

Lily Pond Park Master Plan

Nantucket, MA, U.S.A.

Applicant ID#: 202304

Category: IV - Planning and Analysis

Completed: 2020

Project Size: 90 acres

Budget for Design: \$40,000

Submitters Role: Prime Consultant
/ Lead Designer

Summary Statement

The Lily Pond Park Master Plan demonstrates a holistic approach to site design by balancing the site's ecologic, and hydrologic functions with the human experience to create a space that immerses visitors in nature while enhancing natural resources. The Master Plan presents an approach to restore and diversify wetland habitats, treat runoff with green stormwater infrastructure and enhance the user experience and accessibility with improved connectivity. Being comprised mainly of wetland, the park is a central low spot within the surrounding neighborhood and is affected by over ninety acres of upper watershed. This plan looks beyond the park boundaries to understand these watershed effects, propose opportunities for improvement and weave these elements with other important park features.



INTRO - SUMMARY

Narrative

The Site

The team developed the Lily Pond Park Plan was developed to improve the hydrologic, ecological, and recreational function of the park, a 6.2-acre property located within the residential outskirts of historic downtown Nantucket. Despite its name, a pond has not been present at the site for several hundred years. Instead, the Park consists primarily of a heavily vegetated freshwater wetland, traversed by a boardwalk, and a perimeter trail. In addition to serving as a public recreational amenity, the park provides wildlife habitat, flood attenuation and water quality treatment for stormwater runoff from over 90 residential acres. The wetland function and park usage has been negatively impacted by unmanaged stormwater runoff, invasive vegetation, clogged drainage infrastructure, and understated visibility.

The major goals for the park include an enhanced visitor experience, improved stormwater management, diversification, enrichment of habitats, and addressing local flooding concerns. To achieve these goals and explore all options for improvement, the Plan looks beyond the boundaries of the park and considers the site within its watershed. The team hopes to achieve these goals by exploring all options for improvement in the plan and looking beyond the park boundaries while considering the site within the watershed.

Historic photo of the park - 1890s



Site Location

Watershed

Located at the bottom of the surrounding neighborhood, the park is a low spot, capturing runoff through six different inlets and releasing the entire watershed through one small outlet pipe that connects to Child's Beach and out to the ocean. Estimates for pollutant loading from the adjacent neighborhoods were examined and pretreatment, water cleaning practices were explored for locations within and outside of the park. These practices included constructed wetlands, bioswales, pervious pavement and pavement reduction. For each of these features, anticipated pollutant removal and construction costs were quantified, and president images were used to help the owner make decisions moving forward. Stormwater features were sited and designed to complement surrounding aesthetics while significantly increasing pollutant removal from runoff entering and leaving the park.

The holistic approach of considering the entire watershed frames the larger connected system, emphasizing how making improvements upstream can have substantial benefits for downstream ecosystems. In this situation, improving water quality at the top of a drainage area improves water and habitat in the large freshwater wetland, which

INTRO - NARRATIVE

connects to the ocean. Considering this larger system as a major part of the design process is an important step to addressing the interconnectedness of land and important ecological systems.

The Park

Considering the overall watershed, the proposed improvements within the park boundaries are further designed to display more specific site elements and visualizations to help explain what is proposed. These include the boardwalk loop trail, main entrance, a small gathering space, central habitat improvement area and constructed wetlands. The stormwater elements were integrated with pedestrian circulation, and information related to maintenance and water cleaning is provided to highlight benefits of each practice.

The team proposed stormwater improvements while considering appearance, visitor interaction, connectivity, invasive control and habitat diversification. Wetland and stream restoration, and invasive management control are proposed to improve existing habitat conditions and diversity. The impacted wetland is integrated with shallow marsh features and a long section of the outlet drainage pipe is converted to an open water channel. These changes create variable depth regimes that allow for establishment of different plant communities to support a larger diversity of wildlife.

Maintaining and enhancing the naturalistic feel of Lily Pond Park is built into all proposed elements, to ensure visitors feel immersed and connected with nature. Pathways and entrances are arranged to provide clarity to visitors, frame views, and highlight certain features. This is achieved through better defining gateways, and by utilizing more park way-finding and educational signage. A formalized seating area is proposed in the upland area that overlooks the constructed wetland stormwater feature and beyond to the remainder of the wetland. An ADA accessible boardwalk loop trail with small seating areas will allow visitors to experience several unique pockets of the park with different vegetation communities.

INTRO - NARRATIVE

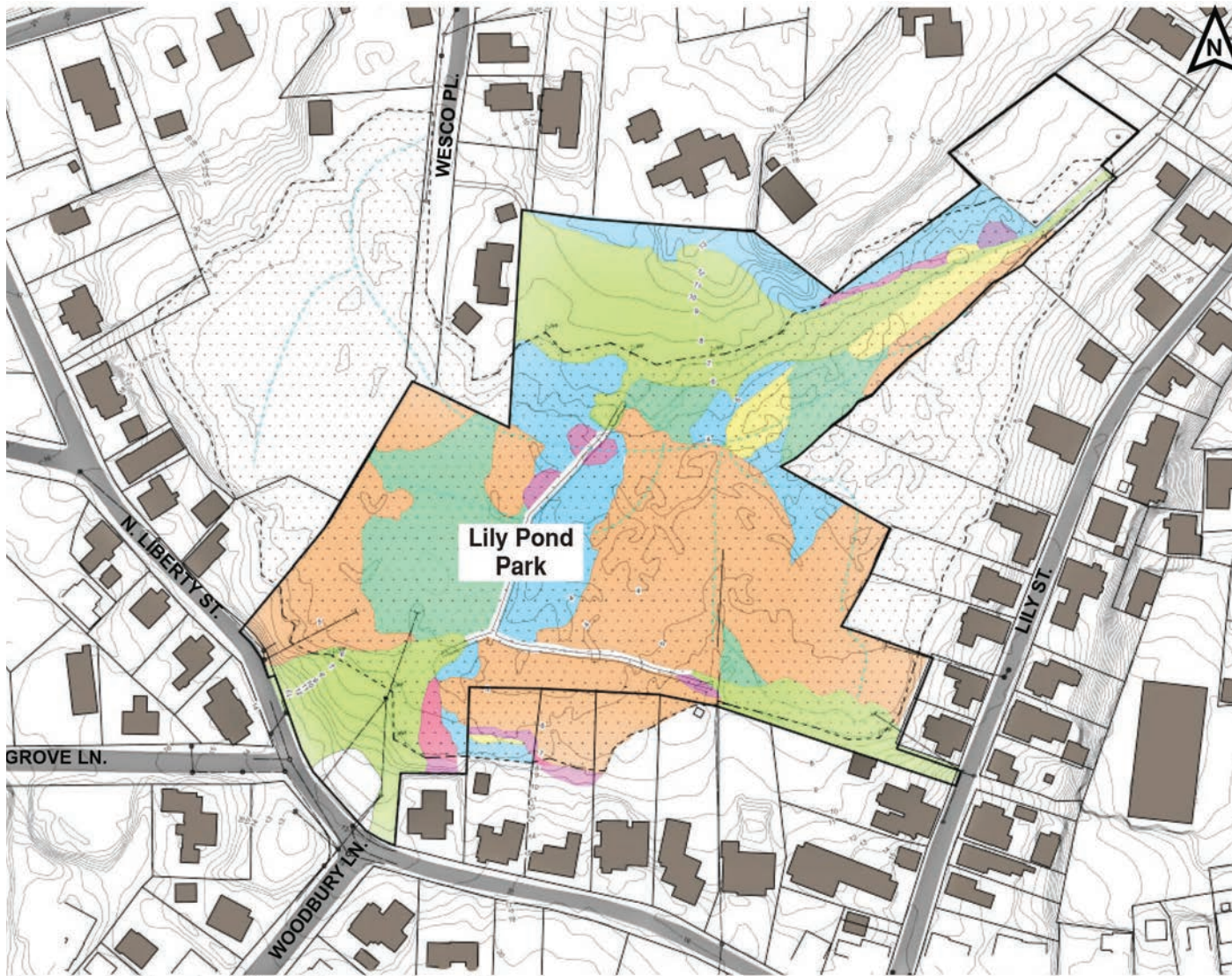
Implementation

An important aspect of the plan is that the owner can use it to move forward with implementation and fully understand next steps. To achieve this, a phasing strategy is outlined with a summary of permitting implications, invasive management priorities and techniques, and planning level costs. The phases are broken down into four larger areas based on construction access and scale, with the habitat improvements in the center of the park as the first phase.

Conclusion

The Lily Pond Park Master Plan presents a preferred approach to restore and diversify wetland habitats, treat runoff with green stormwater infrastructure, and enhance the user experience with improved connectivity. Key features include looped boardwalk extensions, additional seating areas and entrance enhancements, daylighting of the existing outlet drainpipe into a surface stream, and restoration of a shallow marsh system with open water pockets. By blending of the visitor experience with water quality and habitat enhancement, and analyzing the site within its overall watershed makes the Lily Pond Park Plan becomes a unique example of how we should be designing all sites, within their larger ecological systems. The plan was completed in August 2021. The plan has helped the owners secure a grant to construct Lily Pond Park proposed improvements.





Existing Conditions

EXISTING CONDITIONS



Existing Site Photos

EXISTING CONDITIONS

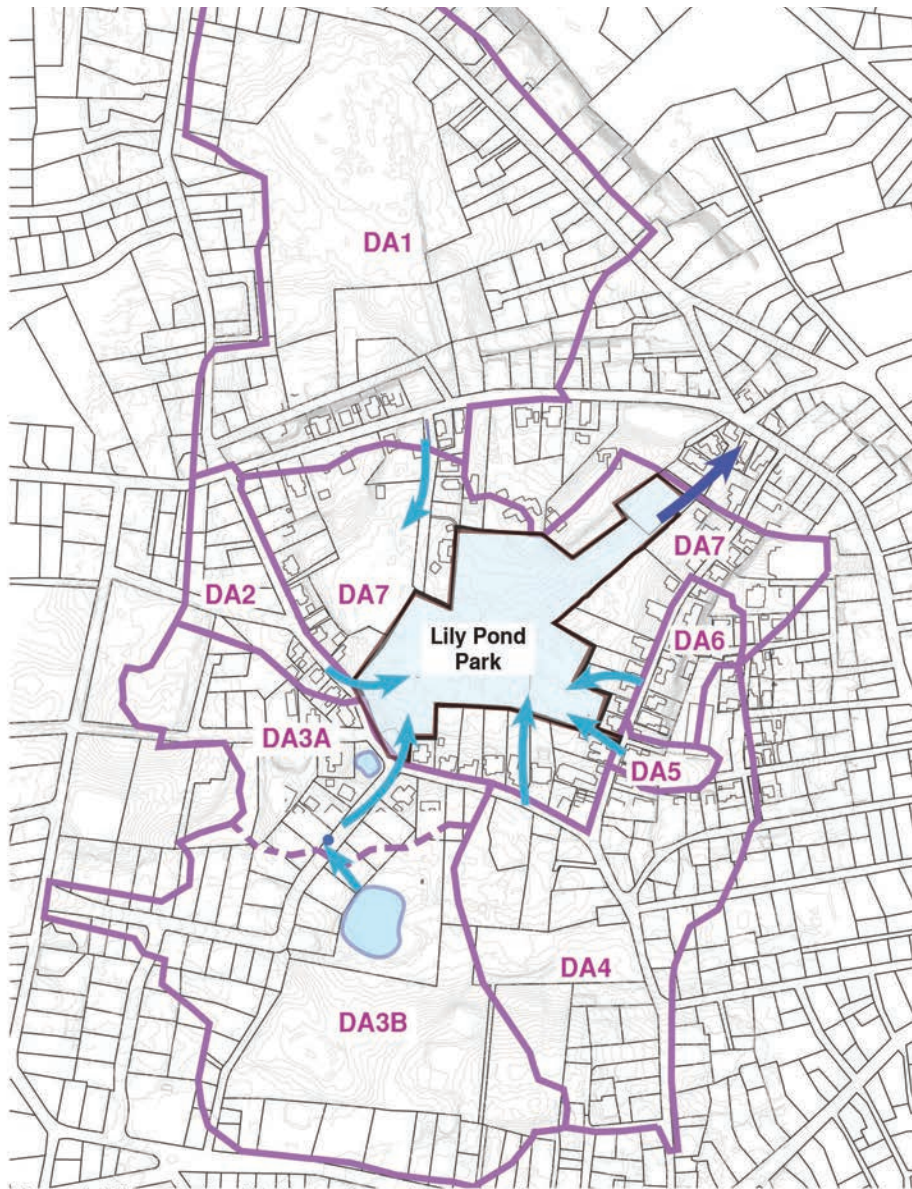
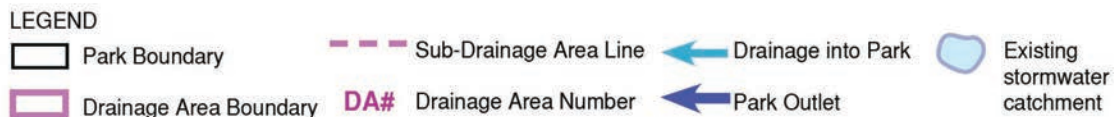
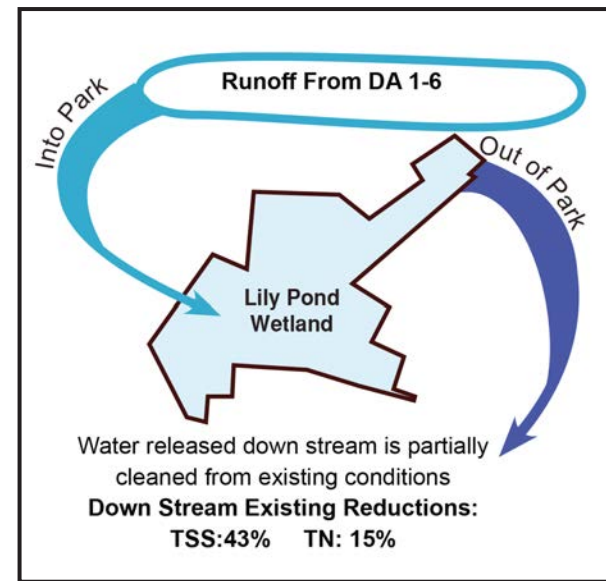


Figure 4. Watershed and Drainage Areas (not to scale)



Existing watershed and drainage areas

ANALYSIS



Existing Pollutant Loading

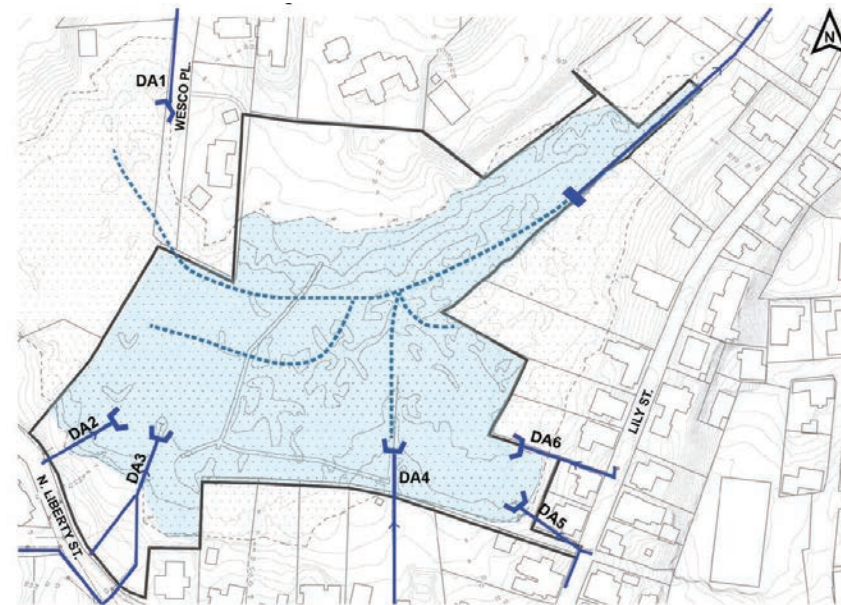


Figure 3. In Park Infrastructure (not to scale)



Existing Drainage Infrastructure

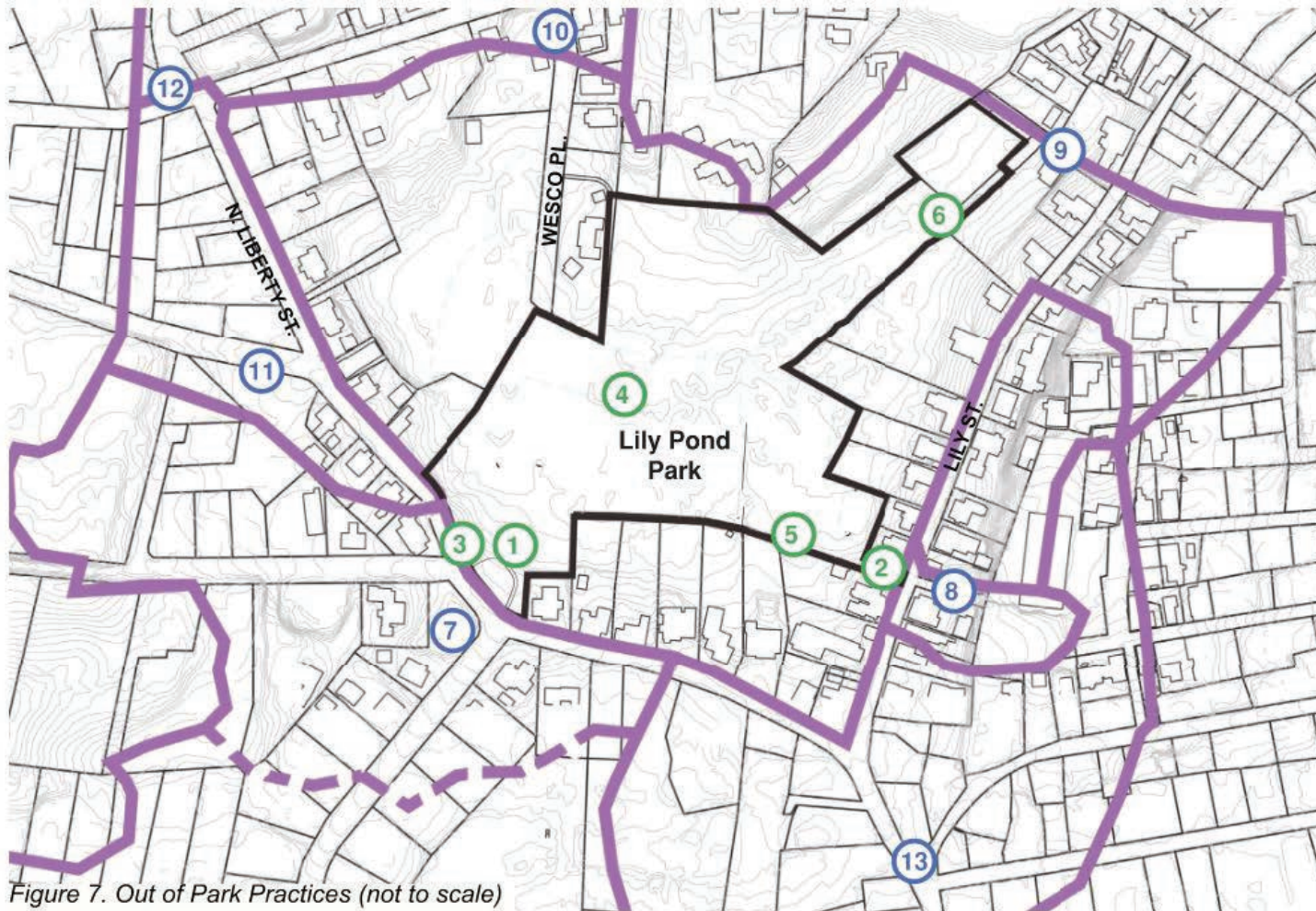


Figure 7. Out of Park Practices (not to scale)

Inside Park

- ① Constructed Wetland
- ② Cascading Bioswale
- ③ ROW Bioswale
- ④ Habitat Restoration
- ⑤ Constructed Wetland
- ⑥ Stream Restoration

Outside Park

- ⑦ Enhanced Constructed Wetland
- ⑧ Green Alley
- ⑨ Green Alley
- ⑩ ROW Bioswale
- ⑪ ROW Bioswale
- ⑫ Pavement Reduction
- ⑬ Pavement Reduction

Proposed Stormwater Improvements within the overall watershed

ANALYSIS

In-Park

	Practice	Stormwater Improvement (in park)		Enhanced Habitat			Park Usage			Constraints					
		Increased Storage Capacity	Pollutant Removal	Create (new type)	Restore (invasive removed)	Increased biodiversity	Enhanced recreation	Improves connectivity	Visibility & Education	Converts useable lawn	Dependency with other BMPs	Wetland impacts	Const. cost	Maintenance burden	Other
1	Constructed Wetland	●	●	○	●	●	○	○	●	◐	◐	◐	H	M	grass
2	cascading bioswale	○	●	○	◐	◐	○	●	●	◐	○	◐	L	M	
3	ROW bioswale	○	●	○	○	◐	○	○	●	●	◐	○	L	M	Trees
4	Habitat Restoration	●	●	●	●	●	●	○	●	○	○	●	H	H	Duck poop
5	Constructed wetland	◐	●	○	●	●	○	○	●	◐	◐	●	L	M	
6	Stream Restoration	●	●	●	●	●	●	●	●	○	○	●	H	L	Buy-in

Outside Park

7	Enhanced Const. Wetland	●	●	●	○	●	○	◐	●	○	○	◐	L	M	private
8	Green Alley	●	●	○	○	○	○	●	●	○	○	○	M	L	private
9	ROW Bioswale	◐	●	◐	○	◐	○	○	○	◐	○	○	M	M	space
10	Pavement Reduction	●	◐	○	○	◐	○	○	○	○	○	○	L	L	space
11															
12															
13															

Comparison matrix that looks at several factors that illustrate the benefits and constraints associated with each opportunity.

ANALYSIS

7 ENHANCED CONSTRUCTED WETLAND



Drainage Area:
4.21 Acres (DA1 - DA6 + overland flow)

Approximate Cost:
Low: \$15,000 - \$50,000

Maintenance:
Vegetation management

- Constraints / Considerations:
- Coordination with property owner.
 - Coordination with Con Com for wetland adjustments.
 - Coordination with DPW for structure adjustment.

A portion of DA3 is directed into existing retention practice and over-flow outlet is raised so more water is held and absorbed.

9 GREEN ALLEY



Drainage Area:
Not Applicable

Approximate Cost:
Medium: \$50,000 - \$100,000

Maintenance:

- Mowing and/or annual cleaning of pavers.

- Constraints / Considerations:
- Coordination with city and adjacent property owners for adjustment within ROW.

Existing alley surface is replaced with grass pave. This will stabilize surface and strengthen the pedestrian connection to the park from Lily St.

10 ROW BIOSWALE



Drainage Area:
0.36 Acres (From DA2)

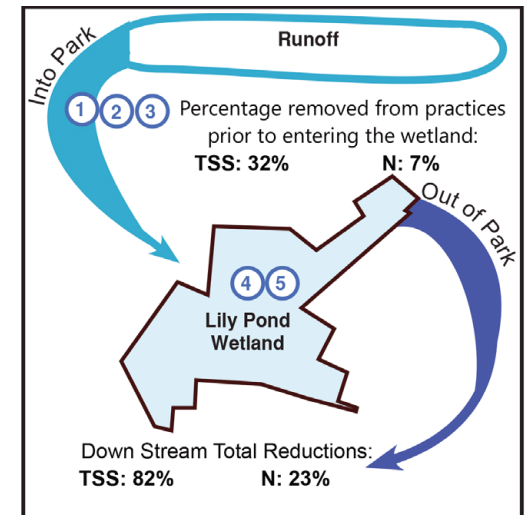
Approximate Cost:
Low: \$15,000 - \$50,000

Maintenance:

- Vegetation management, cleaning sediment forebay when needed.

- Constraints / Considerations:
- Private road, coordination with adjacent property owners.

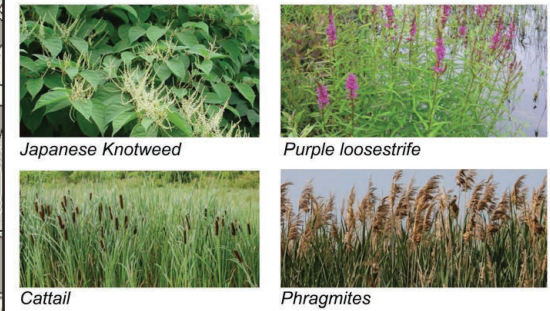
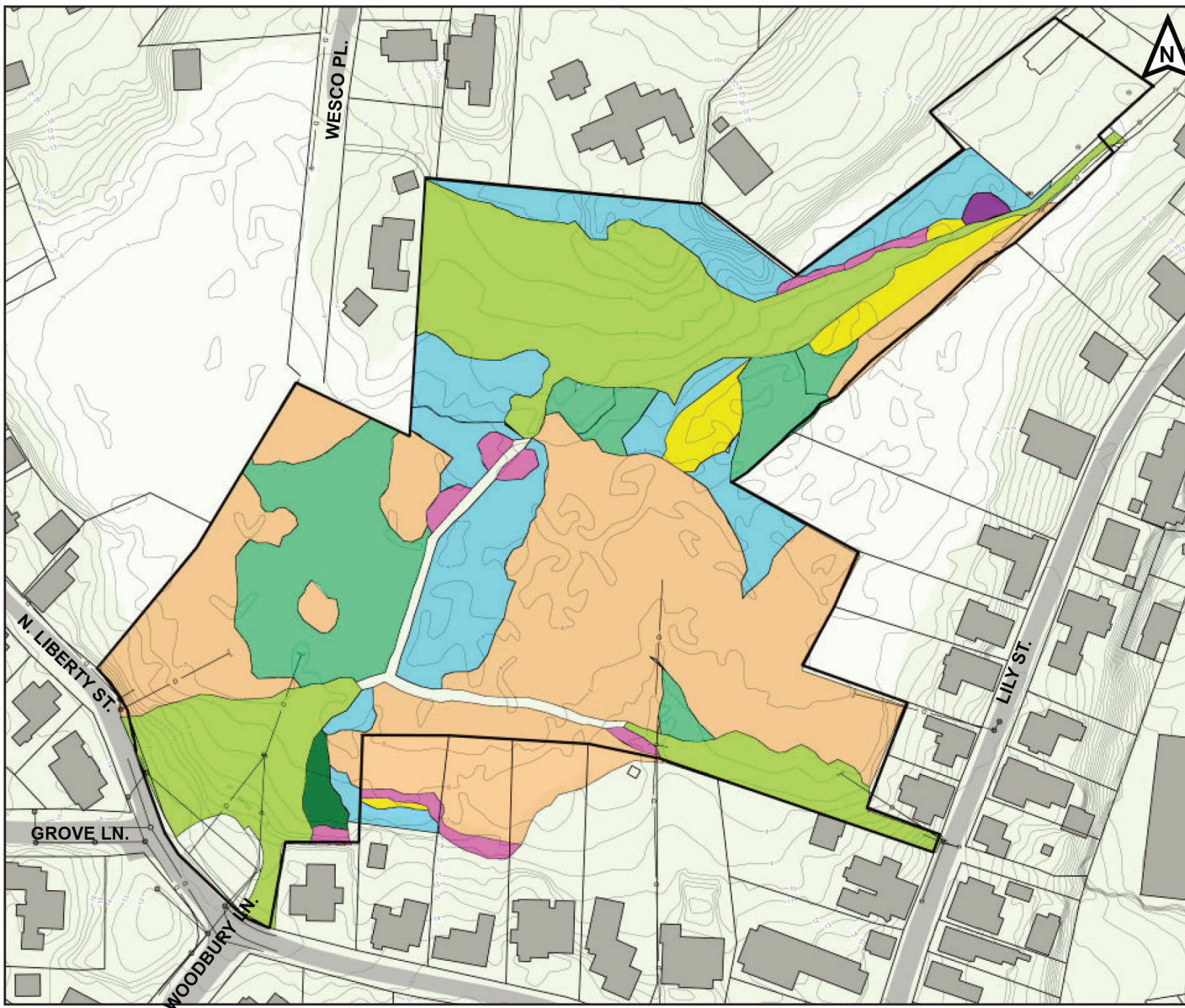
The grass shoulder adjacent to the road gives opportunity for a flow in - flow out bioswale to capture road runoff.



Proposed Pollutant Reductions

Sample of preliminary green infrastructure opportunities

ANALYSIS



PLANT COVERAGE		
Turf	30%	— Maintained
Wetland plants	12%	} Native
Cattail	13%	
Tree Canopy	3%	
Peppermint	0.5%	
Willow	34%	
Japanese Knotweed	1%	} Invasive
Phragmites	3%	
Purple Loosestrife	0.5%	
Other land cover	3%	

LEGEND

- Turf
- Japanese Knotweed
- Purple loosestrife
- Cattail
- Open wetland plants
- Phragmites
- Willow
- Peppermint

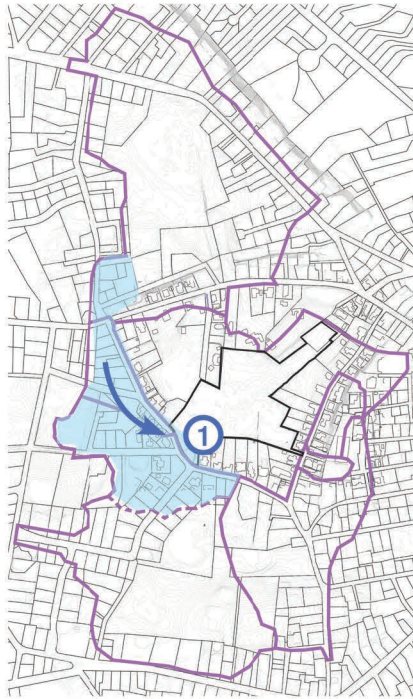
Existing Vegetation Communities

ANALYSIS

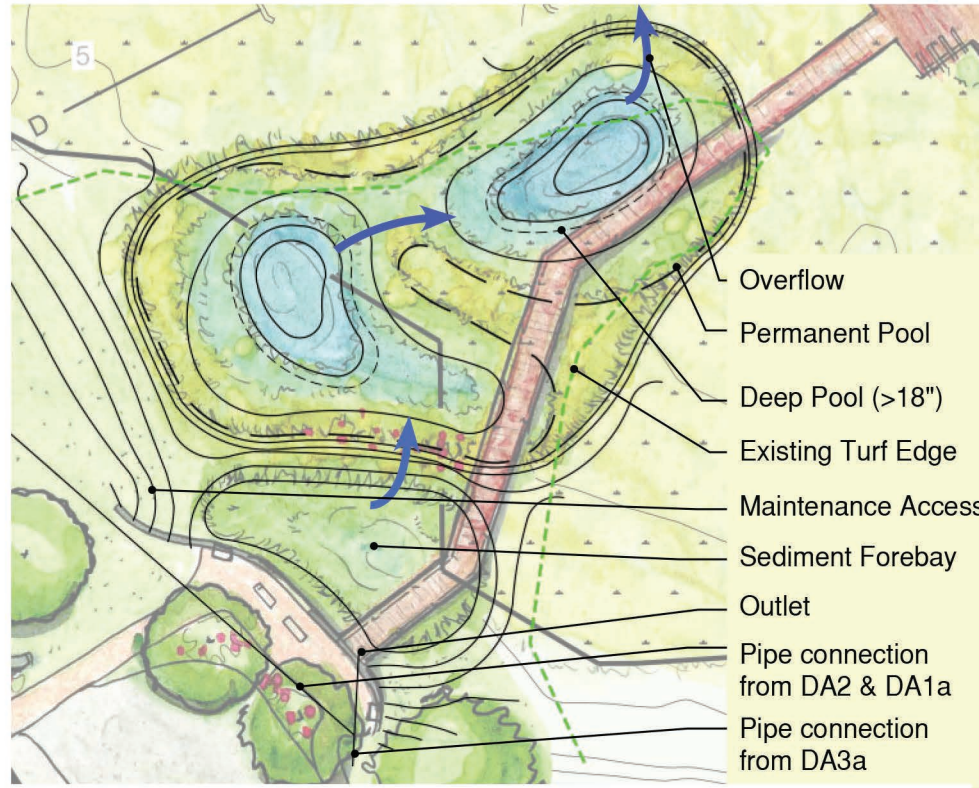


Proposed Design

DESIGN



Drainage Area



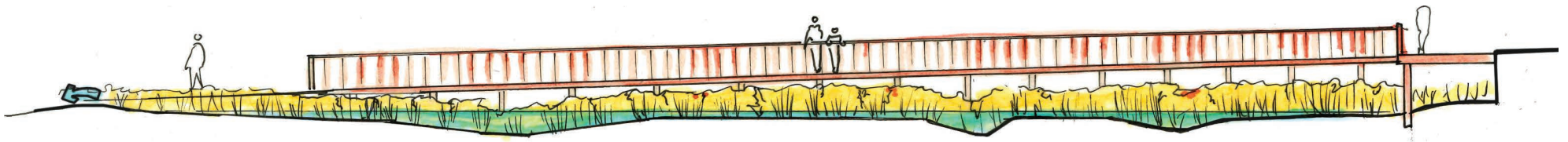
Existing Conditions

Summary

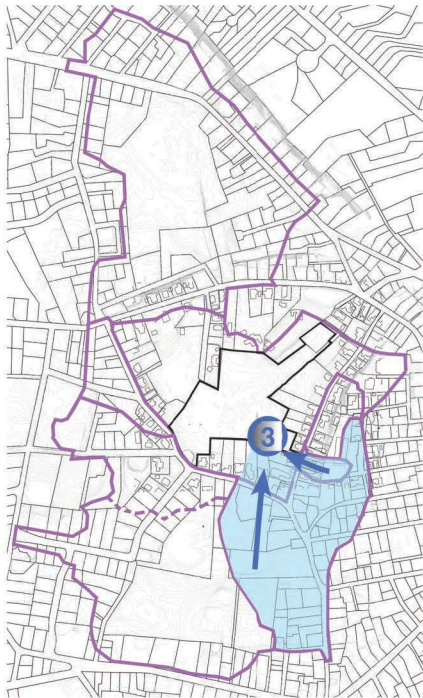
Contributing Drainage Area:	510,109 SF
Contributing Impervious Area:	153,830 SF
Storm treated:	1" Storm
TSS Removed:	85% from DA
Nitrogen Removed:	30% from DA
Size (SF) :	7,650 SF

Description:

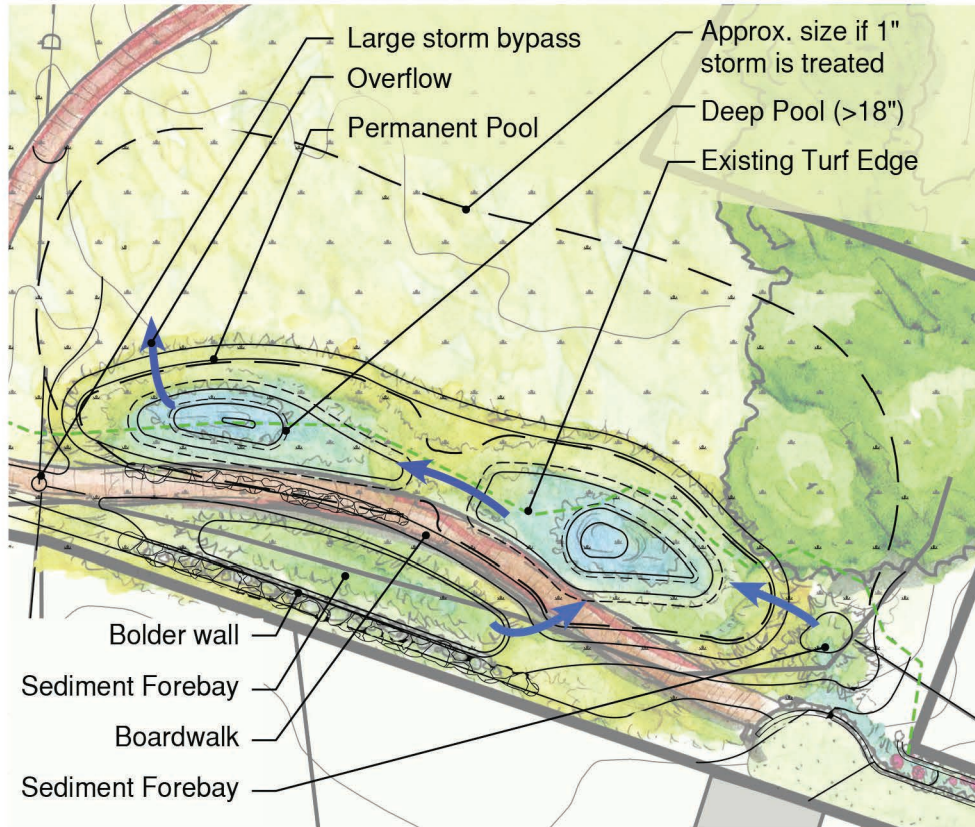
The lawn area at the end of the existing boardwalk is converted into a constructed wetland with a new entrance area & connecting ADA Boardwalk.



DESIGN



Drainage Area



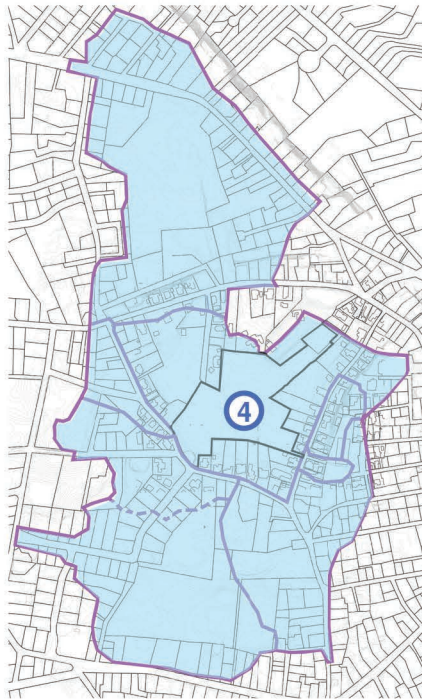
Existing Conditions

Summary

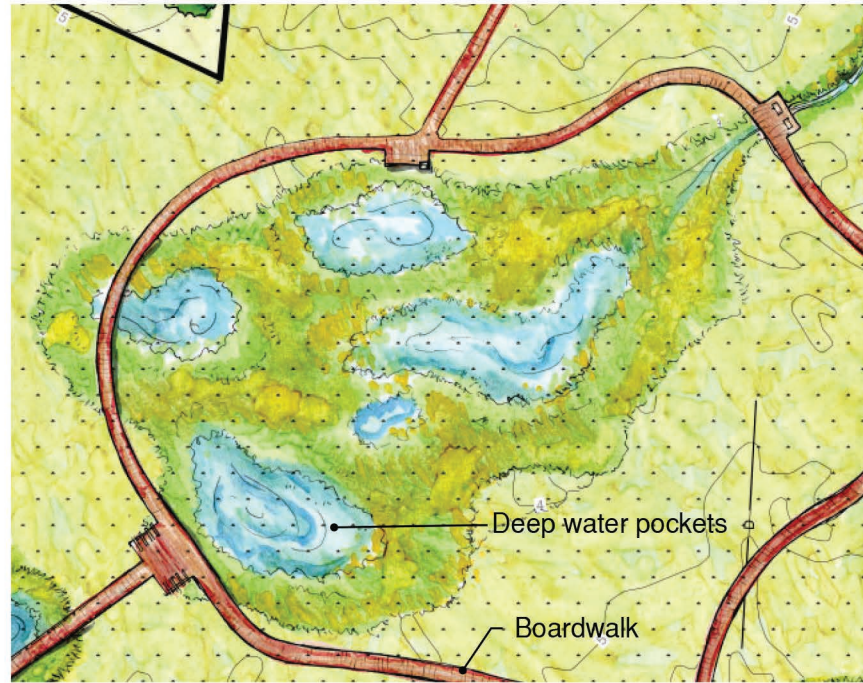
Contributing Drainage Area:	628,500SF
Contributing Impervious Area:	177,000 SF
Storm treated:	1/2" Storm
TSS Removed:	42% from DA
Nitrogen Removed:	15% from DA
Size (SF) :	4,750 SF

Description:

Lawn is converted to a constructed wetland at the end of the cascading bio with a new boardwalk and low boulder walls.



Drainage Area



Existing Conditions

Summary

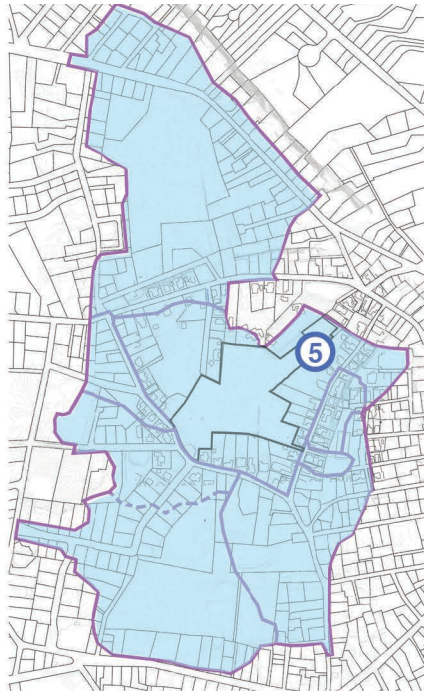
Contributing Drainage Area:	91 Acres
Contributing Impervious Area:	18 Acres
Size Depicted (SF) :	33,000 SF

Description:

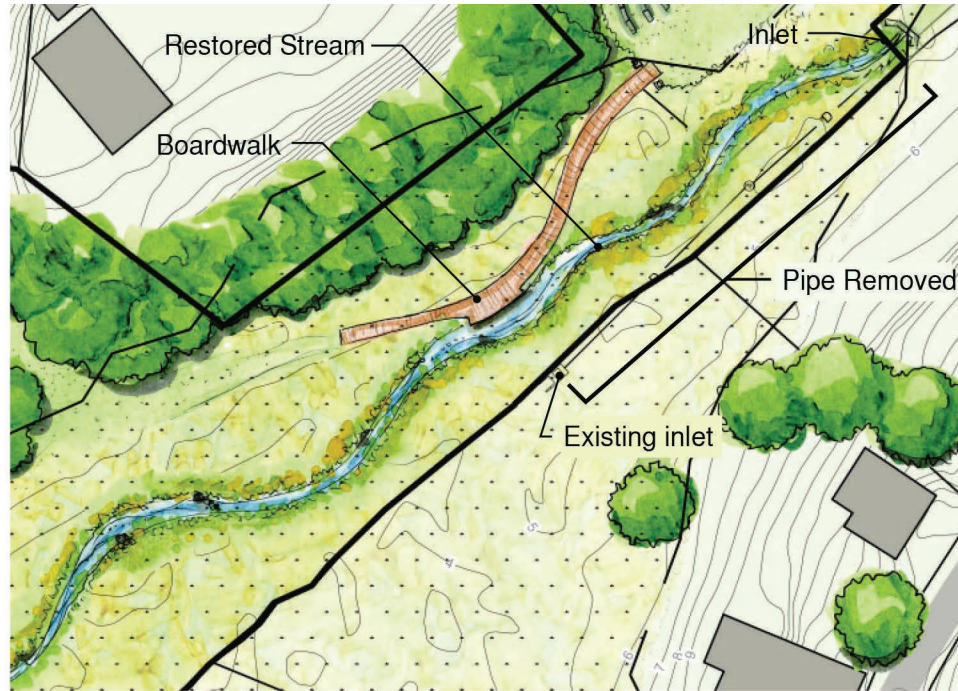
A portion of the existing wetland is converted to an open marsh system with pockets of water at a variety of depths to improve habitat.



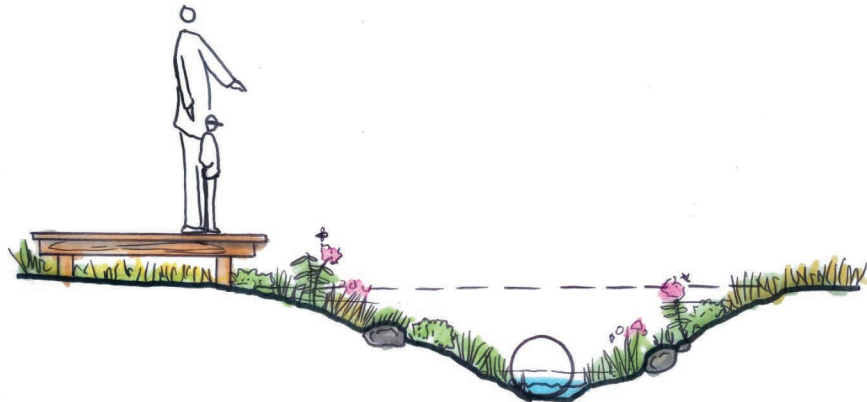
DESIGN



Drainage Area



Existing Conditions



Summary

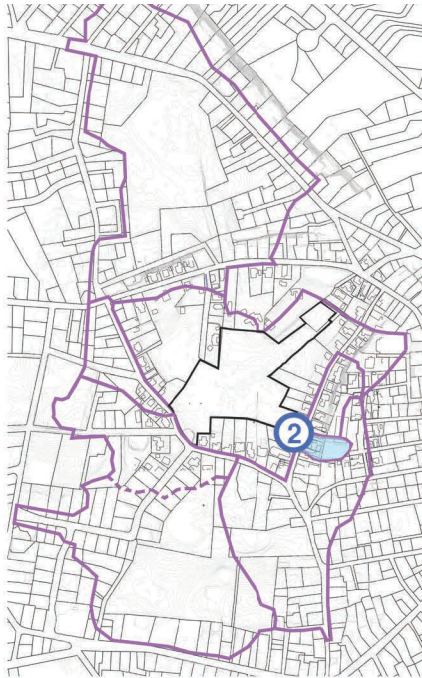
Contributing Drainage Area:
 Length of Pipe Removed:
 Approximate Stream Width:

91 Acres
 200 LF
 10-15'

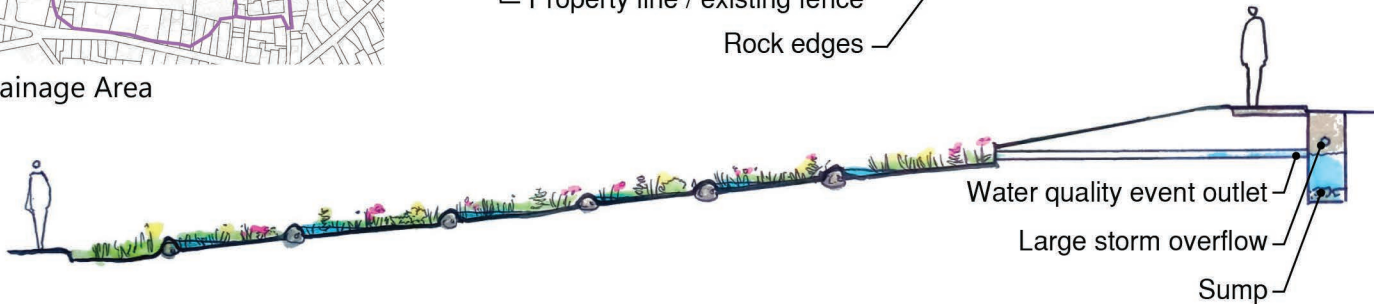
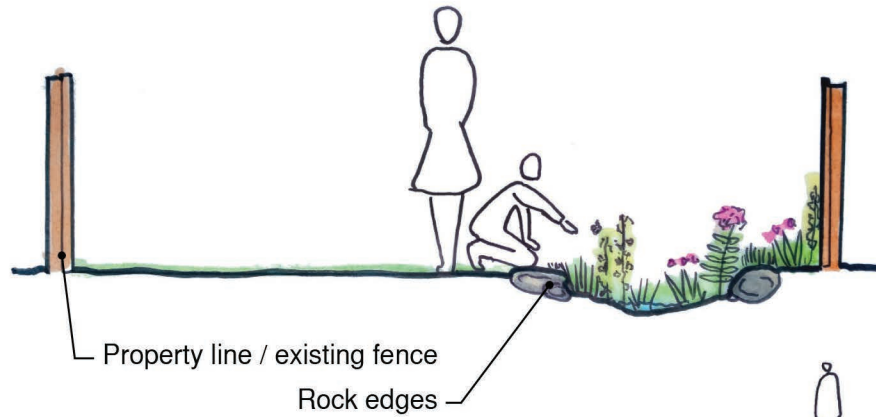
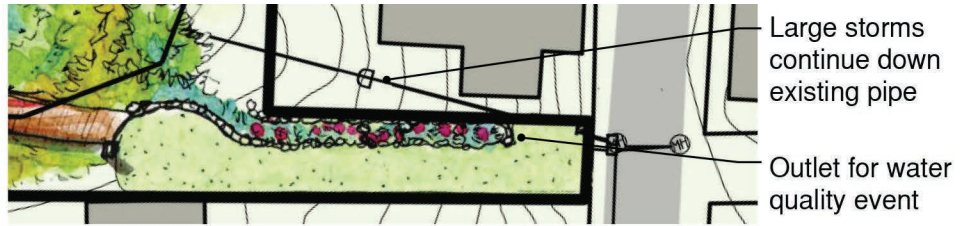
Description:

The channel is restored to a more naturalistic meandering channel. The stream still conveys water to the outlet structure but provides additional habitat.

DESIGN



Drainage Area



Existing Conditions

Summary

Contributing Drainage Area:	32,235 SF
Contributing Impervious Area:	7,400 SF
Storm treated:	1" Storm
TSS Removed:	90% from DA
Nitrogen Removed:	55% from DA
Approx. Length:	40 FT
Avg. Width:	3 FT

Description:

A portion of the grass pathway is converted to a bioswale that conveys stormwater for smaller events into the constructed wetland below.

DESIGN



LEGEND

- - - Phase 1
- - - Phase 2
- - - Phase 3
- - - Phase 4

The proposed designs are broken down into phases based on constructibility and scale.

DESIGN



LEGEND



The invasive treatment strategy highlighted priority areas to begin treatment, regardless of timing for the other phases.

DESIGN



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