TOWN OF WRENTHAM

GREEN INFRASTRUCTURE MASTER PLAN

MVP Municipal Vulnerability Preparedness

PREPARED BY FUSS & O'NEILL

Financial assistance was provided by the Executive Office of Energy & Environmental Affairs (EEA) under the FY22 Municipal Vulnerability Preparedness (MVP) Grant Program. The MVP Action Grant offers financial resources to municipalities that are seeking to advance priority climate adaptation actions to address climate change impacts resulting from extreme weather, sea level rise, inland and coastal flooding, severe heat, and other climate impacts.

PROJECT TEAM

Fuss & O'Neill	Town of Wrentham	Residents
William Guenther, MS Allen Tevyaw Stefan Bengston, MSc, MESM Alex Duryea Erik Mas, PE Christina Viera, PE **Charles River Watershed Association** Lisa Kumpf Jennie Moonan Heather Miller Julie Wood	Mike Lavin, DPW Director (Frmr) / Project Lead Kevin Sweet, Town Administrator Janet Angelico, Director of CoA Brian Antonioli, Acting DPW Director Rachel Benson, Director of Planning & Economic Development Chad Lovett, Director of Facilities & Capital Improvements Darryl Luce, Conservation Agent John Naff, Building Commissioner Julie Garland, Conservation Commission Peter Roman, Board of Health Everett Skinner, Planning Board	Jessica Briar, Lake Archer Mike Glass, Lake Archer Penny Nadeau, Lake Archer Ann Natalizia, Lake Archer Tom Souza, Mirror Lake Gayle Sudit, Lake Archer Nancy Yannuzzi, Mirror Lake

Document photos and graphics produced by Fuss & O'Neill unless otherwise noted.

EXECUTIVE SUMMARY

The Town of Wrentham has developed this Green Infrastructure Master Plan using funding through the Executive Office of Energy and Environmental Affairs Municipal Vulnerability Preparedness Program. The purpose of this Town-Wide Green Infrastructure Master Plan (Green Infrastructure Plan) is to identify opportunities to address stormwater-driven flooding hazards, improve infiltration, and improve water quality through nature-based, green infrastructure practices.

As precipitation events continue to become more intense and less predictable, and droughts become more intense with climate change, the need to infiltrate water will become more necessary in Wrentham to reduce flooding, protect water quality, and ensure stable supplies of drinking water. This increased precipitation delivers additional pollutant loads to Wrentham's three largest lakes, worsening their existing water quality issues. Over half of Wrentham's drinking water supply wells, and two from the Town of Norfolk, are located in this area. Residents of the area have also noted concerns about stormwater quality leading to potentially toxic algae blooms.

Green infrastructure, also referred to as "green stormwater infrastructure" (GSI) and "low impact development" (LID), is an alternative approach to traditional stormwater management. It can be constructed in stages, as funding and resources become available and as roads or Town buildings undergo repaving, renovation, or other upgrades. Unlike traditional underground drainage that needs to be constructed in whole to provide any benefit, green infrastructure solutions can provide incremental benefits as they are implemented, allowing them to be phased in over time.

Green infrastructure practices, like those identified in this plan, help protect the water quality of our lakes and drinking water by promoting infiltration to replenish the aquifer and by treating stormwater pollutants before they make their way into groundwater and waterbodies.

In developing this Green Infrastructure Plan, Town-owned sites throughout Wrentham were screened for green infrastructure opportunities and other nature-based solutions to increase flood resiliency and improve or protect water quality. All sites were screened against federal, state, and local data sets to identify the best candidate sites. Each candidate site was visited to collect additional site-specific information. The list of potential sites was also examined relative to ongoing planning and capital projects in the Town to identify project sites where green infrastructure could be incorporated in a cost-effective manner as part of a larger project (e.g., planned future redevelopment projects or repaving).

This plan is the culmination of a years long process of assessing potential green infrastructure sites and project ideas throughout town and identified nineteen sites with the best opportunities for near- and medium-term redevelopment projects. These sites are Rice Recreation Area, Lake Street, Lakeside Avenue, the Delaney School, the Roderick School, the town boat ramp, the Wrentham Housing Authority, Cypress Road, Walnut Road, Oak Point, and Archer Street. Conceptual stormwater management designs were developed for these sites as part of the plan to support future implementation projects, along with standard engineering details.

The plan ends by identifying a range of federal, state, and local funding sources that can help the Town maximize Town dollars by implementing these projects using grant funds, making Wrentham a more resilient community in the face of a changing climate.

INTRODUCTION

The Town of Wrentham (the Town) has developed this Town-Wide Green Infrastructure Master Plan (Green Infrastructure Plan) using funding through the Executive Office of Energy and Environmental Affairs Municipal Vulnerability Preparedness (MVP) Action Grant program. The purpose of the Green Infrastructure Plan is to identify opportunities to address stormwater-driven flooding hazards, increase infiltration, and improve water quality through the use of nature-based, green infrastructure practices. This nature-based approach looks at "end of the pipe" problems such as nutrient-impaired waters and known problem areas at stormwater outfalls and seeks to create long-term solutions by providing improved stormwater management in the corresponding upgradient drainage areas. The proposed green infrastructure improvements encompass a range of parcel-specific practices, linear green infrastructure in the municipal right of way, and more centralized approaches to manage stormwater, increase flood storage, and restore ecosystems on public lands.

Green infrastructure, also referred to as "green stormwater infrastructure" (GSI) and "low impact development" (LID), is an alternative approach to traditional stormwater management. The green infrastructure approach encourages the infiltration of stormwater into the ground close to where precipitation falls, similar to what occurs naturally in undeveloped areas. By using natural materials including vegetation and soils, these practices restore natural groundwater recharge and filtration processes while reducing downstream flooding. Additionally, green infrastructure can be constructed in stages, as funding and resources become available and as roads or Town buildings undergo repaving, renovation, or other upgrades. Unlike traditional underground drainage that needs to be constructed in whole to provide any benefit, green infrastructure solutions can provide incremental benefits as they are implemented, allowing them to be phased in over time.

In addition to reducing polluted runoff and improving water quality, green infrastructure can improve flow conditions in streams and rivers by infiltrating water into the ground, thereby reducing peak flows during wet weather events and sustaining or increasing stream base flow during dry periods, which can be important for groundwater supplies, aquatic habitat, and fisheries. Protecting groundwater supplies is especially important for a community such as Wrentham which is at the headwaters of three major watersheds and derives the vast majority of its drinking water solely from groundwater supplies. When applied throughout a watershed, green infrastructure can help mitigate flood risk and increase flood resiliency. At a smaller scale, green infrastructure can also reduce erosive velocities relative to conventional stormwater infrastructure. Green infrastructure and LID are the preferred approach for stormwater management in Massachusetts.

Wrentham continues to undergo significant economic development and redevelopment, so there is an imminent need for sound, future-focused solutions to guide development in ways that consider future climate conditions, ongoing maintenance needs, and the needs of the Town's and region's Environmental Justice and climate vulnerable populations. The Green Infrastructure Plan is intended to help Town officials and other local decision-makers think more strategically about ways to utilize nature-based solutions to make the Town more resilient to future climate impacts—from flooding to extreme heat and drought—and to recognize key leverage points where projects can effectively benefit water quality and ecological health while simultaneously communicating proactive, climate resilient development strategies to residents.

This plan is the culmination of a year-long process of assessing potential green infrastructure sites and project ideas throughout the Town and includes:

- Prioritized site-specific and Town-wide recommendations
- 11 concept-level designs to support future implementation projects
- Standard engineering details for low-maintenance green infrastructure stormwater controls tailored to the needs of Wrentham that could be implemented by the Town Department of Public Works (DPW) in a variety of locations
- Potential funding sources for design, permitting, and implementation of recommended projects

A key objective of this project is to promote long-term planning and resiliency measures that consider both existing and ongoing infrastructure needs and natural system solutions and form the basis of a climate resiliency vision and implementation strategy for the Town of Wrentham.

What is Green Infrastructure?

Green infrastructure refers to systems and practices that reduce stormwater runoff through use of vegetation, soils, and natural processes to manage water and create healthier urban and suburban environments. These practices capture, manage, and/or reuse rainfall close to where it falls, reducing stormwater runoff and keeping it out of drainage systems and receiving waters.

Treebox Box

Chambers

Grass Swale

Infiltration/Bioretention Basin/Rain Gardens

Curb Inlet Planters

Green Infrastructure:

- Improves water quality by reducing pollutants in stormwater runoff
- Helps protect and regenerate groundwater sources
- Reduces peak flows during storms
- Helps sustain stream flow during droughts
- Mitigates flooding & increases flood resiliency
- Reduces streambank erosion
- Is more cost-effective than traditional drainage
- Improves air quality
- Sequesters carbon
- Helps reduce energy consumption
- Adds aesthetic interest
- Improves property values
- Contributes to overall economic vitality
- Promotes adaptation to climate change

CURRENT CONDITIONS

Wrentham's Poor Water Quality

The major lakes in Town, Lake Pearl, Lake Archer, and Mirror Lake, face challenges with water quality from stormwater runoff. Bacteria and nutrient pollution in stormwater have led to excessive algal growth and public health concerns in recent years, including closures of the public beach area located on Lake Pearl. These water quality problems are exacerbated by land use practices in the vicinity of the lakes, such as extending residential lawns to the water's edge and excessive use of fertilizers, as well as stormwater inputs. Additionally, residents have noted the increase harmful algal blooms. Harmful Algal Blooms, or HABs can produce toxins that are dangerous to both the public and wildlife.

Wrentham's water supply is entirely derived from groundwater. Three of Wrentham's five existing groundwater wells, which produce up to 72% of the town's drinking water, are located near the Town's major lakes and rely on these surface waterbodies for recharge. Two other drinking water wells are located in the eastern part of Town and the Taunton River watershed. Wrentham's population and thus its water demand is forecasted to increase by almost 10% in the coming decades. In addition, supply wells for the Town of Norfolk are located downstream of Mirror Lake.

The Town currently has the capacity to meet its present and future demand, provided all wells and treatment facilities are online. The Town's recent Water System Master Plan noted that the Town could struggle to meet peak demand without increased treatment facility resilience and additional supply sources. The surface water connection to groundwater highlights the need to maintain or improve water quality in the major lakes.

Figure 1: A harmful algae bloom in 2021 in Lake Archer
Photo Credit: Lake Archer Association

Undersized and Aging Stormwater Infrastructure

The Town of Wrentham operates an extensive drainage network to collect and convey stormwater, consisting of over 2,000 catch basins (inlets from the roadway into the underground drainage system), over 23 miles of drainage pipes currently mapped, and over 400 outfalls where stormwater is ultimately conveyed to lakes, streams, and wetlands. Much of this infrastructure is past its intended design lifespan and sized to accommodate storms that have been less intense than current storms are, and future storms are predicted to be. Residents have noted localized areas of erosion when existing drainage systems have been overwhelmed.

How Stormwater Leads to Water Pollution

When rain falls from the sky, it is generally clean. When a raindrop hits the ground and starts flowing across surfaces, it begins collecting other materials. Stormwater runoff picks up all sorts of surface pollutants-like sand and road grit, excess herbicides, or fertilizers, broken down bits of leaves and grass clippings-and carries these into natural waterbodies, often without an opportunity for effective treatment and/or filtration. This can lead to degraded water quality, also referred to as "impairments," resulting from excessive levels of phosphorus, nitrogen, sediments and solids, salts, bacteria, and other pollutants.

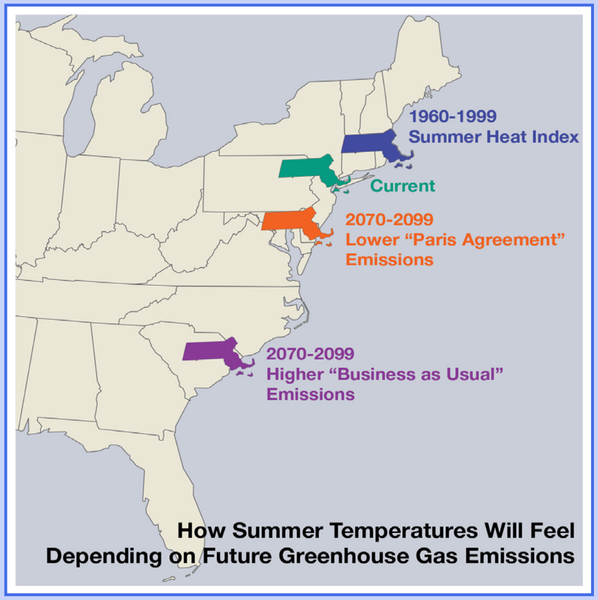
The Massachusetts Department of Environmental Protection tracks water quality in streams, ponds, and lakes around the Commonwealth. Within Wrentham, Lake Pearl and the Stop River have impairments related to phosphorus loading, including low dissolved oxygen. Lake Archer and Mirror Lake are impaired by invasive plants. These waterbodies ultimately discharge to the Charles River, which has a phosphorus Total Maximum Daily Load (TMDL). In 2020, these water quality problems contributed to a harmful algal bloom and public health advisories at Lake Archer which limited recreational use of the pond for several weeks. Wrentham also sits at the intersection of three watersheds with TMDLs for nutrients or bacteria, the Charles River, Ten Mile River, and Taunton River watersheds. Reducing nutrient and bacteria inputs from stormwater in the upper reaches of the watersheds helps improve downstream water quality for other climate vulnerable and Environmental Justice populations.

Green infrastructure practices like those identified in this Green Infrastructure Plan help to protect the quality of our drinking water by promoting infiltration of stormwater to recharge the aquifer and by treating stormwater pollutants before they make their way into groundwater.

Credit: Metropolitan North Georgia Water Planning District

CLIMATE CHANGE IMPACTS

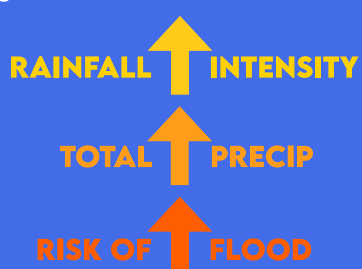
Both the acute and chronic impacts associated with extreme weather and natural and climate-related hazards are an increasing concern for the communities of southeast Massachusetts. When the Town conducted a Community Resilience Building (CRB) workshop as the first step in its climate resilience planning process, Town stakeholders identified flooding and severe storms as two of the top climate change-related hazards facing the Town. The threat from flooding has been growing with the increasing frequency of major storm events that deliver large amounts of precipitation over a short period, and this threat is expected to continue to grow due to climate change. Here in Wrentham, there has already been more than a doubling of heavy rainfall events over the last 60 years.



As time goes on, Wrentham's climate will begin to look more like the climate in the mid-Atlantic. By the end of the century, our climate here in south-eastern Massachusetts will feel like that of the Carolinas today- in other words, we're looking at a hotter, wetter future.

Wrentham's Climate is Changing!

Wrentham, like communities across MA, will experience shifts in precipitation as a result of climate change: higher annual rainfall and more intense and frequent storm events, with longer periods of drought in between. These larger storms can overwhelm our existing stormwater systems and stream culverts, which weren't designed or built for these new conditions.

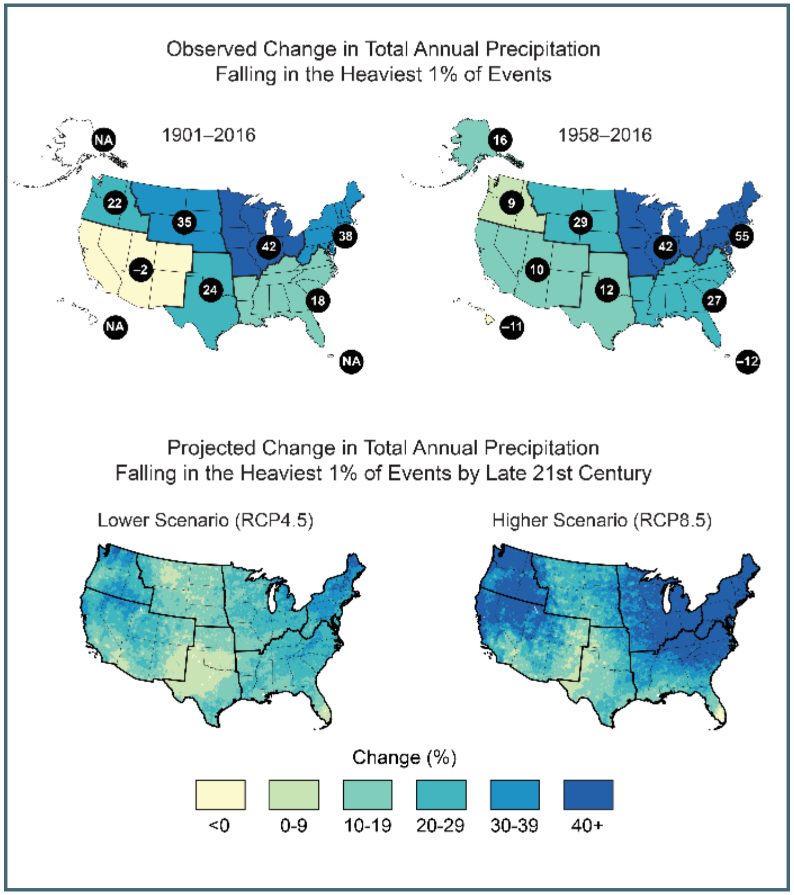


The Northeast Climate Science Center at the University of Massachusetts Amherst projects that, given a medium to high future emissions scenario, Wrentham will see as much as 8.3 inches of additional rainfall per year by the end of the century. More critically in terms of flood potential, the Town could see up to 4 additional days with precipitation over one inch. Similarly, the Massachusetts Department of Transportation (MassDOT)[1] projects that by 2070 the 100-year, 24-hr rainfall event in the Ten Mile and Charles River Basins, will increase up to 20% under a medium emissions scenario (RCP6.0) and up to 30% under a high emissions or business-as-usual scenario (RCP8.5). This is consistent with the broader findings of the 4th National Climate Change Assessment that identified a 55% increase in the total annual precipitation falling in the heaviest 1% of events in the period 1958-2016 and anticipates an up to 40+% change by late century under a high emissions scenario. With higher annual temperatures and warmer winters, more precipitation will be falling in the form of rain, generating more runoff.

What Climate Change Means for Stormwater

As precipitation events become more intense and less predictable, undersized, and aging stormwater infrastructure is expected to pose a greater threat of failure and flooding. Catch basins can be overwhelmed, and even where drainage pipes are of adequate size, high volume stormwater

[1] *https://gis.massdot.state.ma.us/cpws/*

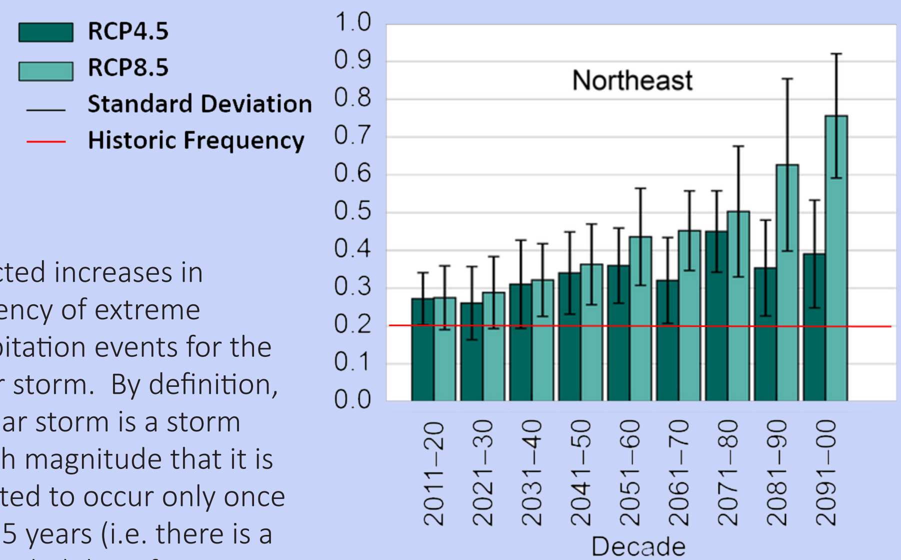


Observed and Predicted Extreme Precipitation (4th National Climate Assessment; https://nca2018.globalchange.gov/chapter/2/)

flows can result in powerful erosive forces and scouring at outfalls, with corresponding impacts to waterbodies. High volumes of stormwater runoff also increase peak flows through downstream culverts and bridges, increasing the likelihood of road washouts or structural failure at inadequate or undersized road-stream crossing structures and significantly impacting the transportation system.

Water Quality and Climate Change

Harmful algal blooms and public health advisories are expected to become increasingly frequent as climate change leads to more extreme heat conditions and drought periods. Wrentham is expected to see an increase in days over 90° of up to 57 additional days by the 2090s, and consecutive dry days between rain events are predicted to increase to 17 days annually by the end of the century. Increased frequency and intensity of precipitation events also increases nutrient loads in stormwater runoff. Together with increasing temperatures, this creates the conditions for cyanobacteria to grow and reproduce to dangerous levels. A nationwide screening-level assessment of climate impacts on cyanobacteria harmful algal bloom prevalence (Chapra et al. 2017) determined that the largest increases in harmful algal bloom occurrence were likely to occur in the Northeast.



Projected increases in frequency of extreme precipitation events for the 5-year storm. By definition, a 5-year storm is a storm of such magnitude that it is expected to occur only once every 5 years (i.e. there is a 20% probability of occurrence in any given year). The historic average frequency for this event is thus 0.2 by definition. The frequency of events of this magnitude is expected to increase significantly in the coming decades. Projections are shown for both a lower emissions scenario (RCP4.5) and a high emissions scenario (RCP 8.5). Source: Janssen et al. 2014[2]

[2]*Janssen, E., D. J. Wuebbles, K. E. Kunkel, S. C. Olsen, and A. Goodman, 2014: Observational- and model-based trends and projections of extreme precipitation over the contiguous United States. Earth's Future, 2, 99–113, doi:10.1002/2013EF000185*

PRIORITIZED GREEN INFRASTRUCTURE CONCEPTS

Site Selection and Assessment Process

Sites throughout Wrentham were screened for green infrastructure opportunities or other nature-based solutions to increase flood resiliency, infiltration stormwater, and improve or protect water quality. A desktop screening process was initially performed using GIS data layers to identify areas with the greatest risk from flooding and potential for water quality benefits from stormwater retrofits. This screening-level review considered the following factors:

- Utility information (particularly existing drainage infrastructure)
- Soil infiltration capacity
- Municipal ownership (parcels and right of ways)
- Open space priorities
- MS4 regulated areas
- Flood-prone areas
- Water quality impairments
- Directly connected impervious surfaces

Information from Town staff and other stakeholders via the project Working Group and their affiliations in local lake associations was incorporated to identify additional areas of known flooding or drainage concerns. The list of potential sites was also examined relative to ongoing planning and capital projects in the Town to identify project sites where green infrastructure could be incorporated in a cost-effective manner as part of a larger project (e.g., planned future redevelopment projects or repaving).

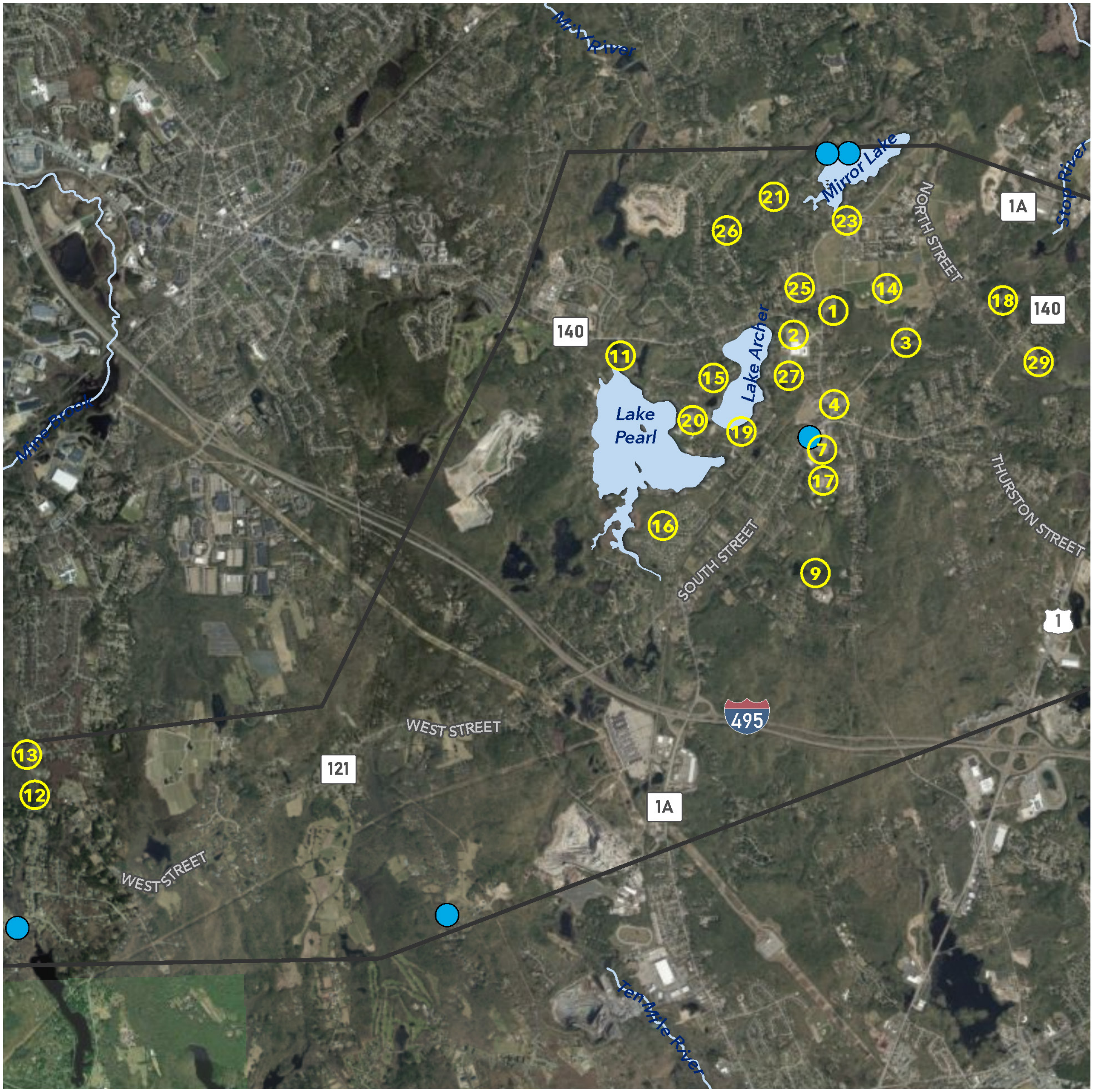
Field inventories were then performed at sites identified by the screening-level review to further evaluate the feasibility of implementing green infrastructure retrofits or nature-based solutions at each location. Field assessments focused on adjacent land use and development characteristics, areas of impervious surfaces, drainage patterns and approximate drainage areas, the presence of utilities, locations for potential stormwater retrofits, and site constraints such as evidence of shallow groundwater or bedrock that could limit the feasibility of infiltration-based practices, and potential project co-benefits such as habitat restoration, energy resilience, or educational benefits.

The concepts presented in this Green Infrastructure Plan master plan were determined to be the most promising candidates for green infrastructure improvements that would yield significant benefits in terms of improved water quality, and climate resilience as well as flooding. Many of the selected sites are also priority areas for either DPW or Planning for future improvements within the next several years.

Each concept includes preliminary calculations of the volume and depth of stormwater runoff that could be captured by the proposed green infrastructure practices. Calculations of potential pollutant load reductions for total suspended solids (sand, grit, etc.), nutrients (phosphorus and nitrogen) and bacteria were calculated for each practice based on BMP performance curves published by the University of New Hampshire Stormwater Center and the U.S. Environmental Protection Agency[3] . Order of magnitude costs were also calculated based on the assumed volume of water to be treated at each side and typical unit costs for constructing green infrastructure practices. A more detailed summary of cost calculations and assumptions is provided after the concepts.

[3]*https://www.unh.edu/unhsc/sites/default/files/media/ms4permit_nomographs_sheet_final_2020.pdf*

https://www.epa.gov/sites/production/files/2020-01/documents/tisbury-subtask-4d-tm.pdf

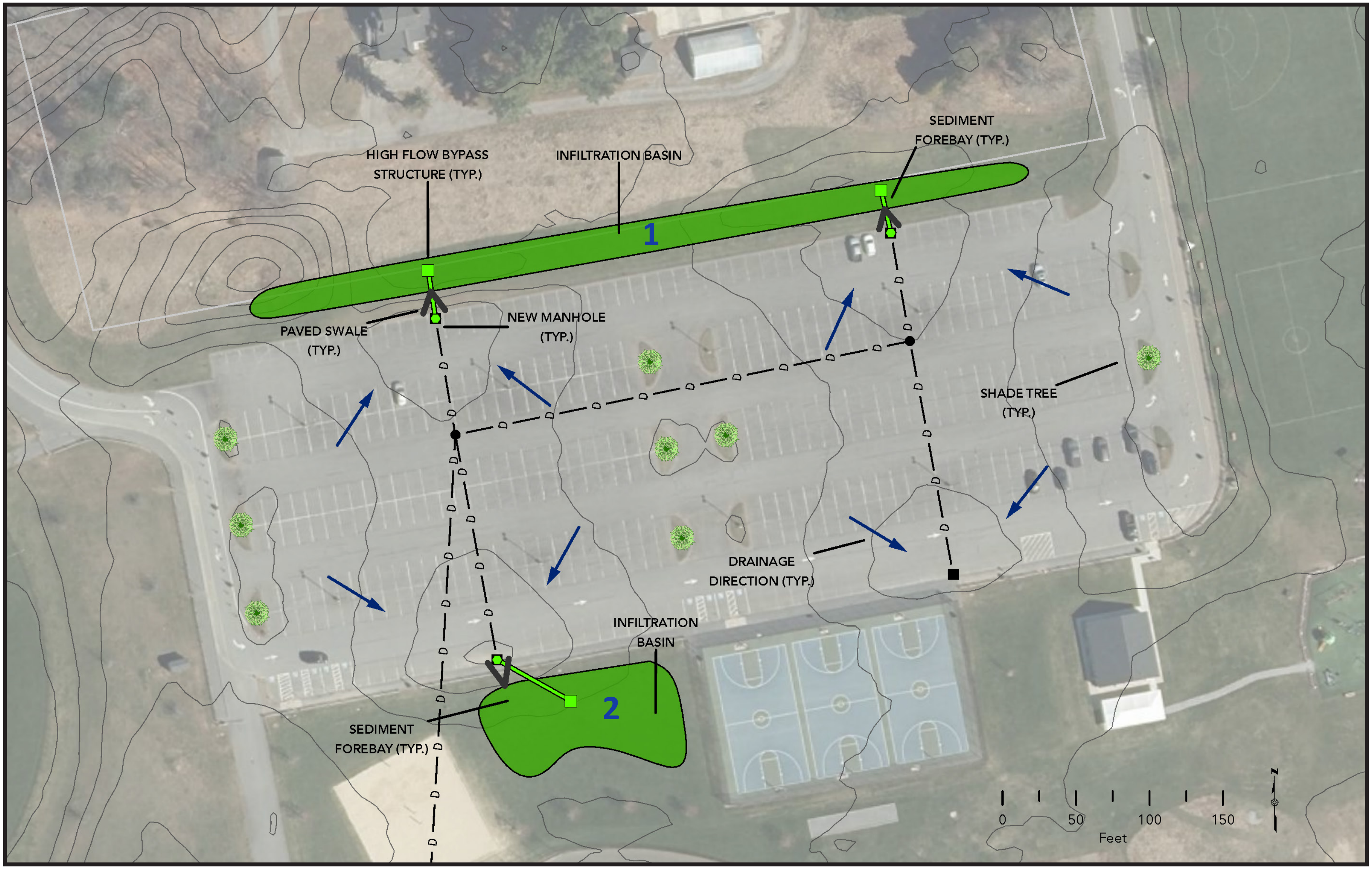


1. **Wrentham Housing Authority**
2. King Philip High School
3. Lorraine Metcalf Drive
4. Board of Selectmen Parcel
5. Town Common
6. **Lake Street**
7. Town Hall and Public Safety Complex
8. **Delaney School**
9. Senior Center
10. Dept. of Public Works
11. **Town Boat Ramp**
12. Ash Road
13. Heaton Place
14. **Rice Recreation Complex**
15. **Oak Point**
16. Annawon Avenue
17. **Roderick School**
18. Lyndon Road
19. **Lakeside Avenue**
20. Lake Pearl Park
21. Holly Lane
22. Willow Lane
23. **Cypress Road**
24. **Walnut Road**
25. Blake Road
26. Martin Lane
27. **Archer Street**
28. Federico Drive

Bold sites indicate conceptual design

Known Flooding Areas

Rice Recreation Complex



Site Description

The parking lot for the Rice Recreation Complex covers 3.5 acres and includes nearly 450 parking spots. It serves baseball, soccer, lacrosse, basketball, and volleyball facilities, walking trails, and a playground. Four catch basins along the northern and southern edges of the parking lot convey runoff from the parking lot to a detention pond, designed to delay stormwater flows into downstream waters. North of the parking lot, two low lying areas are located near catch basins. Soils in the area are largely composed of sands and loamy sands ideal for infiltration-based practices with high pollutant removal potential.

Proposed Green Infrastructure Concept:

1. Construct a linear infiltration practice along the northern edge of the parking area. Conveyance along the northern edge of the lot would direct stormwater to pretreatment areas which would overflow to the infiltration practice. Existing infrastructure could be used as an overflow for higher flows.
2. Construct an infiltration basin behind the south-western catch basin between the volleyball and basketball courts. This basin will similarly require pretreatment and could utilize the existing catch basin as an overflow

- Plant shade trees in parking row islands to reduce heat island effect

Site Data

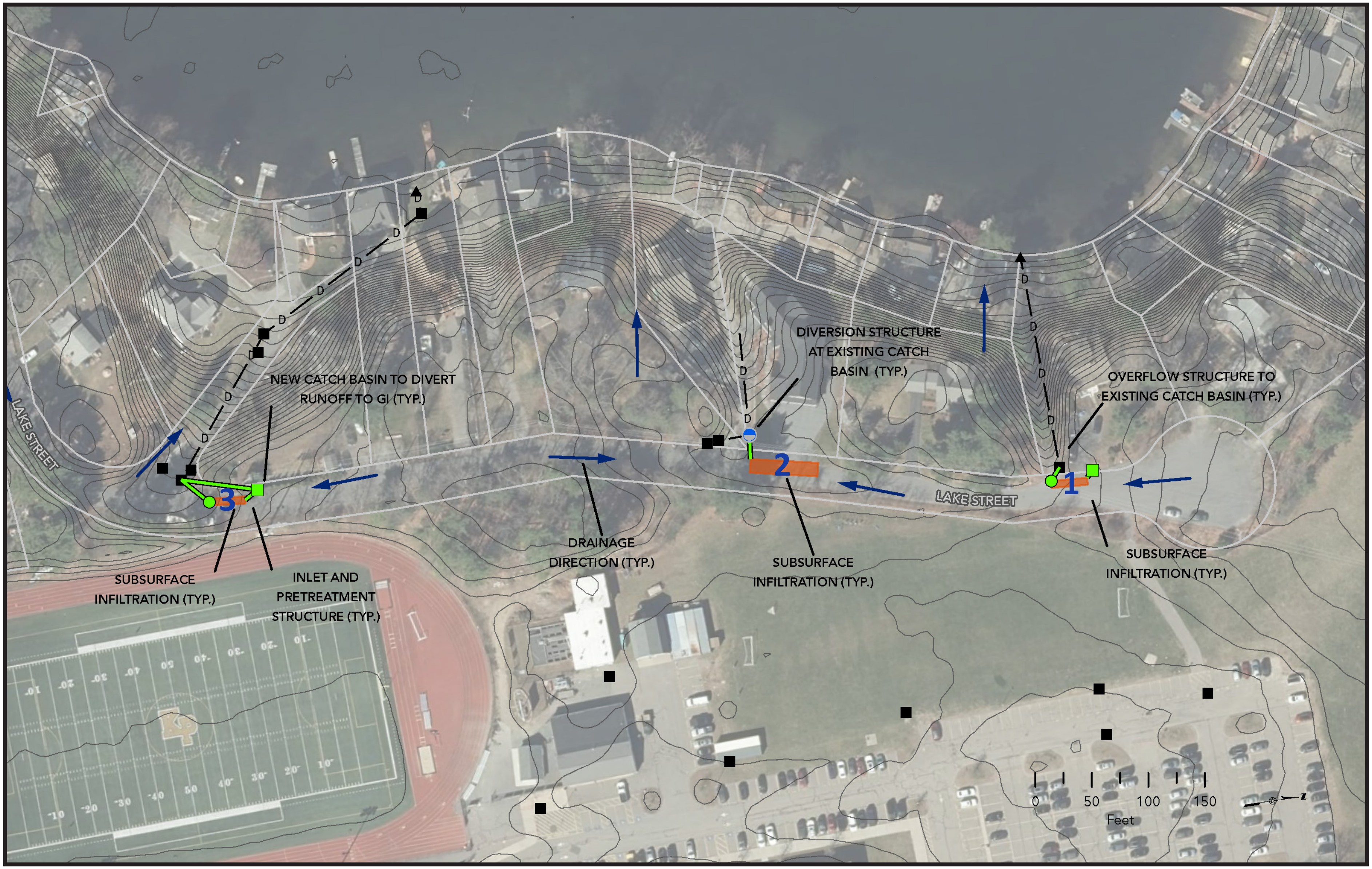
Impervious Area Treated:	3.12 acres
Design Storage Volume:	14,358 ft^3
Runoff Capture Depth:	1.5 inches

Pollutant Removal:

Reduction in Total Suspended Solids:	100%
Reduction in Phosphorus loading:	100%
Reduction in Nitrogen loading:	100%
Reduction in Bacteria loading:	100%

Estimated Cost: $170,000

Lake Street


DIVERSION STRUCTURE AT EXISTING CATCH BASIN (TYP.)
NEW CATCH BASIN TO DIVERT RUNOFF TO GI (TYP.)
OVERFLOW STRUCTURE TO EXISTING CATCH BASIN (TYP.)
LAKE STREET
LAKE STREET
1
2
3
D
DRAINAGE DIRECTION (TYP.)
SUBSURFACE INFILTRATION (TYP.)
INLET AND PRETREATMENT STRUCTURE (TYP.)
SUBSURFACE INFILTRATION (TYP.)
SUBSURFACE INFILTRATION (TYP.)
0
50
100
150
Feet

Site Description

Uphill of a dense neighborhood of small waterfront houses, Lake Street is located along the eastern edge of Lake Archer. Several steep and narrow streets run down hill toward the lake with catch basins located at varying intervals along the street. Catch basins convey stormwater down the hill to three outfalls that discharge to Lake Archer. The single-family homes along Lake Street are located along the west side of the street, with King Philip High School to the east. The roadway is approximately 21-foot-wide. Utility poles are located along the west edge of the street. Soils in the area are ideal for infiltration-based practices with high pollutant removal potential.

Proposed Green Infrastructure Concept:

- Install subsurface infiltration systems within the right-of-way along Lake Street to infiltrate the water quality volume

1. Northern most infiltration system will need replacement of the existing catch basin along with a pretreatment system before water is conveyed to the infiltration area to prevent clogging and prolong the life of the system.
2. Central infiltration system will need to have the existing catch basin modified or replaced with a diversion structure and a pretreatment chamber installed prior to the infiltration system to prevent clogging and prolong the life of the system.
3. Southern infiltration system will be similar to the previous systems. Here, at least one new catch basin will need to be installed, along with adequate pretreatment, ahead of the infiltration system.

- Pretreatment structures should meet all standards described in the Massachusetts Stormwater Handbook.

Site Data

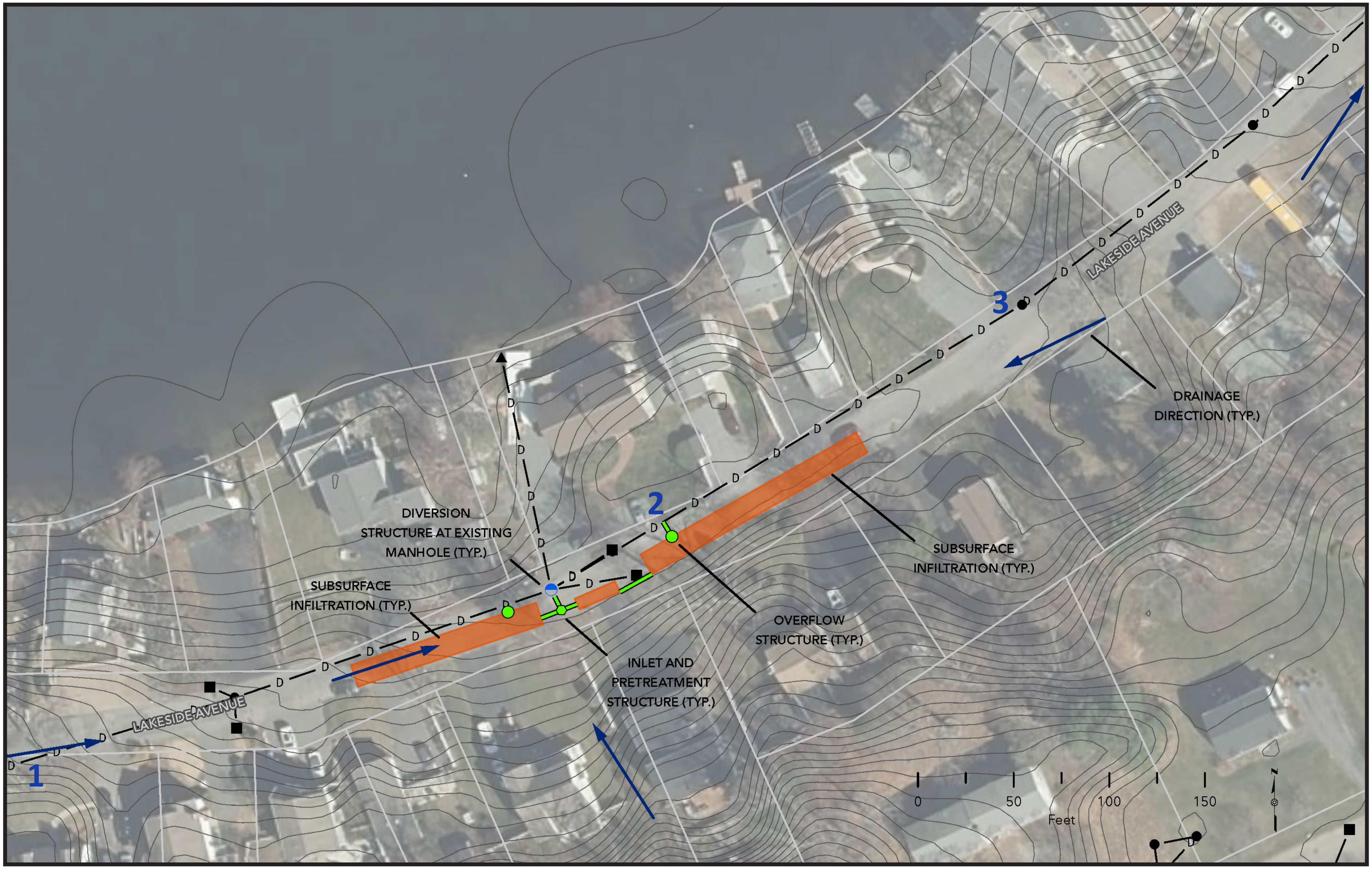
Impervious Area Treated:	0.55 acres
Design Storage Volume:	2,200 ft^3
Runoff Capture Depth:	1.0 inches

Pollutant Removal:

Reduction in Total Suspended Solids:	100%
Reduction in Phosphorus loading:	98%
Reduction in Nitrogen loading:	100%
Reduction in Bacteria loading:	99%

Estimated Cost: $350,000

Lakeside Avenue



Site Description

Lakeside Avenue and A Street contain a dense neighborhood of small waterfront homes, located along the southern shoreline of Lake Archer, ending in a private cul de sac. A series of catch basins collects runoff from the street and uphill areas to the south, discharging directly to Lake Archer. Water and gas utilities were identified within the right-of-way. Soils in the area should be ideal for infiltration-based practices with high pollutant removal potential based on available mapping data.

Proposed Green Infrastructure Concept:

1. The four westernmost systems will require retrofit of existing catch basins to divert the water quality volume to a pretreatment structure and subsurface infiltration chambers. If practicable, chambers should be sited to allow excessive stormwater volumes to overflow to the existing storm drain.
2. The central system will be similar to the previous system. Here, the catch basin receives stormwater from a large catchment area and so may require additional siting considerations to infiltrate the water quality volume.
3. The easternmost system will require retrofitting the existing drainage manhole to a diversion structure, such as a weir, to divert the water quality volume to a pretreatment structure and subsurface infiltration chambers. If practicable, installing the chambers near the central infiltration system, may reduce construction costs if a common trench can be excavated.

- Pretreatment structures should meet all standards described in the Massachusetts Stormwater Handbook.

Site Data

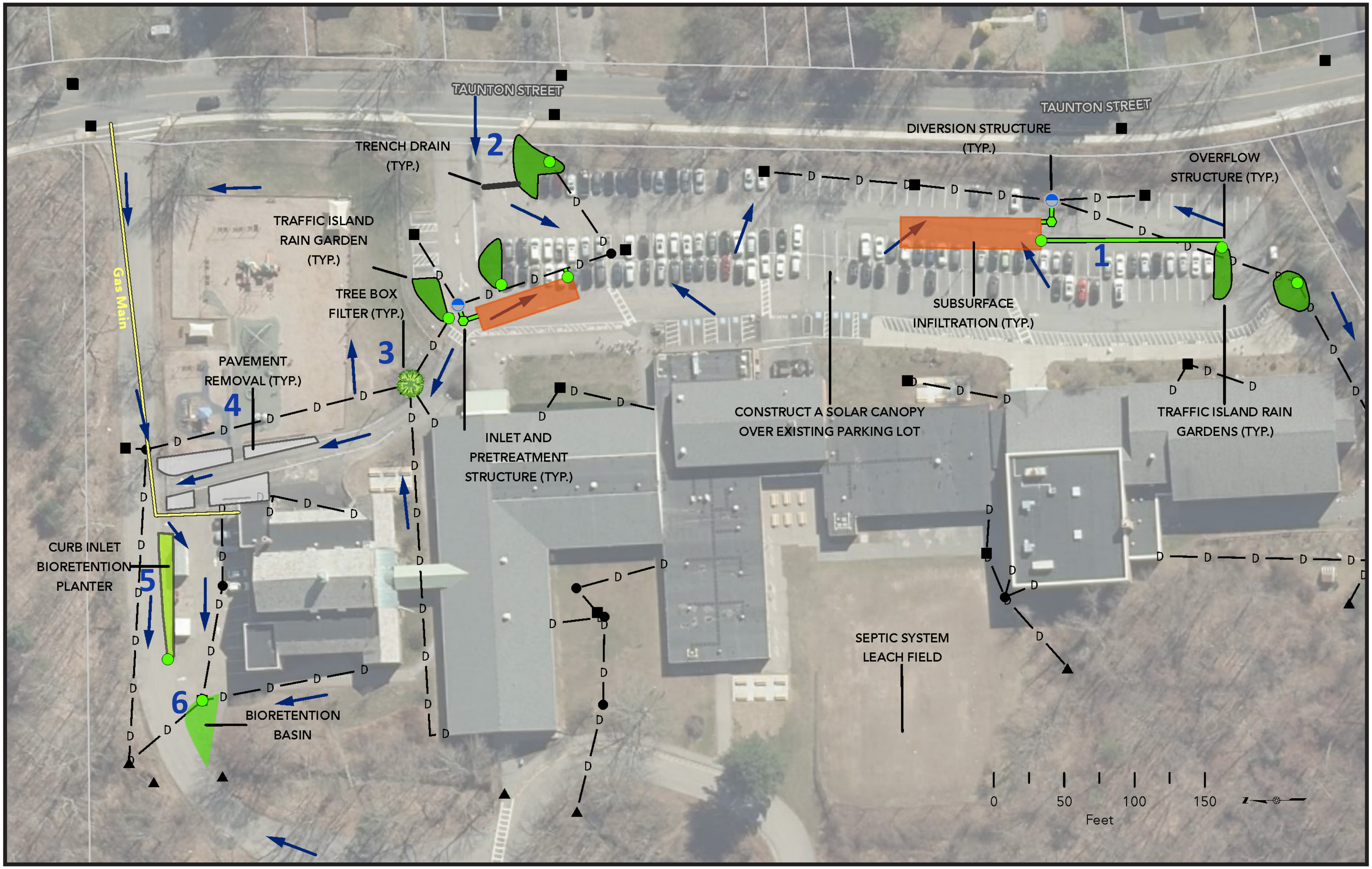
Impervious Area Treated:	1.39 acres
Design Storage Volume:	4,725 ft^3
Runoff Capture Depth:	1.0 inches

Pollutant Removal:

Reduction in Total Suspended Solids:	100%
Reduction in Phosphorus loading:	98%
Reduction in Nitrogen loading:	100%
Reduction in Bacteria loading:	99%

Estimated Cost: $740,000

Delaney School - Option A



Site Description

The Delaney School, located south of downtown Wrentham, serves students in preschool through grade 3. An approximately 1.75-acre staff parking lot drains around the south end of the school discharging to a wetland. The parking lot appeared to be in fair condition, resurfaced approximately 15 to 20 years ago according to school staff. A paved area in front of the northern end of the school was converted to a drop-off lane in 2017. Roof leaders at the front of the school are connected to dry wells and infiltrating roof runoff from the southern part of the school. Roof leaders from the northern end of the school, the drop-off circle, and an access road drain to a stream that runs behind the school, ultimately discharging to Lake Pearl. The school's septic system is located in a large flat area at the rear of the school. Soils in the area are ideal for infiltration-based practices with high pollutant removal potential.

Proposed Green Infrastructure Concept:

1. Install a subsurface infiltration practices beneath the staff parking lot when the parking lot is next resurfaced.
   - *Consider installing a solar canopy above the parking lot to create a microgrid that will provide backup power to the school and improve energy resilience*
2. Construct infiltration planters in the existing traffic islands at the northern and southern ends of the main staff parking lot. Direct water beyond the design volume back to the parking lot, or to existing storm drains, as practicable.
3. Install an infiltrating tree box at the existing catch basin in the drop off lane.
4. Remove excess pavement from the front of the northern end of the school. Maintain paved access from the stairways, playground, and north parking to maintain existing paths.
5. Construct a curb-inlet bioretention planter in the space between the north parking area and access road to treat access road runoff. Direct water beyond the design volume back to the access road
6. Construct a bioretention basin in the traffic island between the parking area and access road. Raise existing catch basin rim elevation to act as a high-flow bypass structure.

- Pretreatment structures should meet all standards described in the Massachusetts Stormwater Handbook.

Estimated Costs **(not including the solar canopy):**

1. $740,000
2. $40,000
3. $8,000
4. $11,000
5. $20,000
6. $30,000

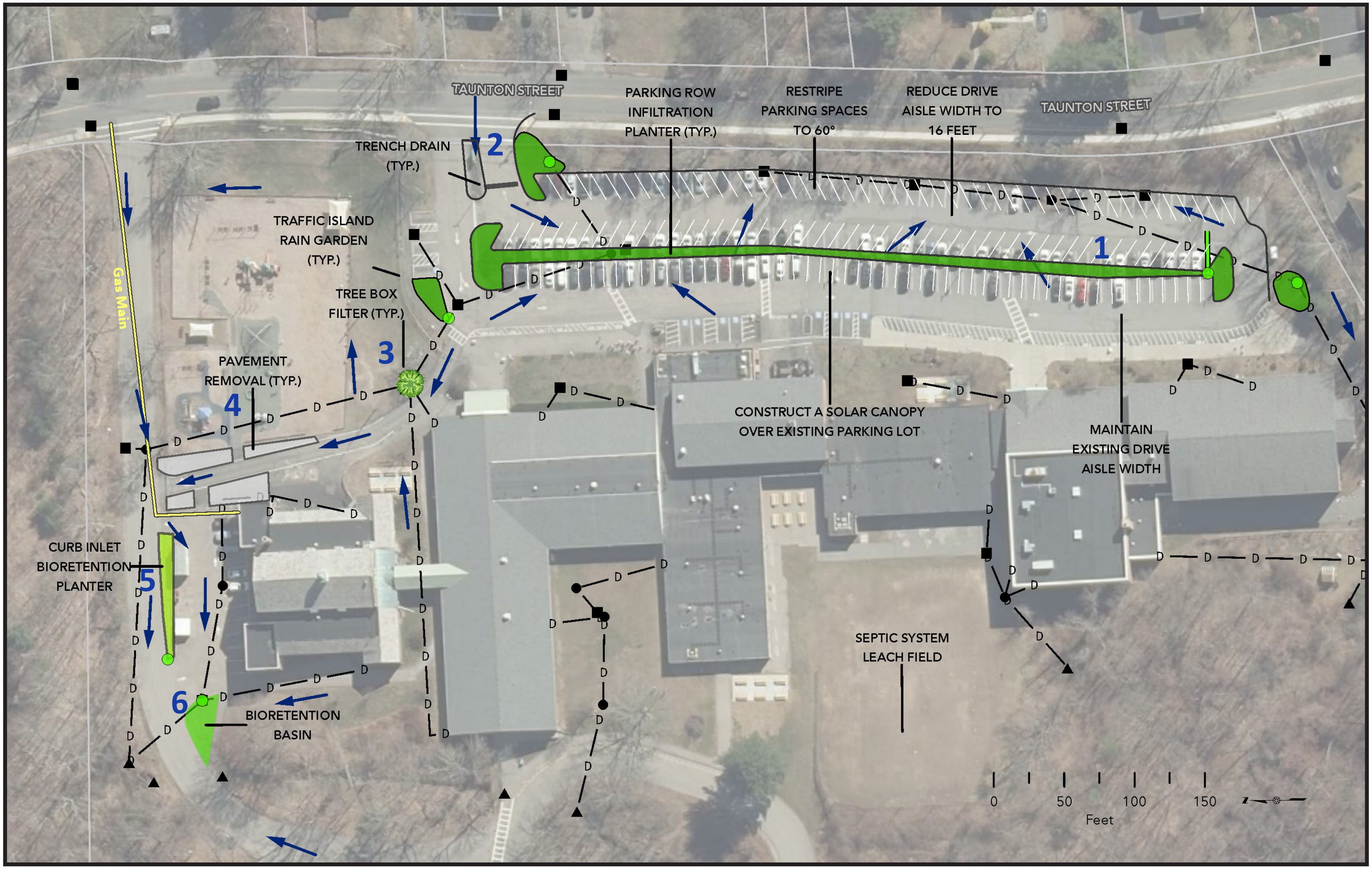
Site Data

Impervious Area Treated:	2.44 acres
Design Storage Volume:	8,905 ft^3
Runoff Capture Depth:	1.0 inches

Pollutant Removal:

Reduction in Total Suspended Solids:	99%
Reduction in Phosphorus loading:	91%
Reduction in Nitrogen loading:	92%
Reduction in Bacteria loading:	86%

Delaney School - Option B



FUSS & O'NEILL

Site Description

The Delaney School, located south of downtown Wrentham, serves students in preschool through grade 3. An approximately 1.75-acre staff parking lot drains around the south end of the school discharging to a wetland. The parking lot appeared to be in fair condition, resurfaced approximately 15 to 20 years ago according to school staff. A paved area in front of the northern end of the school was converted to a drop-off lane in 2017. Roof leaders at the front of the school are connected to dry wells and infiltrating roof runoff from the southern part of the school. Roof leaders from the northern end of the school, the drop-off circle, and an access road drain to a stream that runs behind the school, ultimately discharging to Lake Pearl. The school's septic system is located in a large flat area at the rear of the school. Soils in the area are ideal for infiltration-based practices with high pollutant removal potential.

Estimated Costs (not including the solar canopy):

1. $250,000
2. $30,000
3. $8,000
4. $11,000
5. $20,000
6. $30,000

Proposed Green Infrastructure Concept:

1. Restripe eastern parking aisle to 60° parking spaces and reduce drive aisle width to 16 feet, in accordance with Town dimensional requirements. Construct a curb inlet infiltration planter in the space between parking rows.
   - *This option sacrifices 10 parking spaces, because angled parking spaces are wider along the curb.*
   - *Consider installing a solar canopy above the parking lot to create a microgrid that will provide backup power to the school and improve energy resilience*
2. Construct infiltration planters in the existing traffic islands at the northern and southern ends of the main staff parking lot. Direct water beyond the design volume back to the parking lot, or to existing storm drains, as practicable.
3. Install an infiltrating tree box at the existing catch basin in the drop off lane.
4. Remove excess pavement from the front of the northern end of the school. Maintain paved access from the stairways, playground, and north parking to maintain existing paths.
5. Construct a curb-inlet bioretention planter in the space between the north parking area and access road to treat access road runoff. Direct water beyond the design volume back to the access road
6. Construct a bioretention basin in the traffic island between the parking area and access road. Raise existing catch basin rim elevation to act as a high-flow bypass structure.

- Pretreatment structures should meet all standards described in the Massachusetts Stormwater Handbook.

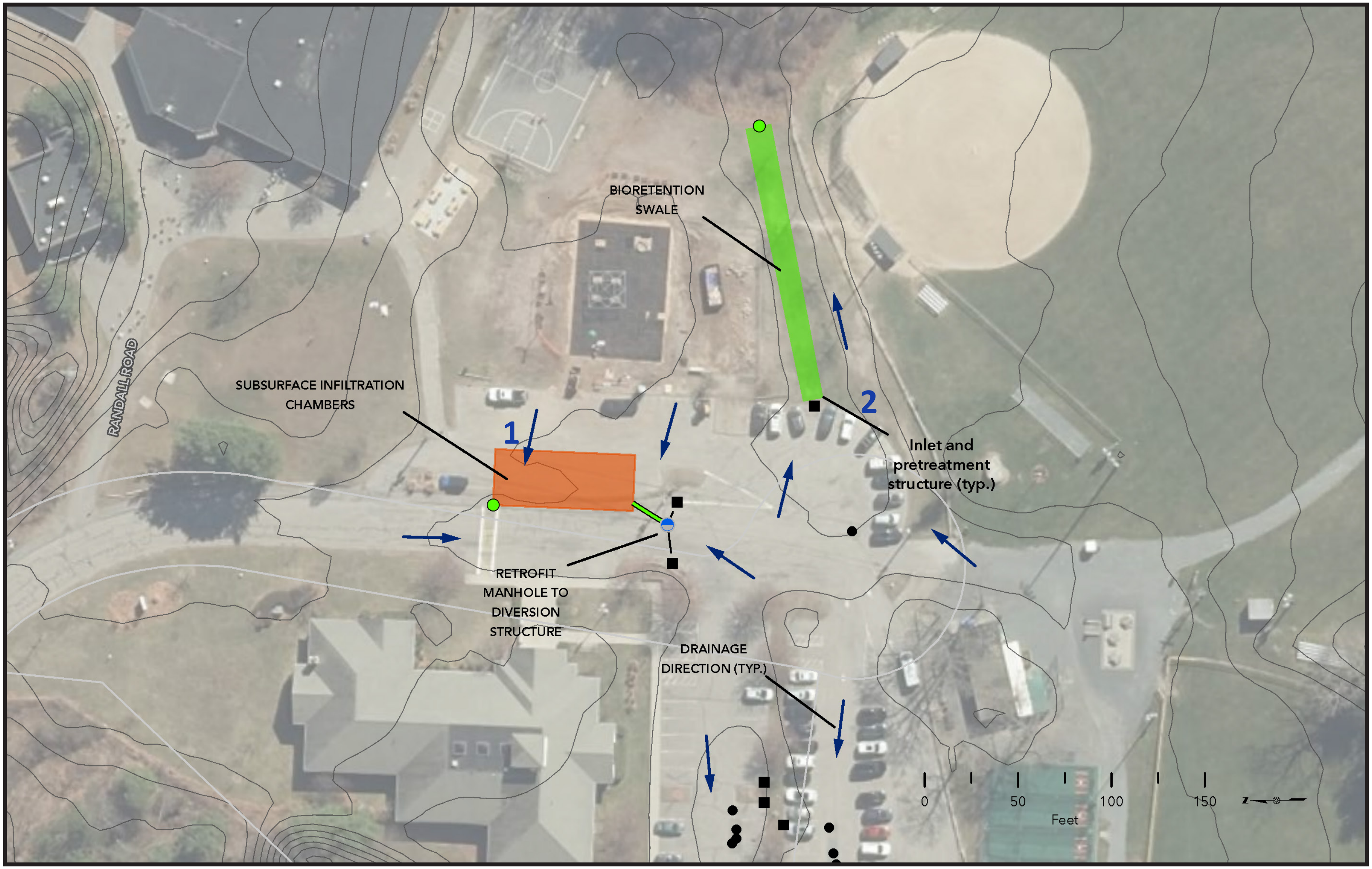
Site Data

Impervious Area Treated:	2.44 acres
Design Storage Volume:	8,905 ft^3
Runoff Capture Depth:	1.0 inches

Pollutant Removal:

Reduction in Total Suspended Solids:	99%
Reduction in Phosphorus loading:	91%
Reduction in Nitrogen loading:	92%
Reduction in Bacteria loading:	86%

Roderick School



Site Description

The Roderick School, located south of downtown Wrentham, serves students in grades 4-6. Roof drains are located within the building envelope and all discharge to a wetland at the north end of the school. A bus drop off circle is located between the Roderick and Delaney Schools. A culvert stream runs underneath the parking area and drop off loop. Presently there is no stormwaer treatment on site. West of the school, Randall Road leads to a parking lot for the school and nearby baseball fields. The soils in the area are ideal for infiltration-based practices with high pollutant removal potential.

Proposed location of bioretention swale

Proposed Green Infrastructure Concept:

1. In the available space under the sidewalk and parking area west of the school, install an offline subsurface infiltration practice
2. Direct surface runoff behind the catch basin at the east side of the parking lot and construct a bioretention practice to treat parking lot runoff. Surface flows can be directed to the practice and overflow to the existing catch basin and drainage network.

- Pretreatment structures should meet all standards described in the Massachusetts Stormwater Handbook.

Site Data

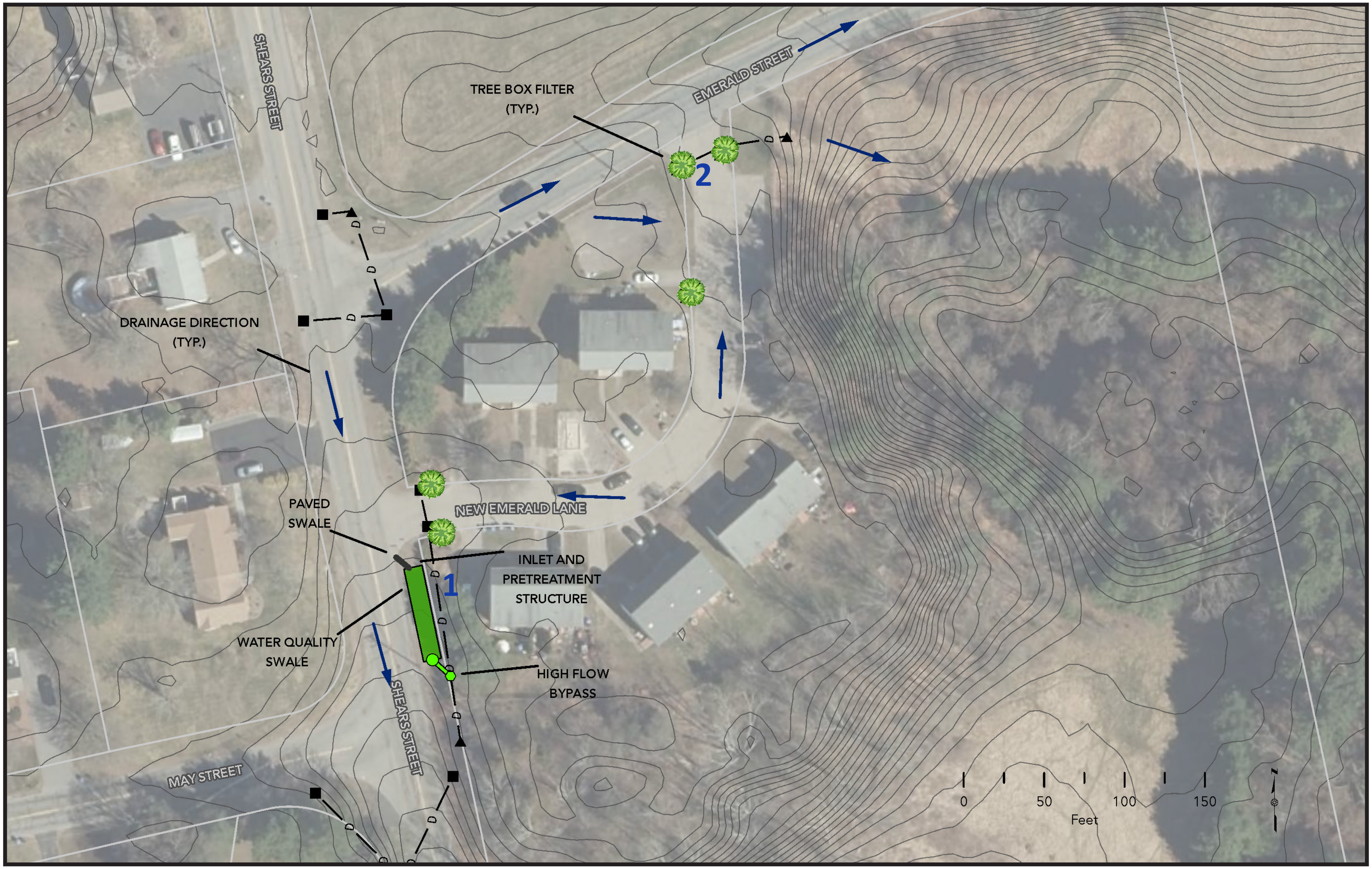
Impervious Area Treated:	0.89 acres
Design Storage Volume:	2,663 ft^3
Runoff Capture Depth:	1.0 inches

Pollutant Removal:

Reduction in Total Suspended Solids:	98%
Reduction in Phosphorus loading:	88%
Reduction in Nitrogen loading:	87%
Reduction in Bacteria loading:	80%

Estimated Cost: 1. $280,000
2. $30,000

Wrentham Housing Authority



Site Description

The Wrentham Housing Authority property contains five multi-unit buildings along a one-way street. The property is broken into roughly two main catchment areas, one draining to the northeast of the property and one to the southwest of the property. Runoff enters a pair catch basins at the down-gradient end of each of each catchment. The western half of the property drains to two catch basins at the west entrance, discharging to the south and a flat upland area. The east half of the property, including a basketball court, drains to the north toward a pair of catch basins at the east exit, discharging down a slope toward a wetland. To the west, Shears Street slopes from north to south toward a wetland and culvert. Soils in the area are ideal for infiltration-based practices with high pollutant removal potential.

Proposed Green Infrastructure Concept:

1. Construct a linear infiltration practice in the right-of-way space between the west entrance and utility pole at the intersection of Shears Street and May Street
2. Install a bottomless tree box filter adjacent to the existing catch basin at the entrance and exit of the property. Including additional subsurface storage chambers can increase the volume of stormwater treated by each system.

- Pretreatment structures should meet all standards described in the Massachusetts Stormwater Handbook.

Site Data

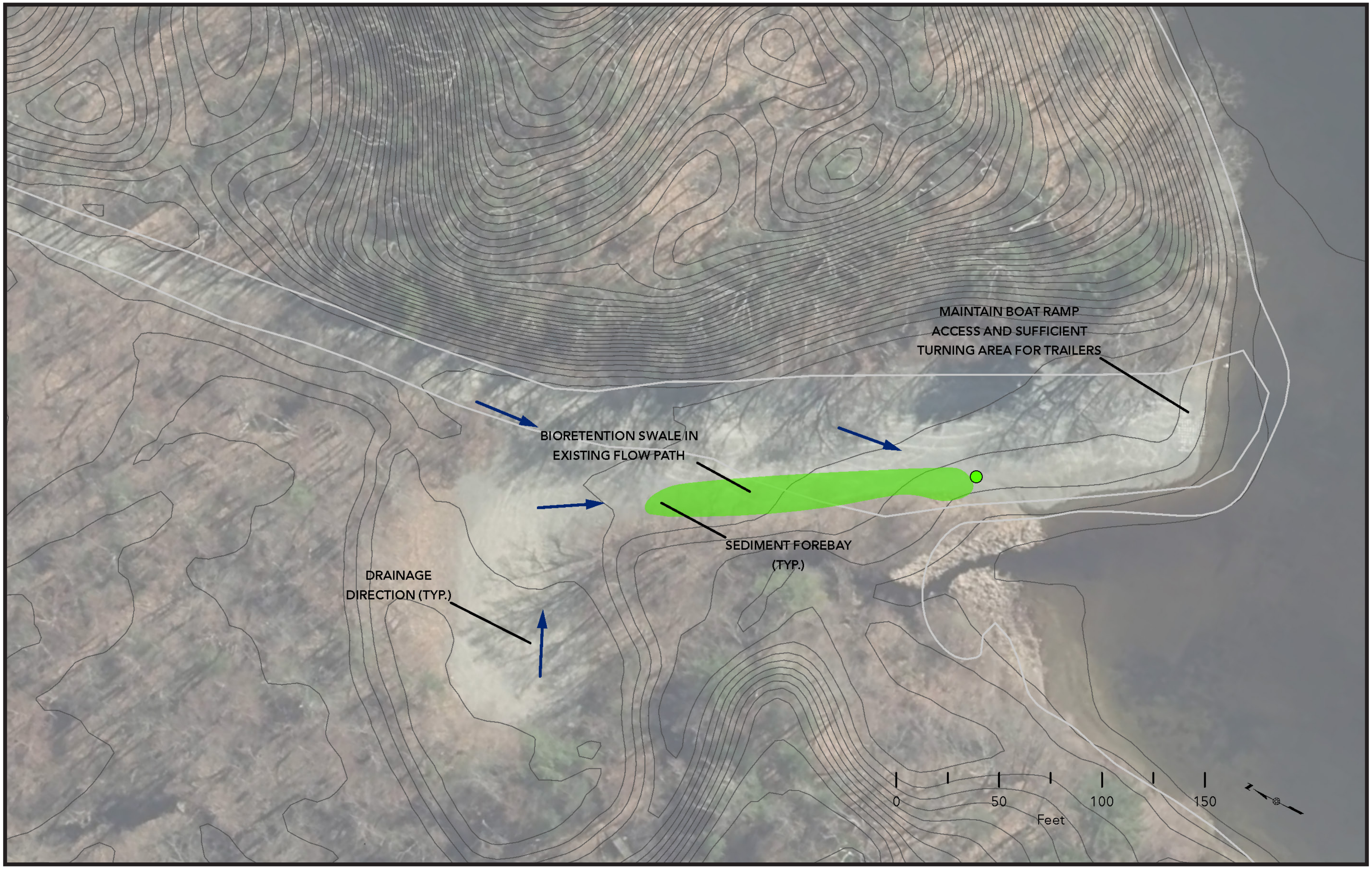
Impervious Area Treated:	0.88 acres
Design Storage Volume:	4,032 ft^3
Runoff Capture Depth:	1.6 inches

Pollutant Removal:

Reduction in Total Suspended Solids:	99%
Reduction in Phosphorus loading:	86%
Reduction in Nitrogen loading:	97%
Reduction in Bacteria loading:	80%

Estimated Cost: 1. $10,000
2. $180,000

Town Boat Ramp



Site Description

The Town of Wrentham maintains a boat ramp at the northwest corner of Lake Pearl. An unimproved, gravel road provides access from Elysium Street. The boat ramp is located at the southern end of the property, with a wide gravel turnaround area. A small area to the north provides parking for boat trailers and vehicles. Stormwater flows from the access road and parking area along the turnaround area before flowing into Lake Pearl. Soils in the area may not have adequate infiltration rates to install infiltration practices, suggesting that green infrastructure practices may require an underdrain to properly function.

Proposed location of bioretention swale

Proposed Green Infrastructure Concept:

- Construct a linear bioretention practice along the existing flow path along the west edge of the boat ramp area to intercept stormwater before it enters Lake Pearl
- Providing multiple inlets maximizes the volume of runoff treated by the practice
- Situate the practice so as to maintain adequate turning area for boat trailers
- Pretreatment structures should meet all standards described in the Massachusetts Stormwater Handbook.

Site Data

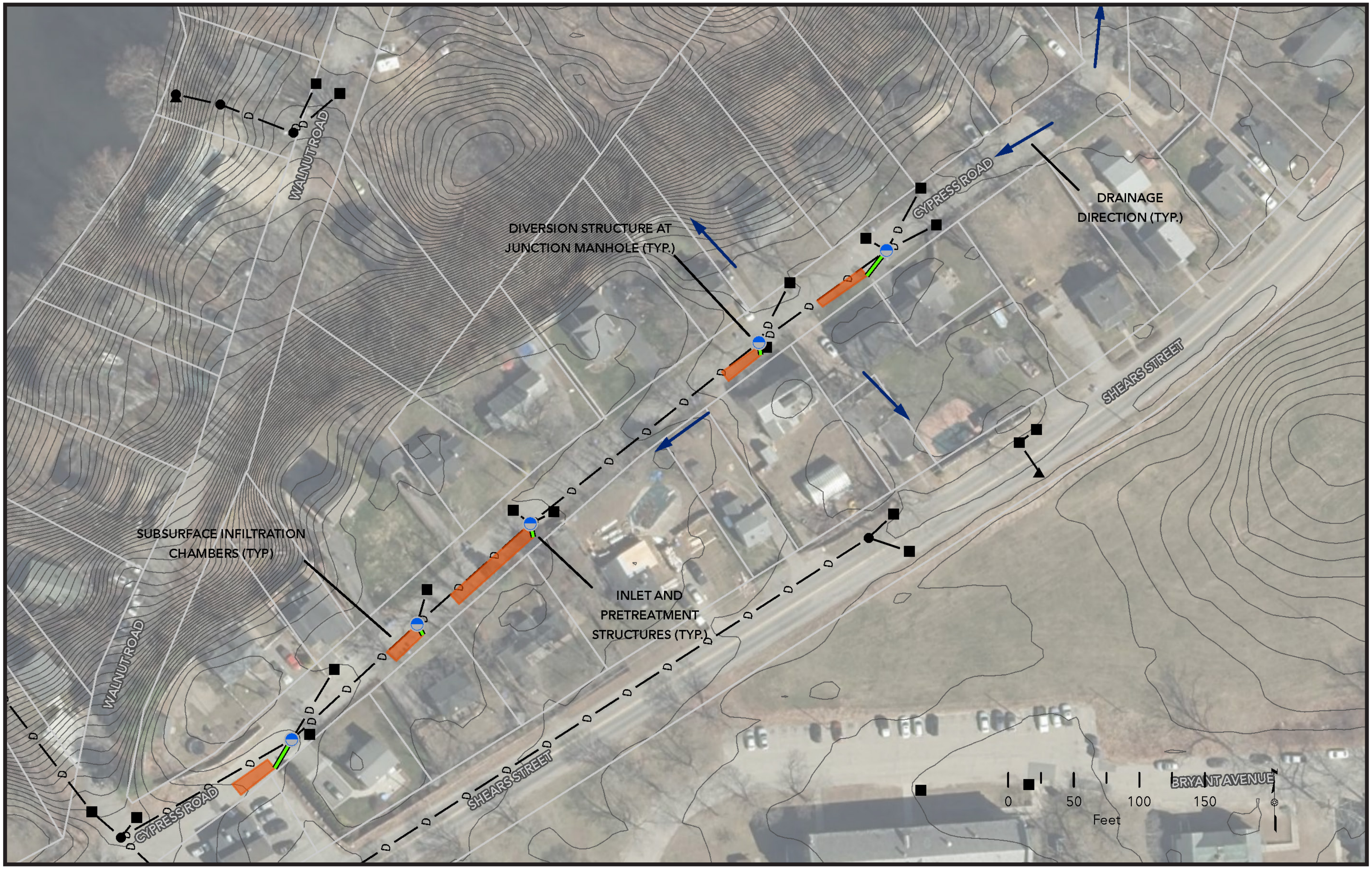
Impervious Area Treated:	0.43 acres
Design Storage Volume:	2,156 ft^3
Runoff Capture Depth:	0.9 inches

Pollutant Removal:

Reduction in Total Suspended Solids:	97%
Reduction in Phosphorus loading:	75%
Reduction in Nitrogen loading:	71%
Reduction in Bacteria loading:	55%

Estimated Cost: $60,000

Cypress Road



Site Description

Cypress Road is a residential street uphill of the eastern shore of Mirror Lake containing quarter-acre lots. A relatively small drainage network consisting of ten catch basins connects to a larger system that collects water from nearby Shears Street. The systems connect at the intersection of Cypress Road and Walnut Street ultimately discharging directly to Mirror Lake via an outfall from Walnut Road. Cypress Road is approximately 25 feet wide from beginning to end, with a relatively narrow right-of-way. A water main is located along the northern edge of the street. Soils in the area are ideal for infiltration-based practices with high pollutant removal potential.

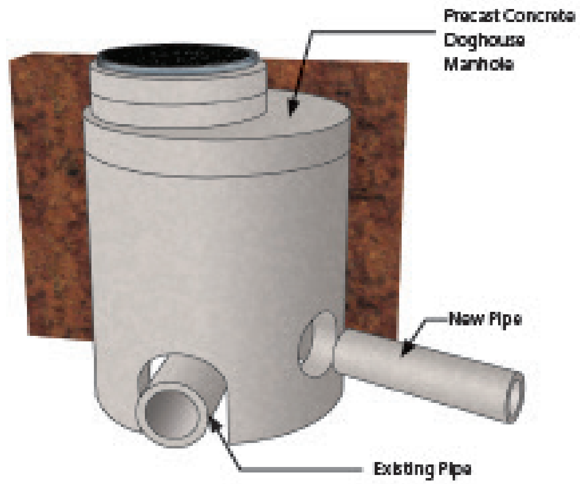


Photo Credit: National Precast Concrete Associates

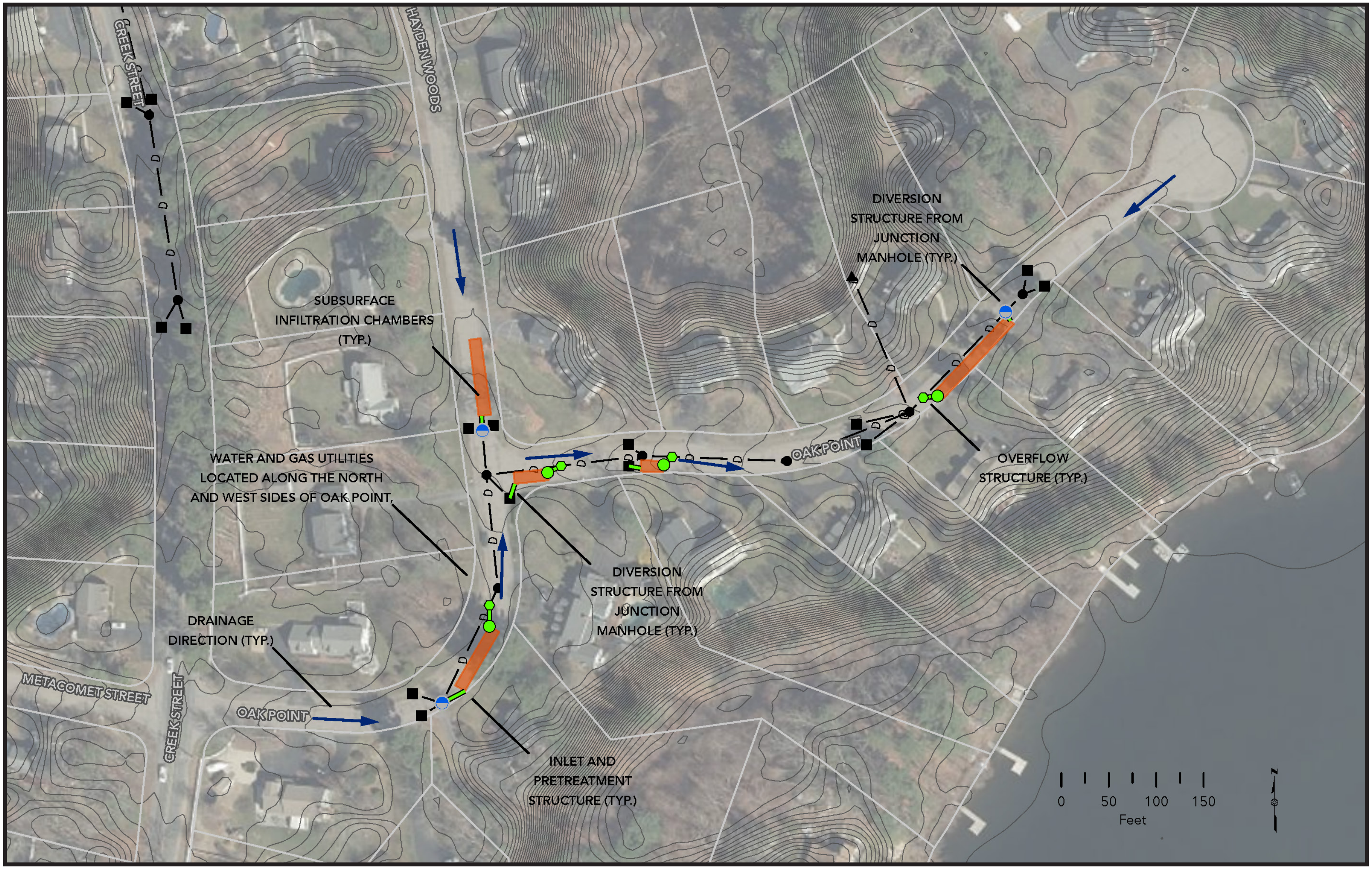
Proposed Green Infrastructure Concept:

- Install subsurface infiltration chambers downstream of each junction manhole
- Use a weir or similar diversion structure to divert the water quality volume to each practice
- Construct a doghouse manhole to convey water from the outlet of the chambers to the trunk line

Site Data

Impervious Area Treated:	0.64 acres
Design Storage Volume:	2,100 ft^3
Runoff Capture Depth:	1.0 inches
Pollutant Removal:	
Reduction in Total Suspended Solids:	100%
Reduction in Phosphorus loading:	98%
Reduction in Nitrogen loading:	100%
Reduction in Bacteria loading:	99%
Estimated Cost:	$330,000

Oak Point



CREEK STREET
HAYDEN WOODS
SUBSURFACE INFILTRATION CHAMBERS (TYP.)
DIVERSION STRUCTURE FROM JUNCTION MANHOLE (TYP.)
WATER AND GAS UTILITIES LOCATED ALONG THE NORTH AND WEST SIDES OF OAK POINT.
OAK POINT
OVERFLOW STRUCTURE (TYP.)
DIVERSION STRUCTURE FROM JUNCTION MANHOLE (TYP.)
DRAINAGE DIRECTION (TYP.)
METACOMET STREET
CREEK STREET
OAK POINT
INLET AND PRETREATMENT STRUCTURE (TYP.)
0 50 100 150
Feet

Site Description

Oak Point is a residential subdivision located on the western shore of Lake Archer. Drainage infrastructure at Oak Point collect stormwater from Creek Street at the west of the catchment, part of Hayden Woods at the north, and the culvert at the end of Oak Point at the east, draining to a low point at approximately 55 Oak Point. Catch basins are connected to a trunk line. All utilities are buried along the north side of Oak Point and the west side of Hayden Woods. Soils in the area are largely composed of sands and loamy sands, ideal for infiltration-based practices with high pollutant removal potential.

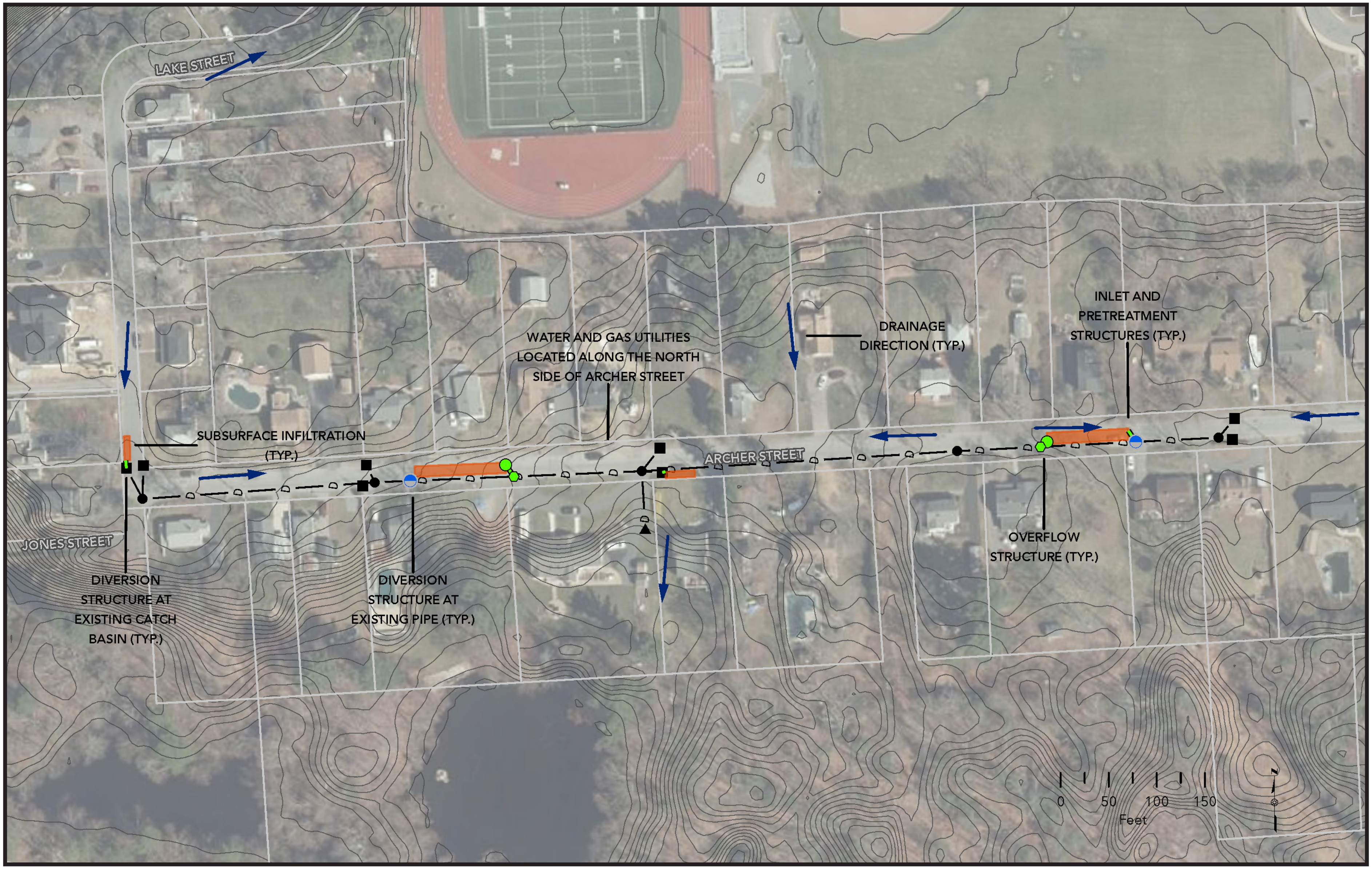
Proposed Green Infrastructure Concept:

- Install subsurface infiltration chambers downstream of each junction manhole
- Use a weir or similar diversion structure to divert the water quality volume to each practice
- Construct a doghouse manhole to convey water from the outlet of the chambers to the trunk line
- Pretreatment structures should meet all standards described in the Massachusetts Stormwater Handbook.

Site Data

Impervious Area Treated:	1.70 acres
Design Storage Volume:	6,000 ft^3
Runoff Capture Depth:	1.0 inches
Pollutant Removal:	
Reduction in Total Suspended Solids:	100%
Reduction in Phosphorus loading:	98%
Reduction in Nitrogen loading:	100%
Reduction in Bacteria loading:	99%
Estimated Cost:	$930,000

Archer Street



Site Description

Archer Street runs between MA-140 and Lake Archer, providing access to the waterfront homes on the east shore of the lake. Residential quarter-acre lots are common along both sides of the street. Generally, the topography of Archer Street slopes from the east and west toward an outfall at approximately 87 Archer Street. Eight catch basins are connected to a trunk line under the eastbound travel lane. Water and gas utilities are located along the north side of the street, with utility poles along the south side. Soils in the area are largely composed of sands and loamy sands, ideal for infiltration-based practices with high pollutant removal potential.

Proposed Green Infrastructure Concept:

- Install subsurface infiltration chambers downstream of each junction manhole
- Use a weir or similar diversion structure to divert the water quality volume to each practice
- Construct a doghouse manhole to convey water from the outlet of the chambers to the trunk line
- Pretreatment structures should meet all standards described in the Massachusetts Stormwater Handbook.

Site Data

Impervious Area Treated:	1.21 acres
Design Storage Volume:	4,050 ft^3
Runoff Capture Depth:	1.0 inches
Pollutant Removal:	
Reduction in Total Suspended Solids:	100%
Reduction in Phosphorus loading:	98%
Reduction in Nitrogen loading:	100%
Reduction in Bacteria loading:	99%
Estimated Cost:	$630,000

Additional Green Infrastructure Opportunities

While this Green Infrastructure Plan makes recommendations for 11 publicly owned locations, public input gathered during outreach efforts and discussion with Town staff noted several other privately owned locations with known issues stemming from stormwater. The desktop review of available information and site visits also identified several other opportunities on Town-owned properties and right-of-ways, and additional public-private opportunities that can provide additional climate resilience and water quality benefits. While these benefits can be substantial, they may require additional time and effort to conduct outreach with property owners and could incur additional costs to acquire easements.

Examples of non-municipal locations include institutional sites, such as the Wrentham Developmental Center, managed by the Massachusetts Department of Developmental Services, and Norfolk County District Court. Private institutional sites include the many religious facilities around Wrentham Town Common, as well as the Common itself. Private commercial locations, such as Wrentham Village Outlets and Stonewall Park, occasionally already feature some green infrastructure elements, which could be suitable retrofit candidates to more effective practice types depending on site conditions. Other private locations, such as Lake Pearl Park and commercial areas along Route 1, may require additional effort to install green infrastructure, but have the potential to address substantial volumes of untreated runoff.

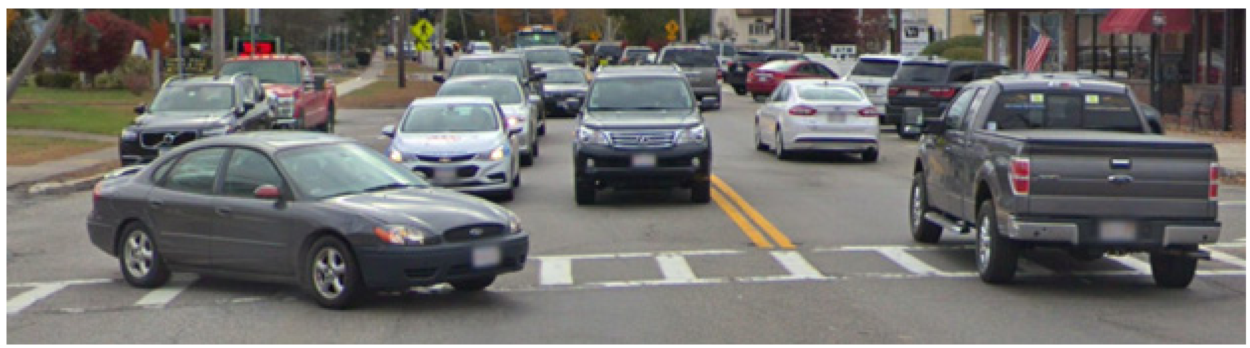
Department of Public Works Facility

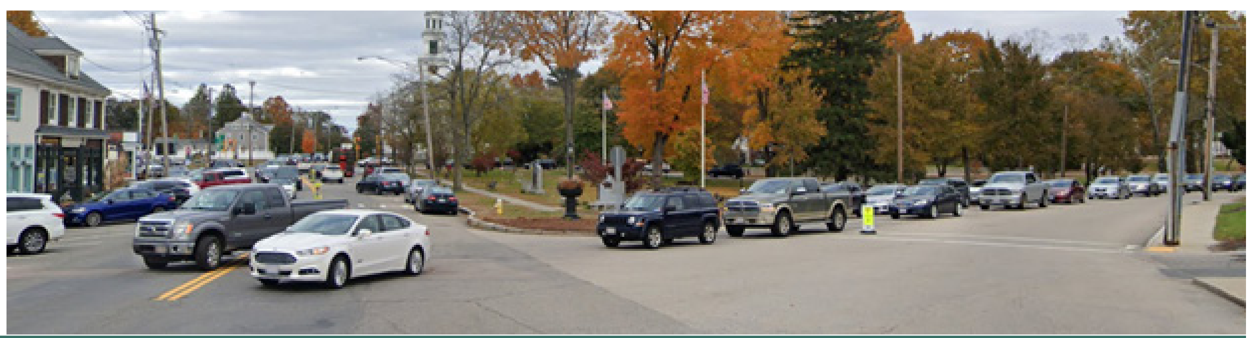
The existing DPW facility experiences recurring flooding during even moderate rainstorms. The Town is actively seeking to move the facility to a less flood-prone location and should follow LID best practices for good stormwater management in the design of the new facility. After the new site is constructed, the impervious cover at the existing DPW yard should be removed.

Town Common

As noted in the Town's Master Plan and past studies, the Town Common and Downtown Wrentham face substantial traffic congestion and pedestrian safety challenges, due to the Town's car-centric infrastructure. Because the roads are State-owned, coordination remains a hurdle. In implementing changes, the Town should consider opportunities to incorporate green infrastructure as it works to improve multimodal access to its core business district. A redesign of the traffic flow presents a generational opportunity to address stormwater infrastructure. Reducing the width of pavement on State streets or placing underground infiltration chambers under parking spaces may be viable green infrastructure solutions.

The Master Plan also noted traffic calming measures at certain key intersections identified as nodes for traffic collisions. Incorporating green infrastructure practices in these areas, such as curb extension bioretention planters, can be an efficient use of space that provides multiple co-benefits.





Blake Road

Fisher Road, Wares Lane, and Blake Road drain to an outfall at the end of a cul-de-sac, which is experiencing substantial erosion, undercutting the roadway. A series of catch basin retrofits, e.g., to tree box filters, may be the best solution to infiltrate stormwater upstream of the outfall and address the erosion and water quality issues.

Residential Opportunities

Residential land use accounts for most of the developed land in Wrentham, and nearly all of the land use adjacent to its impaired waterbodies. Residential areas can be a significant source of runoff and nonpoint source pollutant loads to the Scituate Reservoir, satellite reservoirs, and their tributaries. The actions of individual homeowners can also help to reduce runoff and pollutant loads that flow overland and directly into waterbodies or into the storm drainage systems in residential areas that, in turn, discharge from storm drains into waterbodies. The previous section describes larger-scale green infrastructure recommendations primarily targeted at the watershed municipalities, institutions, and private development. However, LID and other small-scale best practices can also be implemented by homeowners on individual residential lots.

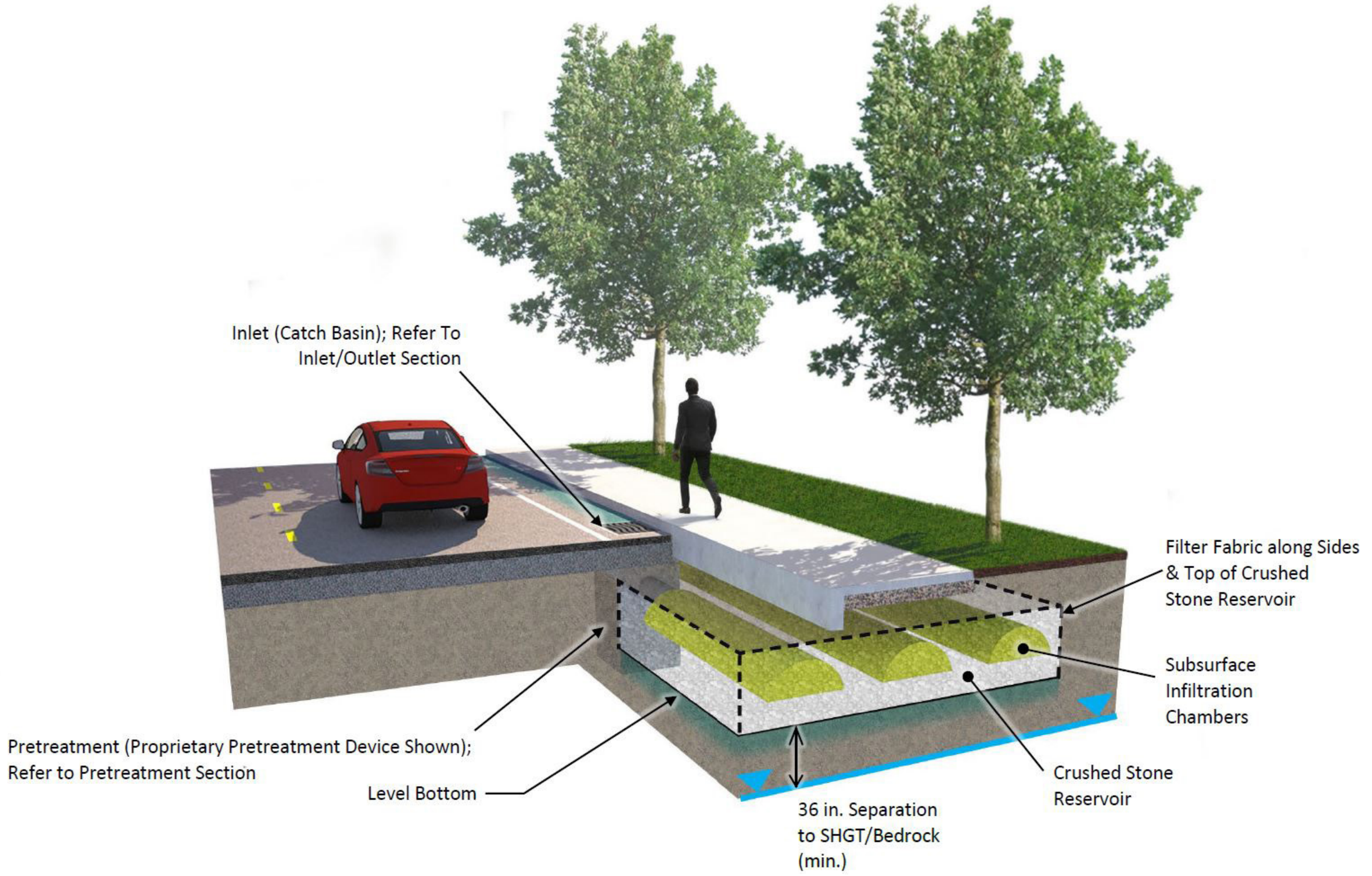
Residential BMPs on individual lots target small areas, requiring the participation of many homeowners to make a measurable difference across a watershed. A coordinated effort is required for widespread participation in such a program, which typically includes a combination of targeted education, technical assistance, and financial subsidies to homeowners. Successful implementation of residential/small-scale practices therefore requires homeowner education and outreach programs.

- Promote residential best practices to homeowners, including outreach via the Lake Archer Association:
  - Plant or grow natural buffers at the edges of rivers/streams, lakes/ponds, and wetlands
  - Nurture native trees, shrubs, and flowers
  - Reduce the size of grass lawns
  - Limit the number of paved areas and create natural places for the water to soak into the ground
  - Reduce or eliminate use of fertilizers and pesticides
  - Dispose of pet waste in the trash, not in catch basins
  - Encourage regular inspections and pump-outs of septic tanks
  - Dispose of unused and unwanted medications in the trash; do not flush them down the toilet.
- Encourage disconnection of rooftop runoff from the storm drainage system by redirecting exterior roof leaders to pervious lawn areas and through the use of dry wells, rain barrels or rain gardens. Downspout disconnection can be a cost-effective option for reducing the volume and cost of stormwater that requires public management. The use of pervious materials for patios, walkways and driveways, as well as pavement removal and planting new native and/or non-invasive trees, shrubs and herbaceous plants, can also reduce impervious surfaces on residential lots and the contribution of runoff and pollutant loads to waterbodies.

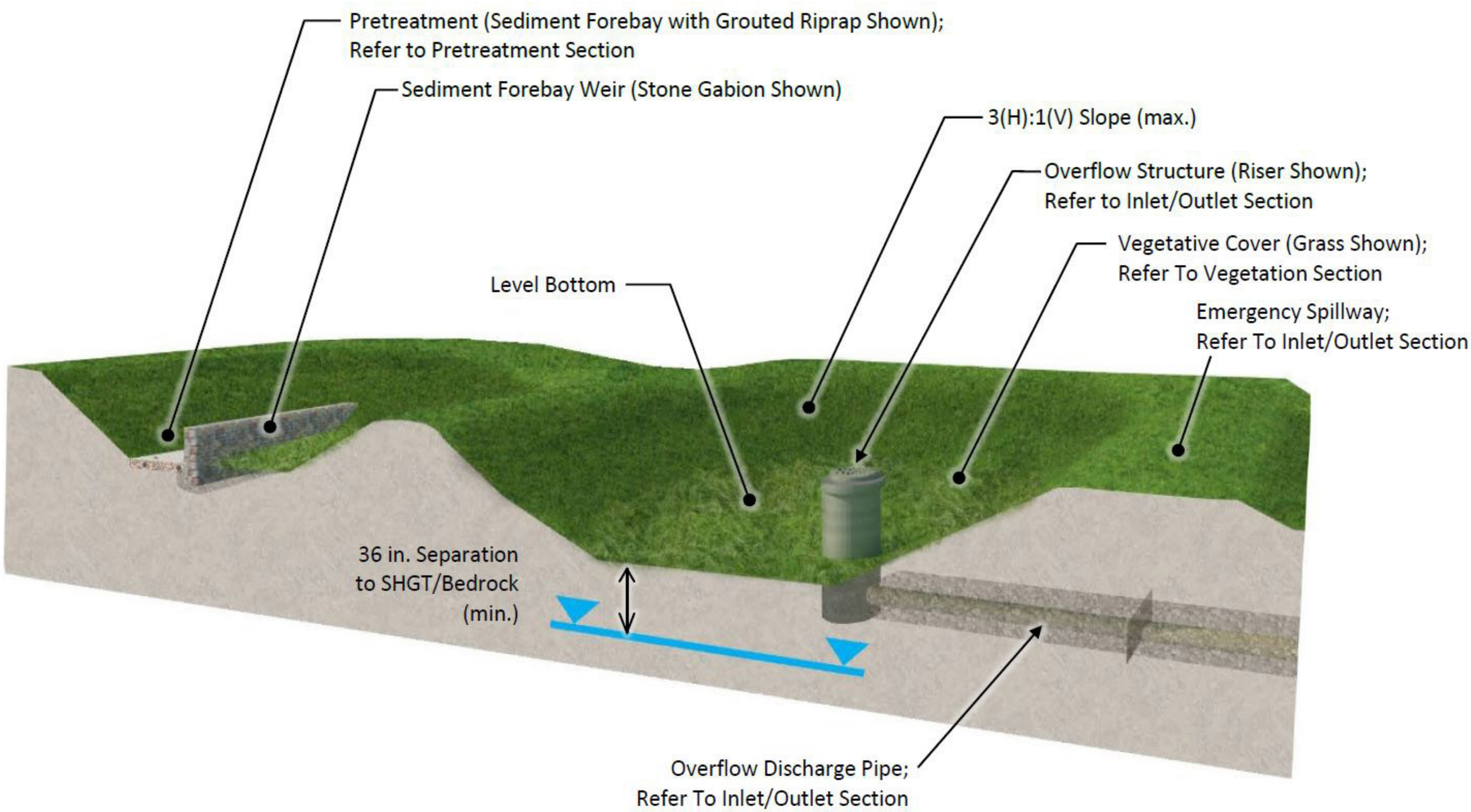
STANDARD ENGINEERING DETAILS FOR TYPICAL GREEN INFRASTRUCTURE PRACTICES

The following Details are from the RIDOT Linear Stormwater Manual

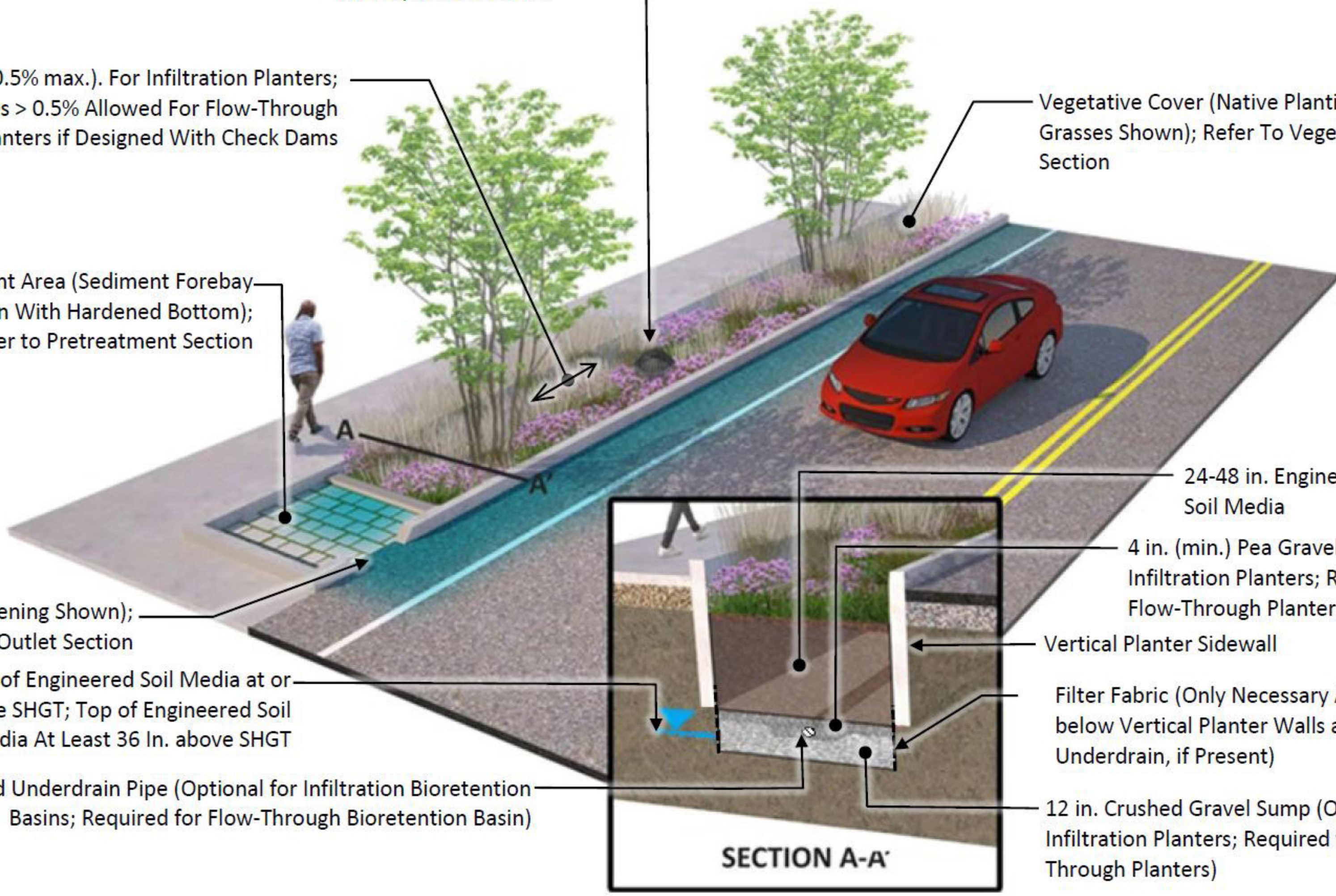
Subsurface Infiltration System



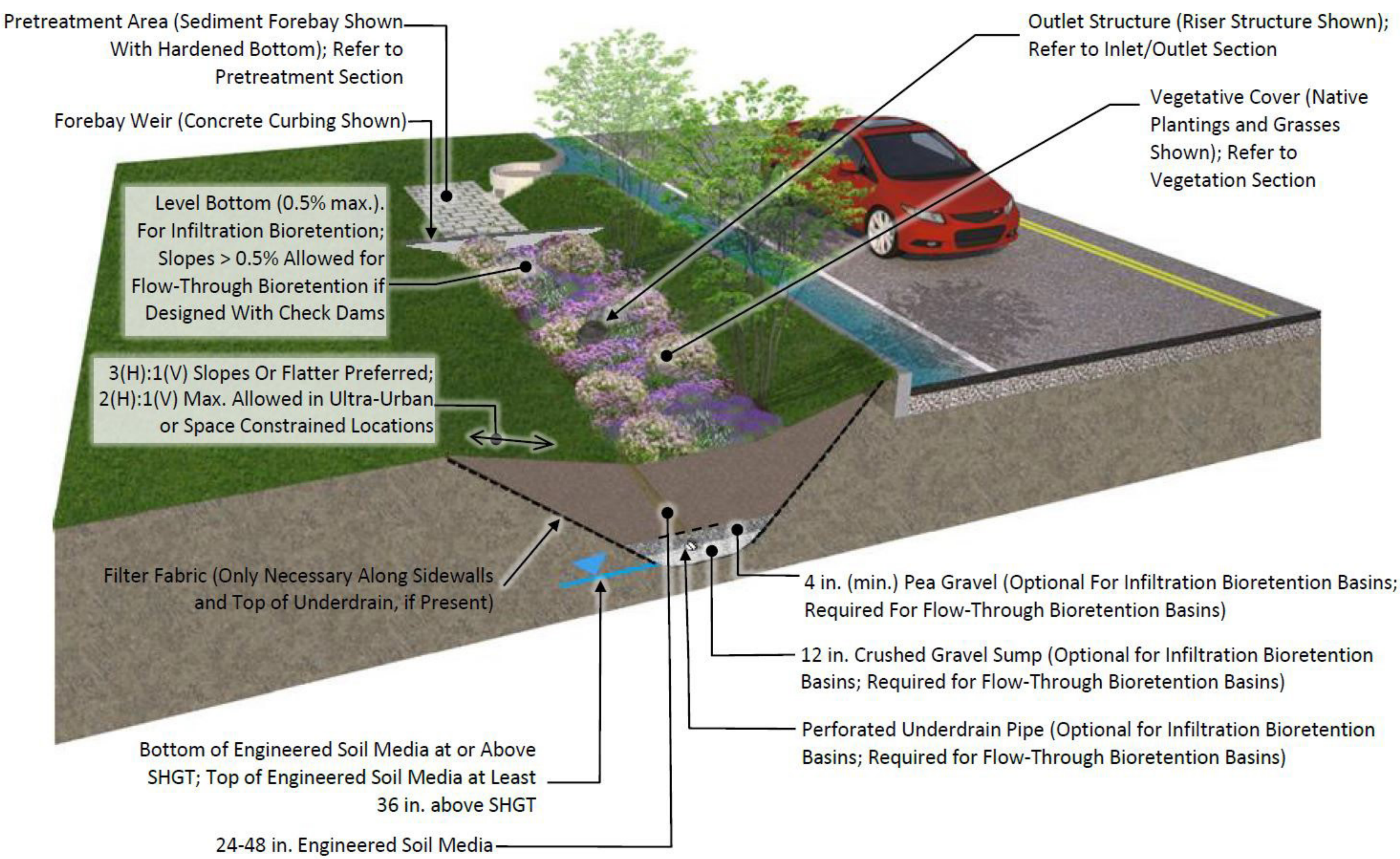
Infiltration Basin



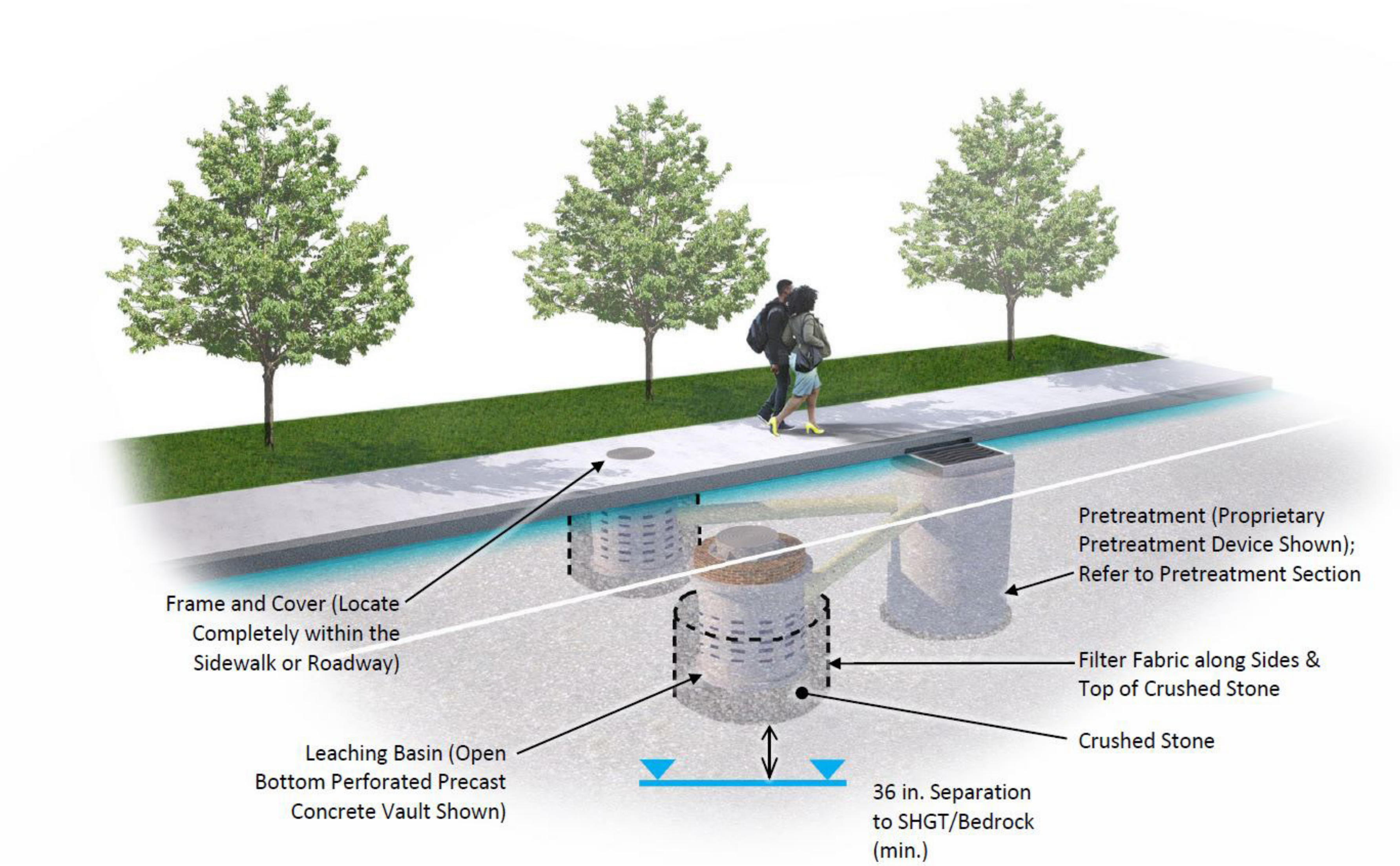
Bioretention Curb Inlet Planter



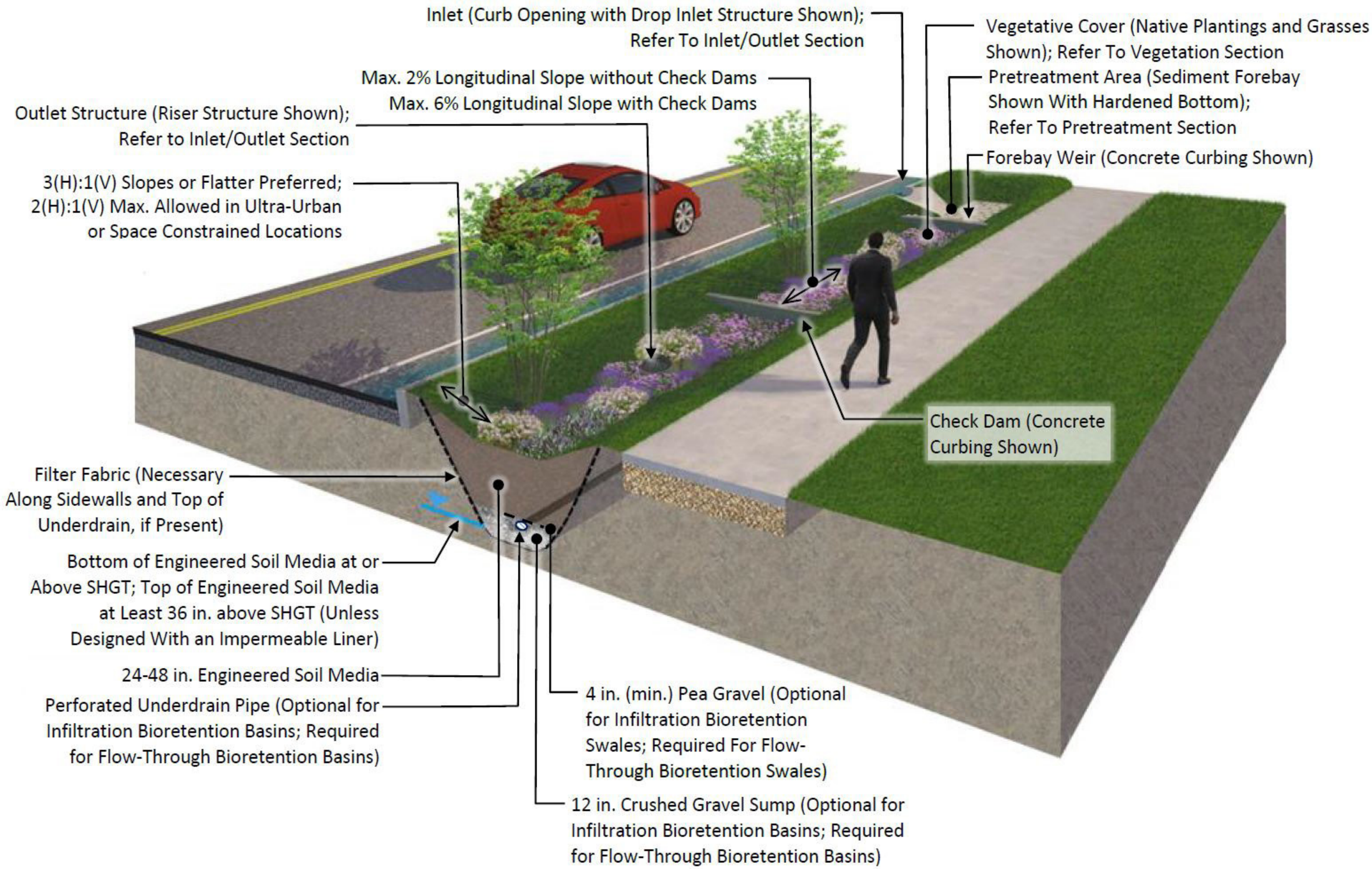
Bioretention Basin



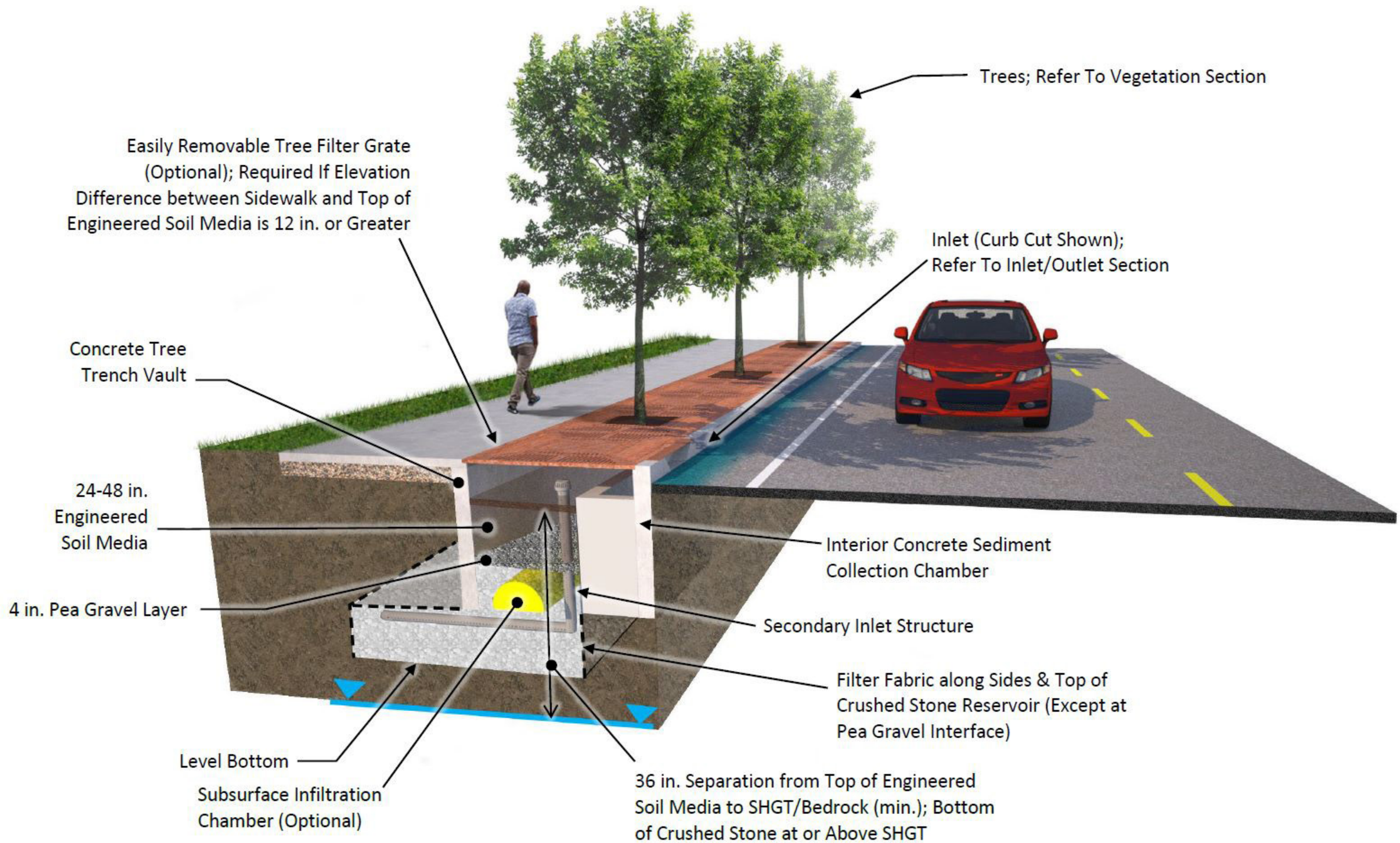
Leaching Catch Basin



Bioretention Swale



Tree Filter With Storage



PUBLIC PRIORITIZATION

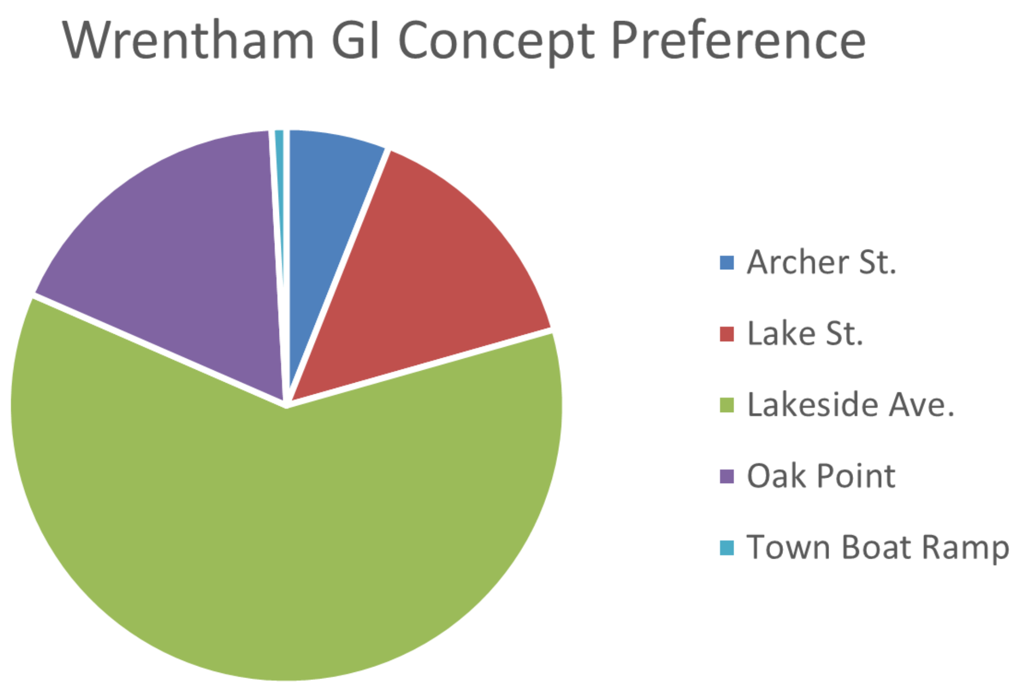
A public survey was created in the MVP project website requesting public feedback on preferred GI conceptual designs. The Town Administrator put out a press release and an associated Twitter post directing residents to the MVP website where residents were able to easily navigate to the survey to vote on their preferred GI projects.

A total of three lake focused project workshops were held in Wrentham. The first was held on Saturday, April 9th, 2022 at Mirror Lake. The other two workshops were held at Lake Archer and Lake Pearl on Saturday, May 7th, 2022. These workshops educated the public on water quality, climate change, and green infrastructure solutions in Wrentham. Attendees were encouraged to visit the project website to give their input on their preferred green infrastructure conceptual design.

Project posters were presented at a Town Planning Board meeting on June 15th, a Select Board meeting on June 21st, and a Conservation Commission meeting on June 23rd. Posters were also hung up at Town Hall. The posters contained a QR code and the link to the project website encouraging residents to vote on their preferred GI project. Social media posts were also created encouraging the public to visit the project website to vote.

The deadline for survey responses was June 30th, 2022. Responses were collected between June 17th and June 29th, with one additional vote logged on July 21st. We received a total of 233 votes, 61% of which were for Lakeside Ave. The project with the second highest percent of votes is Oak Point with 18%, followed by Lake St. with 15%, Archer St. with 6%, and the Town Boat Ramp with 1% of votes. The table below summarizes the voting results. While this is one method of project prioritization, it is not necessarily indicative of Town priorities and the ranking is not binding.

Wrentham GI Concept Preference	
Project Location	Percentage
Lake Avenue	61%
Oak Point	18%
Lake Street	15%
Archer Street	6%
Town Boat Ramp	1%



FUNDING STRATEGIES

FUNDING STRATEGIES

When properly designed and maintained, green infrastructure and other nature-based approaches have the benefit of lower maintenance costs and effort over time. Managing stormwater through on-site infiltration reduces the need to dig up, repair, or extend pipe networks. If it becomes necessary over the life of a green infrastructure installation, the infiltration capacity of these practices can be 'refreshed' by replacing media and plantings without major construction effort. A shift toward green infrastructure thus promotes resilience benefits at lower future cost and is a smart long-term investment for the Town. However, like any construction improvement, the initial investment in green infrastructure can be costly.

Fortunately, as climate resilience and nature-based solutions continue to gain traction throughout Massachusetts and the wider United States, a variety of funding programs have become available to fund green infrastructure and other resilience solutions. The Commonwealth of Massachusetts has been at the forefront of prioritizing climate adaptation actions through an expanding set of funding opportunities, and both state and federal opportunities exist to help fund green infrastructure projects. Wrentham anticipates pursuing an array of grant funding to help offset capital costs as the Town gradually begins to incorporate green infrastructure into its future capital projects.

STATE FUNDING SOURCES

Executive Office of Energy and Environmental Affairs Planning Assistance Grants

EEA Planning Assistance grants are available to support projects that are consistent with state priorities for land conservation, reduction of natural resource consumption, and climate mitigation and resilience building. Actions implementing the results of climate vulnerability assessments or priorities identified during a community's MVP process are eligible for funding, as are Low Impact Development, and other related projects. Up to $50,000 is available per municipality, with the option of pursuing a multi-jurisdictional regional project. Projects must include a minimum non-state match of 25%. Approximately $1M to $1.3M has been awarded each year.

Website:
https://www.mass.gov/service-details/planning-assistance-grants

Chapter 90 Program

The Chapter 90 program is administered by the Massachusetts Department of Transportation. The program provides 100% reimbursement for approved roadway projects, including projects such as road resurfacing, roadside drainage structures, bridges, side road approaches, and landscaping and tree planting.

Website:
https://www.mass.gov/chapter-90-program

Clean Water Act, Section 319 Nonpoint Source Implementation Grants

Section 319 Grants are available for projects that promote restoration and protection of water quality through reducing and managing nonpoint source pollution. These grants are made possible by federal funds provided to MassDEP by the USEPA under Section 319 of the Clean Water Act. Eligible applicants include municipal, state, or regional governments, quasi-state agencies, public schools and universities, and non-profit watershed, environmental, or conservation organizations. Pursuant to federal guidelines for Section 319 funding, projects can only be funded in those areas in which a Watershed-Based Plan has been completed. MassDEP created the Massachusetts Watershed-Based Plan (WBP) for all watersheds in the state that can be used to develop proposals for 319 grants.

Clean Water Act Section 319 grants may be used for green stormwater infrastructure projects (if not mandated by a stormwater permit) and certain restoration activities such as dam removal. The EPA's guidance, "Nonpoint Source Program and Grants Guidelines for States and Territories," includes hydrologic modification as a type of nonpoint source pollution and therefore projects that address hydrologic modification such as dam removal are potentially eligible for funding. Dam removal or river restoration projects need to be consistent with a state's written Nonpoint Source Management Program Plan. Dam removal projects that are included in local watershed-based plans that are consistent with EPA Guidelines would also be eligible for 319 funds.

MassDEP WBP Website: https:
https://www.mass.gov/guides/watershed-based-plan-information

MassDEP 319 Website:
https://www.mass.gov/info-details/grants-financial-assistance-watersheds-water-quality

Division of Ecological Restoration (DER) Project Grants

The DER offers small grants to fund wetland, river, and flow restoration projects that are high-priority and provide significant ecological and community benefits to the Commonwealth. The DER considers funding for several types of "priority projects," including dam removal and culvert replacements. In addition to small grants, eligible projects also receive technical services (data collection, engineering, design work, and permitting) and project management and fundraising help.

DER Website:
https://www.mass.gov/how-to/become-a-der-priority-project

Dam Removal Website:
https://www.mass.gov/river-restoration-dam-removal

Culvert Replacement Website:
https://www.mass.gov/river-restoration-culvert-replacements

MassWorks Infrastructure Program

The MassWorks Infrastructure Program is administered by the Executive Office of Housing and Economic Development, the Department of Transportation, and the Executive Office for Administration and Finance. The program provides public infrastructure funding to support sustainability in Massachusetts, as well as job creation and economic development. Although the program is not specifically for hazard mitigation, the infrastructure improvements covered under MassWorks could help protect communities from natural disasters such as flooding.

Website:
https://www.mass.gov/service-details/massworks-infrastructure-grants

Municipal Vulnerability Preparedness (MVP) Action Grant Program

The MVP Action Grant Program is administered through the Executive Office of Energy and Environmental Affairs. To be eligible for funding, communities must complete the MVP Planning Grant process. The MVP Action Grant offers financial assistance to municipalities that are interested in implementing climate adaptation actions to address the impacts of climate change (extreme weather, sea level rise, inland and coastal flooding, severe heat, etc.). The program funds projects relating to planning, assessments, and regulatory updates; nature-based solutions for ecological and public health; and resilient redesigns and retrofits for critical facilities and infrastructure. The MVP program also emphasizes robust engagement of the public and benefits for environmental justice communities or climate vulnerable populations. In past funding rounds, applicants were able to request $25,000 to $2,000,000 in funding (up to $5,000,000 available for regional projects). A 25% match, either through cash or in-kind services, is required.

Website:
https://www.mass.gov/service-details/mvp-action-grant

State Revolving Fund (SRF) Loan Program

The SRF provides a low-cost financing option for communities through two programs: the Clean Water Program and the Drinking Water Program. The Clean Water Program provides loans to help municipalities comply with federal and state water quality requirements by focusing on watershed management priorities, stormwater management, and green infrastructure. The Drinking Water SRF Program provides loans to communities to improve water supply infrastructure and drinking water safety.

SRF Clean Water Program Website:
https://www.mass.gov/service-details/srf-clean-water-program

SRF Drinking Water Program Website:
https://www.mass.gov/service-details/srf-drinking-water-program

Water Management Act (WMA) Grant Program

The WMA grant program is available to WMA permit holders. The program provides aid for planning assistance, demand management, and withdrawal impact mitigation projects in local communities. Grants are reimbursed at 80% and require a 20% match through in-kind services or cash. The Commonwealth awards approximately 10 grants per year. Both planning and implementation projects are eligible.

Website:
https://www.mass.gov/info-details/water-management-act-grant-programs-for-public-water-suppliers

FEDERAL FUNDING SOURCES

Army Corps of Engineers Aquatic Ecosystem Restoration Program

Under Section 206 of the Water Resources Development Act of 1996 (33 U.S.C. 2330), the Army Corps of Engineers can participate in the study, design and implementation of ecosystem restoration projects. Projects conducted in New England under this program have included eelgrass restoration, salt marsh and salt pond restoration, freshwater wetland restoration, anadromous fish passage and dam removal, river restoration, and nesting bird island restoration. Projects must be in the public interest and cost effective and are limited to $10 million in Federal cost.

Non-Federal project sponsors must be public agencies or national non-profit organizations capable of undertaking future requirements for operation, maintenance, repair, replacement and rehabilitation (OMRR&R), or may be any non-profit organization if there are no future requirements for OMRR&R. The Corps of Engineers provides the first $100,000 of study costs. A non-Federal sponsor must contribute 50 percent of the cost of the feasibility study after the first $100,000 of expenditures, 35 percent of the cost of design and construction, and 100 percent of operation and maintenance costs.

Website:

Http://www.nae.usace.army.mil/Missions/Public-Services/Continuing-Authorities-Program/Section-206/

Community Rating System (CRS) under National Flood Insurance Program (NFIP)

The Community Rating System is a voluntary program under the NFIP that encourages municipalities to participate in flood management actives that exceed the minimum requirements of the NFIP. There are three goals of the CRS: reduce flood damage to insurable property, strengthen and support the insurance aspects of the NFIP, and encourage a comprehensive approach to floodplain management. Communities participating in the CRS receive reduced insurance premiums as a result of their compliance.

Website:

https://www.fema.gov/media-library/assets/documents/181241

FEMA Hazard Mitigation Assistance Grant Programs

The Federal Emergency Management Agency (FEMA) administers two major programs related to hazard mitigation: the National Flood Insurance Program (see Section 3.1 of this plan) and the Hazard Mitigation Assistance Program. FEMA's hazard mitigation assistance grant programs provide funding to protect life and property from future natural disasters. In Massachusetts, these programs are administered by the Massachusetts Emergency Management Agency (MEMA). FEMA flood hazard mitigation assistance funding is available to Massachusetts communities through the following programs:

- Building Resilient Infrastructure and Communities (BRIC) BRIC provides funds to support public infrastructure projects that increase a community's resiliency to reduce the effects of future disasters. The program replaced the former Pre-Disaster Mitigation (PDM) program in 2020. The goal of the BRIC program is to reduce overall risk to the population and structures, while at the same time, also reducing reliance on Federal funding from actual disaster declarations. A 25% non-federal share (local government or other organization) is required.
- Flood Mitigation Assistance (FMA) provides funds for projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis. These are cost share grants for pre-disaster planning and projects, with a federal share (up to 100%) and non-federal share (local government or other organization).
- Severe Repetitive Loss (SRL) is designed to reduce flood damages to residential properties that have experienced SRLs under flood insurance coverage. The program provides funds so that measures can be taken to reduce or eliminate risk of flood damage to buildings insured under the NFIP. Funding is available on an annual basis (as available). SRL provides up to 90% Federal funding for eligible projects.
- Hazard Mitigation Grant Program (HMGP) assists in implementing long-term hazard mitigation measures following Presidential disaster declarations. Funding is available to implement plans or projects in accordance with State,

Tribal, and local priorities. HMGP grants are post-disaster cost share grants consisting of 75% federal share and 25% non-federal share (local government or other organization).

- Public Assistance (PA) Grants provide assistance to local, tribal and state governments and certain types of Private Non-Profit (PNP) organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President. Through the PA Program, supplemental Federal disaster grant assistance is provided for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain PNP organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.

Website:
https://www.fema.gov/hazard-mitigation-assistance

National Fish and Wildlife Foundation (NFWF) New England Forests and Rivers Fund

The National Fish and Wildlife Foundation (NFWF) New England Forests and Rivers Fund is dedicated to restoring and sustaining healthy forests and rivers that provide habitat for diverse native bird and freshwater fish populations in the six New England states. This program annually awards competitive grants ranging from $50,000 to $200,000 each. Since its creation in 2015, the Fund has awarded 48 grants to restore early successional habitat, modify and replace barriers to fish movement, restore riparian and instream habitat, and engage volunteers in forest habitat restoration and stream connectivity projects. Major funding for the New England Forests and Rivers Fund is provided by Eversource Energy, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture's Natural Resources Conservation Service and Forest Service.

Website:
http://www.nfwf.org/newengland/Pages/home.aspx

US Department of Housing and Urban Development (HUD) Community Development Block Grants

Title 1 of the Housing and Community Development Act of 1974 authorized the Community Development Block Grant program. The program is sponsored by the US Department of Housing and Urban Development. The Massachusetts program is administered through the Massachusetts Department of Housing and Community Development. CDBG-DR (disaster recovery) funds may be used to restore public facilities and infrastructure, rehabilitate or replace housing, acquire property, promote economic revitalization, and support Hazard Mitigation Planning. CDBG-DR funds are intended to support long-term recovery from a specific natural disaster and may not be applied to recovery activities associated with other disasters. Annual CDBG Program funds may also be used for certain eligible hazard mitigation and disaster recovery activities (Commonwealth of Massachusetts, n.d.). Implementation of green stormwater infrastructure and drainage system upgrades to mitigate drainage-related flooding is potentially eligible for CDBG funding.

Website:
https://www.mass.gov/service-details/community-development-block-grant-cdbg

US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Funding Programs

The USDA Natural Resources Conservation Service (NRCS) works with land owners in Massachusetts to improve and protect soil, water, and other natural resources. NRCS has several funding programs in Massachusetts that help property owners address flooding and water quality issues.

- The Emergency Watershed Protection (EWP) Program is designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences. EWP is an emergency recovery program, which responds to emergencies created by natural disasters. It is not necessary for a national emergency to be declared for an area to be eligible for assistance. EWP is designed for installation of recovery measures. Activities include providing financial and technical assistance to remove debris from stream channels, road culverts, and bridges, reshape and protect eroded banks, correct damaged drainage facilities, establish cover on critically eroding lands, repair levees and structures, and repair conservation practices.

Website:
https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp/

- The Emergency Watershed Protection - Floodplain Easement Program (EWP-FPE) provides an alternative measure to traditional EWP recovery, where it is determined that acquiring an easement in lieu of recovery measures is the more economical and prudent approach to reducing a threat to life or property. The easement area is restored to the maximum extent practicable to its natural condition using structural and nonstructural practices to restore the flood storage and flow, erosion control, and improve the practical management of the easement. Floodplain easements restore, protect, maintain and enhance the functions of floodplains while conserving their natural values such as fish and wildlife habitat, water quality, flood water retention and ground water recharge. Structures, including buildings, within the floodplain easement must be demolished and removed, or relocated outside the 100-year floodplain or dam breach inundation area.

Website:
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ct/programs/financial/ewp/?cid=stelprdb1244478

- The Watershed and Flood Prevention Operations Program provides technical and financial assistance to states, local governments and Tribes to plan and implement watershed project plans for the purpose of watershed protection, flood mitigation, water quality improvement, fish and wildlife enhancement, wetlands and wetland function creation and restoration, groundwater recharge, and wetland and floodplain conservation easements.

Website:
https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/wfpo/

American Rescue Plan Act

In 2021, Congress passed and President Biden signed the American Rescue Plan Act, which includes $1.9 trillion dollars in funding to individuals, schools, businesses, and areas suffering from the COVID-19 pandemic. $130 billion is directed to municipal and county governments for the purpose of replacing revenue lost or reduced due to the pandemic, funding COVID-related costs, providing support to aid households and businesses impacted by the crisis investing in economic recovery and renewal, and funding investments in water, sewer and broadband infrastructure. Green infrastructure and stormwater projects can be funded under the sewer infrastructure category. As of June 1, 2021, Wrentham's total allocation through ARPA was anticipated to be approximately $1.2 million. In addition, Norfolk County received $137 million, to distribute to towns. The funds will be provided in two blocks, in 2021 and 2022, and will be available for use through 2024.

MVP
Municipal Vulnerability
Preparedness

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