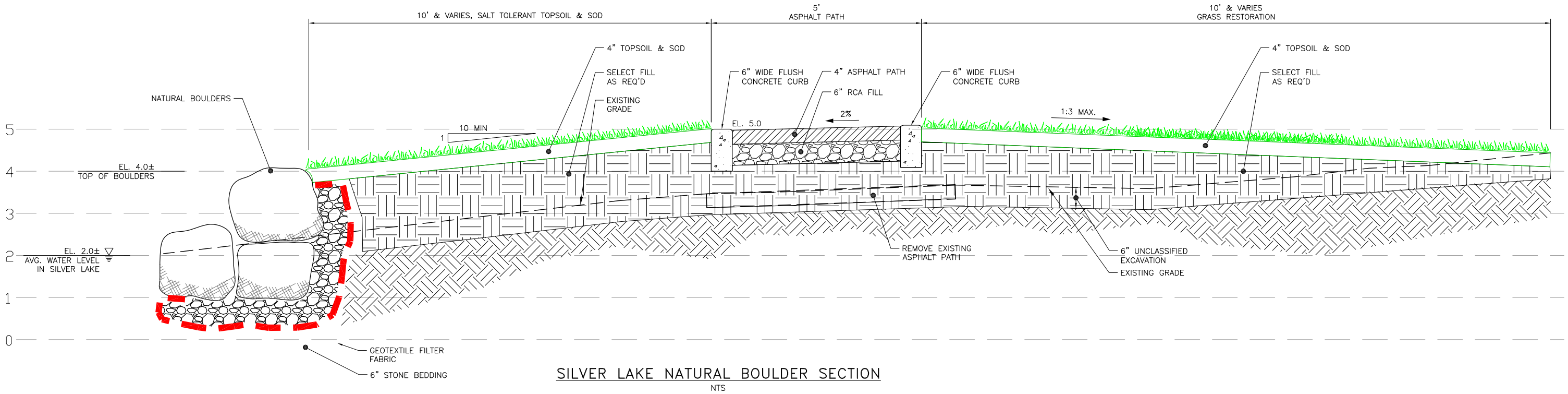
LKMA

NASSAU COUNTY
DEPARTMENT OF PUBLIC WORKS
SILVER LAKE PARK DRAINAGE IMPROVEMENTS
BALDWIN, NEW YORK

MISCELLANEOUS DETAILS – 1

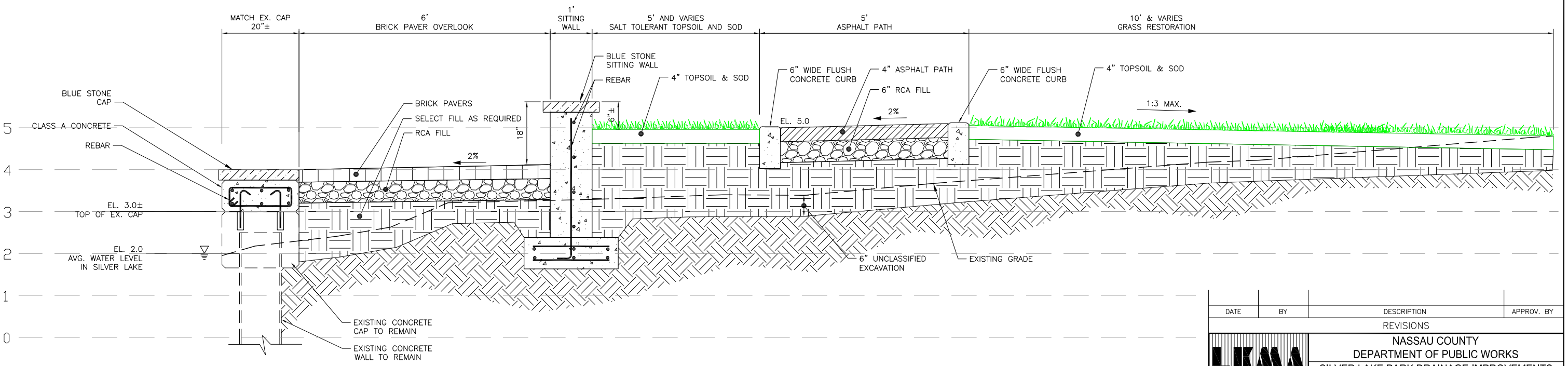
L. K. McLEAN ASSOCIATES, P.C.
CONSULTING ENGINEERS 437 SOUTH COUNTRY RD., BROOKHAVEN, NEW YORK 11719

Designed By:	RAS	Scale:	AS NOTED	Sheet No.
Drawn By:	MC	Date:	NOVEMBER 2018	MD–1
Approved By:	RGD	File No.	18023.000	



SILVER LAKE NATURAL BOULDER SECTION

NTS



SILVER LAKE CONCRETE CAP SECTION (AT BLUE STONE SITTING WALL)

NTS

DATE	BY	DESCRIPTION	APPROV. BY

REVISIONS

LKMA

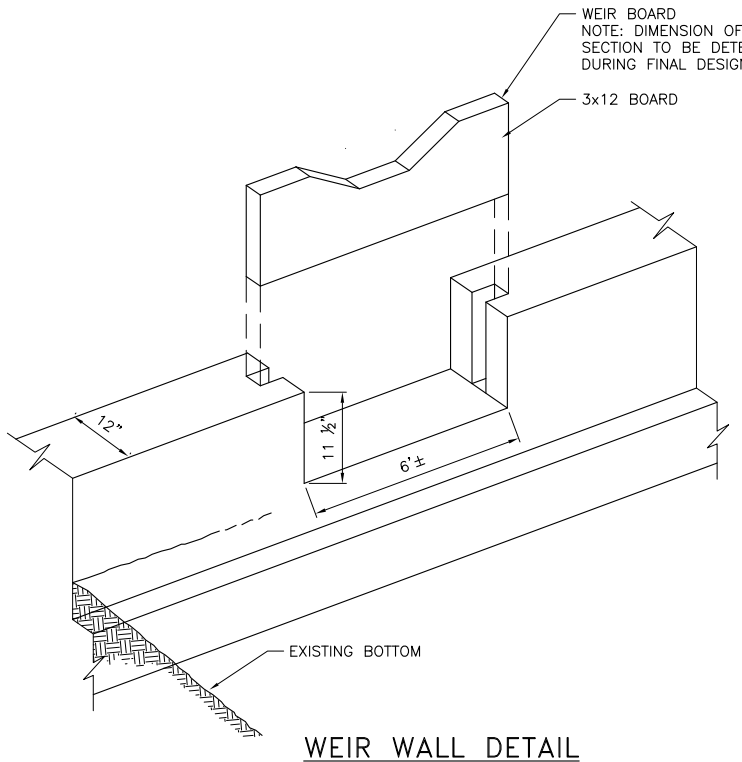
NASSAU COUNTY
DEPARTMENT OF PUBLIC WORKS
SILVER LAKE PARK DRAINAGE IMPROVEMENTS
BALDWIN, NEW YORK

MISCELLANEOUS DETAILS – 2

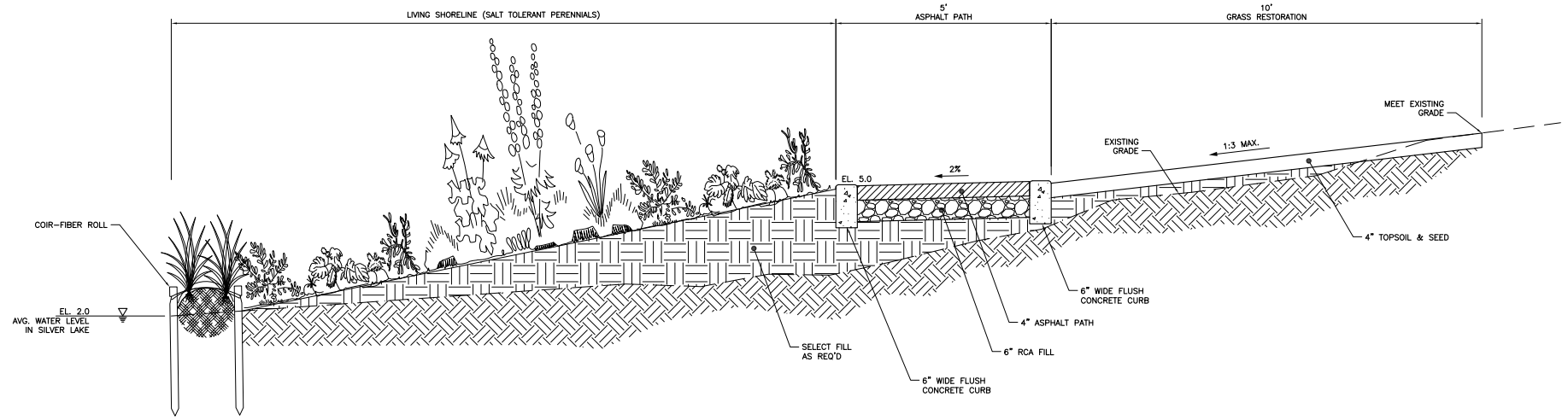
L. K. McLEAN ASSOCIATES, P.C.
CONSULTING ENGINEERS 437 SOUTH COUNTRY RD., BROOKHAVEN, NEW YORK 11719

				Sheet No.
Designed By:	RAS	Scale:	AS NOTED	MD–2
Drawn By:	MC	Date:	NOVEMBER 2018	
Approved By:	RGD	File No.	18023.000	

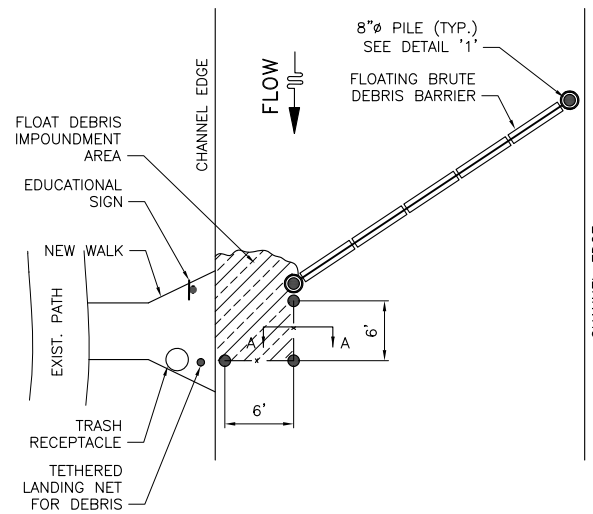
Nov 16, 2018 – 01:26pm
P:\18023.000 Silver Lake Drainage\civil dwg\Conceptual Plans\DETAILS.dwg



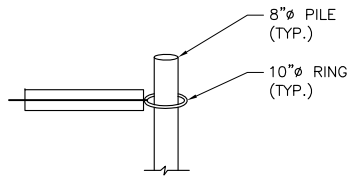
WEIR WALL DETAIL
JUST SOUTH OF WATEREDGE AVE
NTS



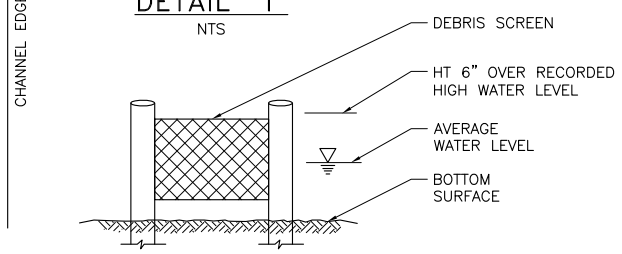
SILVER LAKE LIVING SHORELINE SECTION
NTS



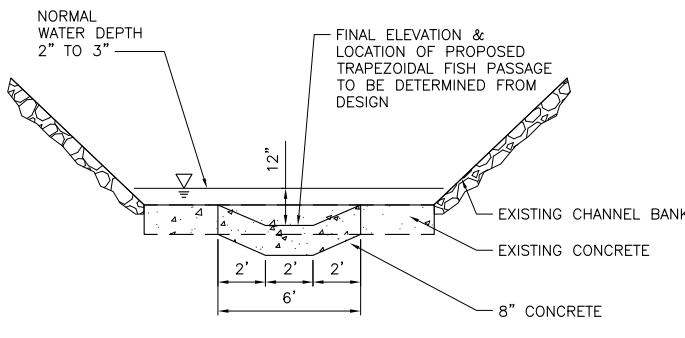
FLOATING DEBRIS BOOM
NTS



DETAIL '1'
NTS



DETAIL 'A'
NTS



TRAPEZOIDAL CHANNEL SECTION
JUST NORTH OF WATEREDGE AVE
NTS

DATE	BY	DESCRIPTION	APPROV. BY

REVISIONS

LKMA

NASSAU COUNTY
DEPARTMENT OF PUBLIC WORKS
SILVER LAKE PARK DRAINAGE IMPROVEMENTS
BALDWIN, NEW YORK

MISCELLANEOUS DETAILS – 2

L. K. McLEAN ASSOCIATES, P.C.
CONSULTING ENGINEERS 437 SOUTH COUNTRY RD., BROOKHAVEN, NEW YORK 11719

				Sheet No.
Designed By:	RAS	Scale:	AS NOTED	MD–2
Drawn By:	MC	Date:	NOVEMBER 2018	
Approved By:	RGD	File No.	18023.000	

Nov 16, 2018 – 01:26pm
P:\18023.000 Silver Lake Drainage\civil dwg\Conceptual Plans\DETAILS.dwg

APPENDIX E

CONCEPTUAL COST ESTIMATES OF PROPOSED ALTERNATIVES

CONCEPTUAL ENGINEER'S ESTIMATE

L.K. McLean Associates, P.C.

Project Name: Silver Lake Park Drainage Improvements
Component 1 Elevate Perimiter of Silver Lake to Elevation 5.0' (NAVD88)
Location: Baldwin, New York
Client Name: Nassau County DPW

Date: October 11, 2018
LKMA Project No: 18023.000

Item	Description	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Asphalt	TON	130	$150.00	$19,500.00
2	Flush Concrete Curb	LF	2,580	$20.00	$51,600.00
3	Low Lying Salt Tolerant Topsoil and Sod	SY	740	$15.00	$11,100.00
4	Wetland Plantings	LS	1	$10,500.00	$10,500.00
5	Natural Boulders	TON	73	$200.00	$14,600.00
7	Recycled Concrete Aggregate	CY	152	$30.00	$4,560.00
8	Aluminum Railing	LF	315	$240.00	$75,600.00
9	Pavers	SF	1,400	$30.00	$42,000.00
10	Lawn Restoration (Topsoil and Hyrdroseeding)	SY	1,300	$5.00	$6,500.00
11	Select Fill	CY	900	$30.00	$27,000.00
12	Structural Concrete for Cap	CY	62	$2,000.00	$124,000.00
13	Rebar for Concrete Cap (Includes Stirrups)	LB	10,700	$5.00	$53,500.00
15	Phragmite Removal	CY	500	$150.00	$75,000.00
16	Turbidity Curtain	LF	360	$35.00	$12,600.00
17	Bio-Log	LF	130	$45.00	$5,850.00
18	Unclassified Excavation	CY	560	$30.00	$16,800.00
19	Park Benches	EA	7	$4,000.00	$28,000.00
20	Geotextile Filter Fabric	SF	625	$7.00	$4,375.00
21	Stone Bedding	CY	25	$100.00	$2,500.00
22	Sitting Wall	LF	65	$350.00	$22,750.00
23	Blue Stone Cap	LS	1	$4,000.00	$4,000.00
24	Mobilization	LS	1	$12,000.00	$12,000.00
25	MPT	LS	1	$23,000.00	$23,000.00
26	Survey and Stakeout	LS	1	$17,000.00	$17,000.00

TOTAL	$664,335.00

WITH 20% CONTINGENCY **$797,202.00**

CONCEPTUAL ENGINEER'S ESTIMATE

L.K. McLean Associates, P.C.

Project Name: Silver Lake Park Drainage Improvements
Component 2. Install Tide Gates on Silver Lake Outfalls
Location: Baldwin, New York
Client Name: Nassau County DPW

Date: September 13, 2018
LKMA Project No: 18023.000

Item	Description	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Culvert Flap Gate at Outfall	EA	1	$150,000.00	$150,000.00
2	SRT Tide Gate	EA	1	$100,000.00	$100,000.00
3	Brick Pavers	SF	2,550	$30.00	$76,500.00
4	Structural Concrete (Vault)	CY	38	$2,000.00	$76,000.00
5	Bar Reinforcement	LB	3,000	$5.00	$15,000.00
6	Unclassified Excavation	CY	325	$40.00	$13,000.00
7	Concrete Curb	LF	275	$20.00	$5,500.00
8	Temporary Sheeting	LS	1	$55,000.00	$55,000.00
9	Mobilization	LS	1	$24,500.00	$24,500.00
10	MPT	LS	1	$19,640.00	$19,640.00
11	18" Diameter Inline Check Valves	EA	3	$10,000.00	$30,000.00
12	Educational Signage	EA	1	$3,000.00	$3,000.00
13	Façade	LS	1	$10,000.00	$10,000.00
14	Survey and Stakeout	LS	1	$14,730.00	$14,730.00

TOTAL	$592,870.00

WITH 20% CONTINGENCY **$711,444.00**

CONCEPTUAL ENGINEER'S ESTIMATE

L.K. McLean Associates, P.C.

Project Name: Silver Lake Park Drainage Improvements Component
3. Install a Stormwater Treatment System
Location: Baldwin, New York
Client Name: Nassau County DPW

Date: September 13, 2018
LKMA Project No: 18023.000

Item	Description	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Weir Overflow Structure	EA	1	$20,000.00	$20,000.00
2	Stormwater Treatment System	LS	1	$100,000.00	$100,000.00
3	30" Corrugated Pipe	LF	20	$120.00	$2,400.00
4	36" Diameter RCP	LF	16	$100.00	$1,600.00
5	Concrete Curb	LF	60	$25.00	$1,500.00
6	Lawn Restoration (Topsoil and Hyrdroseeding)	SY	220	$5.00	$1,100.00
7	Asphalt Pavement	TON	10	$150.00	$1,500.00
8	Recycled Concrete Aggregate	CY	5	$30.00	$150.00
9	Sawcut Existing Pavement	LF	100	$7.00	$700.00
10	Mobilization	LS	1	$6,800.00	$6,800.00
11	Survey and Stakeout	LS	1	$4,200.00	$4,200.00
12	Maintenance and Protection of Traffic	LS	1	$5,475.00	$5,475.00

TOTAL	$145,425.00

WITH 20% CONTINGENCY **$174,510.00**

CONCEPTUAL ENGINEER'S ESTIMATE

L.K. McLean Associates, P.C.

Project Name: Silver Lake Park Drainage Improvements
Component 4. Provide Fish Passage to Caroline's Lake
Location: Baldwin, New York
Client Name: Nassau County DPW

Date: September 13, 2018
LKMA Project No: 18023.000

Item	Description	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Unclassified Excavation	CY	50	$30.00	$1,500.00
2	Sawcut Existing Concrete Pavement	LF	200	$7.00	$1,400.00
3	Structural Concrete	CY	30	$2,000.00	$60,000.00
4	Bar Reinforcement	LB	1,500	$5.00	$7,500.00
5	Turbidity Curtain	LF	55	$35.00	$1,925.00
6	Mobilization	LS	1	$3,600.00	$3,600.00
7	Maintenance and Protection of Traffic	LS	1	$2,900.00	$2,900.00
8	Survey and Stakeout	LS	1	$2,200.00	$2,200.00

TOTAL	$81,025.00

WITH 20% CONTINGENCY **$97,230.00**