SNEP Watershed Grants Final Report

1. Cover Information

Date: March 5, 2023
Project Name: Community-Based Green Infrastructure Training and Employment Initiative
Contract Number: #SNEPWG-19-3-GWRI
Grant and Reporting Period: September 1, 2019 – November 30, 2022
Grantee Organization: Groundwork Rhode Island
Report Contact Person/Project Leader: Amelia Rose, (401) 305-7174, arose@groundworkri.org
Report Type: Final – Executive Summary

2. Project Report Narrative Summary

Groundwork Rhode Island led a three-year project to install green stormwater infrastructure features, called bioswales, in the right-of-way along city streets across Providence. Funded by an almost $200,000 EPA Southeast New England Program (SNEP) Grant and matched with approximately $125,000 of private funding and in-kind support, our project engaged the City of Providence, community members, and Groundwork RI's workforce development programs in the effort, resulting in a total of 57 sidewalk bioswales installed across the city.

Our bioswales are green infrastructure retrofits of the existing streetscape. Typically 12 feet long x 4 feet wide, the bioswales are planted areas located in the rights-of-way in front of homes, parks, or businesses. Five feet of soil are dug out of the entire 48 square foot depaved installation area and the resulting space is then backfilled with three feet of stone and two feet of soil. A curb cut allows stormwater from the street to enter the bioswale, and the bioswale is planted with a variety of perennials to help absorb the stormwater.

The goal of the bioswale is to take on stormwater runoff from the street and absorb and filter the water to help keep pollution out of local water bodies. Our project's wide-ranging geographic scope included the watersheds of the Roger Williams Park ponds, Mashapaug Pond, the West River, the Woonasquatucket River, and York Pond.

Overall, this bioswale project was a great learning experience for our team, allowing us to iterate and continually make improvements to develop a design that works for the Providence streetscape in a variety of contexts, and utilize the bioswale construction and maintenance work as a training opportunity for our own crew as well as multiple job training programs. We strengthened our relationship with two City departments, Parks and Public Works, and raised the profile of both our organization and green infrastructure as a climate resilience strategy among Providence residents and institutions.

2.A. Project Results

Groundwork RI originally committed to installing a total of 48 bioswales using SNEP funding. The total number of bioswales in Providence that have been installed and maintained by Groundwork RI with all funding, including but not limited to the SNEP funds, is now 57. This number includes 33 new bioswales constructed in the past three years with the SNEP funds, 12 reconstructed bioswales that had originally

been installed using other funding (RIDEM Bay Watershed Restoration) but were upgraded to a newer and better design with these SNEP funds, 2 bioswales that were constructed in Roger Williams Park utilizing these SNEP funds combined with SNEP funds from the Providence Stormwater Innovation Center, and 10 bioswales that were constructed in 2019/2020 (overlapping with our SNEP grant project period) utilizing funds from two non-federal grants (TD Bank and Bank of America) that we used as match.

Design and Construction: One of the biggest successes of this project has been the time and attention project partners have spent refining the design of the bioswale in order to maximize functionality, ensure aesthetics that are acceptable to the community, and support easier maintenance over the long-term. Our original design, which we developed with the City of Providence's Department of Public Works (DPW) in 2017, resulted in a bioswale that looked like this, 12 of which are located along Dexter Street:

Design features included a unique steel fence fabricated by the Steel Yard, a local nonprofit, which was set in concrete around the border, perennials as well as a tree in the center of the feature, and two curb cuts with steel plates across the opening that were bolted or glued onto the granite curb. Maintenance of these design features proved to be difficult: the fences were prone to car damage and were not easy to fix, the steel plates were difficult to bolt into the granite and popped off occasionally due to contact with cars or plows, and we are unsure how the stormwater capture system will work as the tree matures and the roots take up more space within the bioswale.

A bioswale project in New Haven, CT influenced design modifications that we incorporated into our design: adding a stone gabion that helps drain the bioswale faster when filled with stormwater, eliminating trees from the planting design due to the unknowns of how the tree roots interact with underground features within the bioswale, creating a stone border to assist in infiltrating water faster into the stone layer below, and replacing the steel fencing with aluminum posts and steel chains for easier repair when a car inevitably causes damage. All of our design modifications were approved by the Providence DPW.

The next iteration of the bioswale design looked like this:

We added a single angled curb cut instead of the double, steel-plated straight curb cut. The angle served the same purpose as the steel plates of allowing snow plows to pass by the bioswale without damaging the open edge of the curb cut. We added a concrete splash pad as well; the splash pad has some texture and grooves to slow water down as it enters the bioswale. The stone border and stone gabion help absorb more stormwater and infiltrate the water faster. A gabion is typically a wirework container filled with rock or another material that allows water to pass through. Our gabion uses a corrugated drainpipe filled with rock instead of wire or wire mesh, in order to add more structure and stability to this feature.

The fencing is shorter than our original design and is made from easier-to-repair materials. The aluminum fence posts are set in concrete.

As part of this SNEP project we retrofitted the original 12 bioswales we installed in 2017 on Dexter Street and upgraded the design to include the stone border and gabion drain. We continue to replace the original steel fencing with a new border on an as-needed basis as the steel fencing becomes damaged or unrepairable.

Groundwork RI staff continued to tinker with the fence design in an effort to minimize damage from vehicles, make repairs and maintenance as easy as possible, and ensure the fencing stays aesthetically pleasing. After a few iterations, we landed on this fencing border made out of stone pavers, shown in the photo to the right, which was approved by Providence DPW.

So far, we have been pleased with the results in terms of ease to repair and maintain the border, and we have received positive feedback from local residents regarding the appearance of the bioswale.

Locations and Site Selection: Groundwork RI bioswales can be found at the following locations, all in Providence:

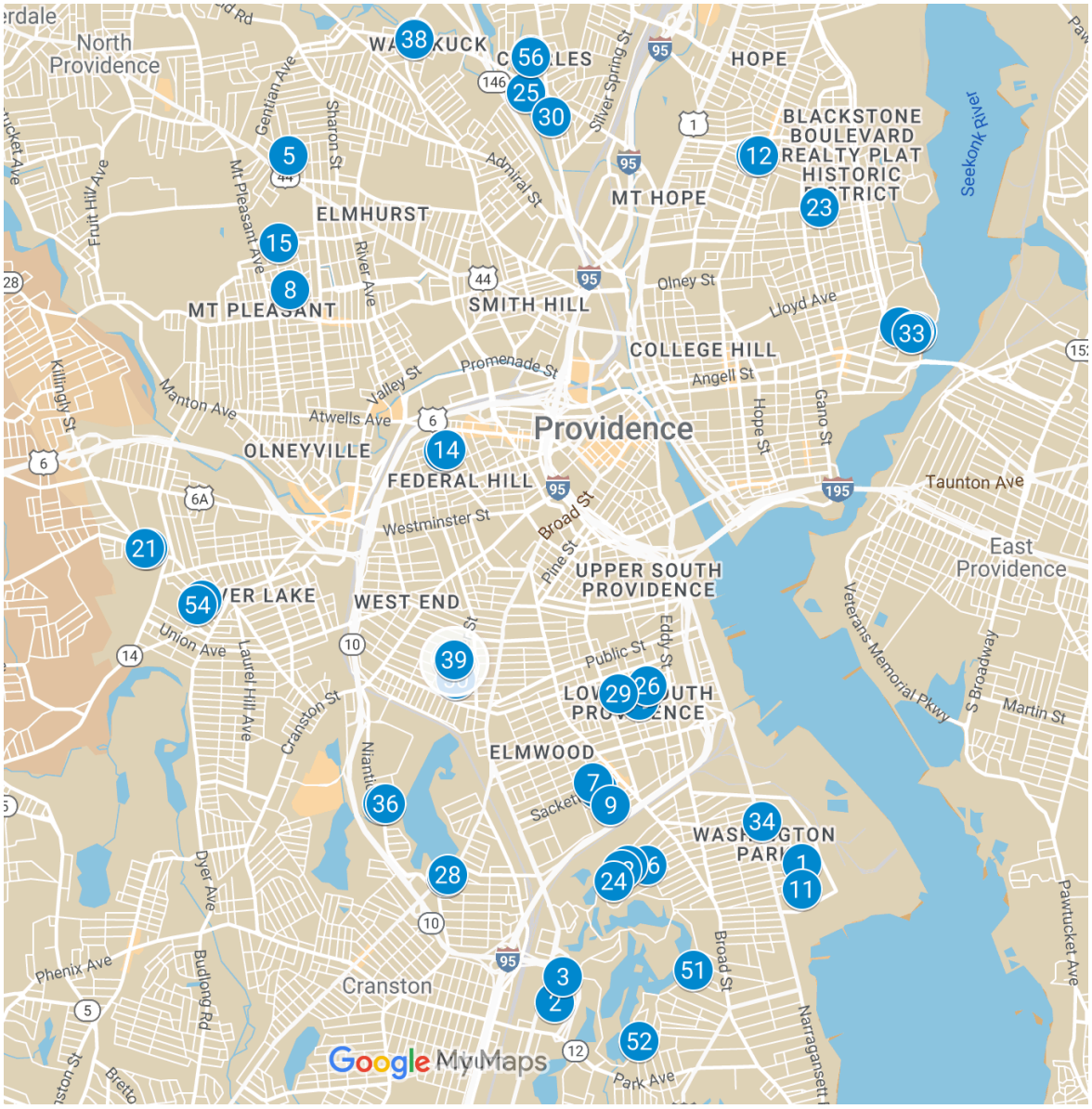
Groundwork Rhode Island Installed Bioswales	
Providence, RI	
16 Miller Ave.	Across, park side
126 Miller Ave	Across, park side
154 Miller Ave.	Across, park side
178 Miller Ave.	Across, park side
64 Warrington St.	
78 Sassafras St.	
118 Ocean St.	
130 Ocean St.	
371 Sayles St.	
800 Allens Ave.	
0 Michigan Ave.	
62 Sackett St.	
100 Fisk St.	
9 Sawyer St.	
18 Stamford St.	
92 Alabama Ave.	
FC Greene Memorial Blvd 1	
FC Greene Memorial Blvd 2	
Corner Veazie & Branch Lot 1	
Corner Veazie & Branch Lot 2	
Refocus Opper St. Lot Entrance 1	
Refocus Opper St. Lot Entrance 2	
493 Charles St.	
293 Sayles St.	
43 Oriole Ave.	
92 Dana St.	
82 Dana St.	
690 Angell St. 1	Across, park side
690 Angell St. 2	Across, park side

690 Angell St. 3	Across, park side
165 Sessions St.	Across, park side
96 Knight St.	Tell St. side
93 Knight St.	Parking lot
70 Rowan St.	Glover St. side
154 Killingly St. 1	
154 Killingly St. 2	
55 Modena St.	
200 Hawkins St.	Park side
Paul Grande Park 1	Daniel Ave. side
Paul Grande Park 2	Mercy St. side
98 Minto St.	Whitford Ave. side
Access Rd. 1	Across from fields
Access Rd. 2	Across from fields
310 Reservoir Ave. 1	Anchor Recovery Community Center
310 Reservoir Ave. 2	Anchor Recovery Community Center
Dexter St. 1 – on Linwood	Starting Point Dexter/Linwood Intersection
Dexter St. 2 – on Linwood	
Dexter St. 3 – on Linwood	
Dexter St. 4	
Dexter St. 5	
Dexter St. 6	
Dexter St. 7	
Dexter St. 8	
Dexter St. 9	
Dexter St. 10	
Dexter St. 11	
Dexter St. 12	Ending Point Dexter/Sherry Intersection

We worked closely with the Providence DPW to determine suitable locations for the bioswales. Permits were required for each individual bioswale site.

Mapped Bioswale Locations – The map on the following page shows the approximate locations of all 57 bioswales, demonstrating the geographic scope of our project across Providence. Note that, due to the

scale of the map, the blue circles with numbers representing each individual bioswale installation overlap where multiple bioswales were installed close together.



Bioswale Site Selection Criteria

- 15 ft minimum distance from street corner.
- 10 ft minimum distance from any retaining walls or buildings.
- Not to be installed in the vicinity of utility pole anchors.
- Must not obstruct public entrances to properties.
- Must not block handicap ramps or openings.
- 15 ft minimum distance from drainage basins.
- No more than a 5% slope grade on roadways.
- No more than a 10% slope to the surrounding areas of the bioswale.
- Adequate room for delivery trucks entering and existing must be taken into consideration.

- Sidewalk must be a minimum of 7’ wide.
- Sidewalks cannot be cut more than 50% when leaving a cut slab in the field.
- No utility lines can be present underground.
- 12ft minimum open sidewalk length is required to install the bioswale.
- Not to be installed within 10’ of a curb cut opening.
- Not to be installed in a loading zone.
- Not to be installed in a fire zone.
- Tree roots must be a minimum 15’ away with no uplifting of surrounding cement slabs.
- Site soil properties are not applicable as all original soil is removed and disposed of, then replaced with an engineered mix consisting of approximately 70% sand/20% loam/10% compost.

The two bioswales that we installed on Opper Street, as well as two in Roger Williams Park that we installed in collaboration with the Providence Parks Department, have slightly different, site-specific designs, while still following the site selection criteria. The two projects we installed in Roger Williams Park are meant to serve as green infrastructure examples as part of the larger efforts of the Providence Parks Department and Providence Stormwater Innovation Center.

Opper Street in the West River Watershed

Roger Williams Park

In addition, on Killingly Street outside a Little League field next to Neutaconkanut Park in Silver Lake, we installed two bioswales in quick succession due to the volume and velocity of water coming down the slope of that road towards the fields. The first bioswale acts as a stone forebay without any plants (which would otherwise easily get washed out in a rainstorm) to capture as much water as possible before reaching the second bioswale downslope, which has the typical planted style.

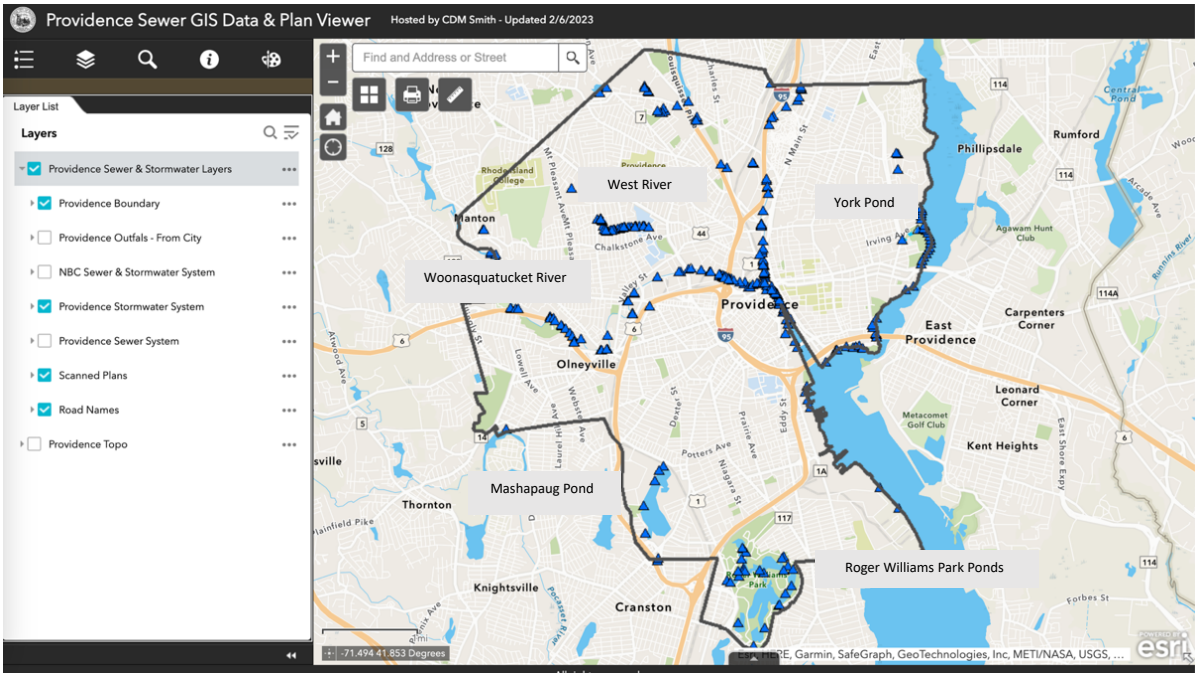
← Location of stone forebay bioswale in relation to planted bioswale in foreground

Below: Close-up photo of stone forebay bioswale

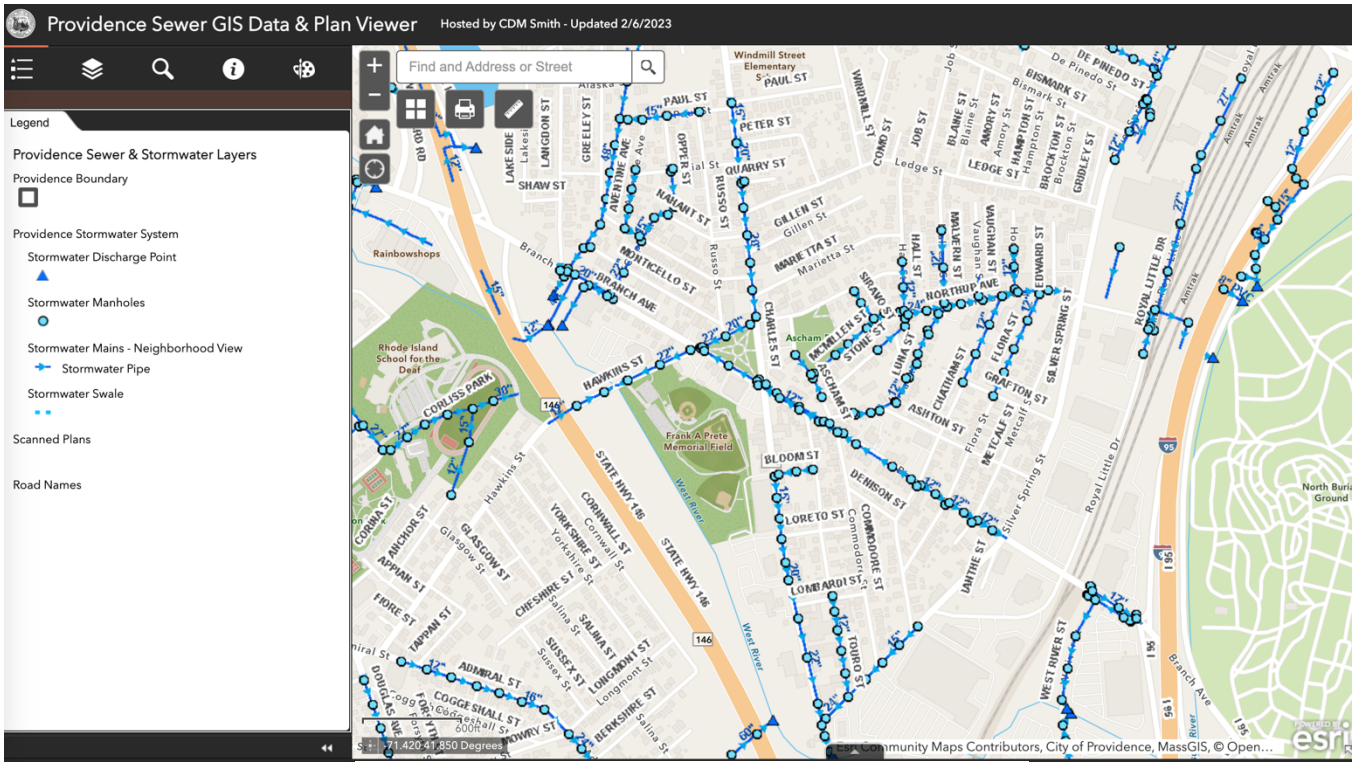
Killingly Street in the Woonasquatucket River watershed

The primary tool we used to determine locations was the City of Providence's Sewer and Stormwater GIS Database and Plan Viewer, which can be found at the following url: https://cdmsmith.maps.arcgis.com/apps/webappviewer/index.html?id=9d5b1e994a2c4630b1679446889078e1

Groundwork RI staff started with this map to determine separated sewer areas of the city, the locations of Providence's stormwater system and catch basins, and to understand how stormwater flows to each of our focus water bodies. Approximate locations of our project's focus water bodies are labeled for general reference.



You can zoom into the City's Sewer and Stormwater viewer more closely to see the stormwater pipes and directional flow into catch basins and ultimately into each of our focus water bodies. An example of this for part of the West River watershed is below. Using this mapping tool is how our staff began identifying the areas shedding water into our five project water bodies. Staff then visited the locations on foot to identify specific individual bioswale locations that met the site selection criteria.



West River Watershed Stormwater System Detail

Maintenance: Since installation of our 57 bioswales started in 2017, Groundwork RI's GroundCorp landscape team has maintained the features, typically on a quarterly schedule. Maintenance includes removing overgrowth, weeds, and litter, replacing missing plants (we experienced some theft of plants), clearing away accumulated sediment, repairing any erosion that has occurred, replacing parts of the fencing, resetting the fencing in concrete, and other tasks. Sometimes something like significant visible erosion will necessitate a larger design modification. In June 2022, we surveyed the status of all of the bioswales that had been installed as of that date to determine conditions and maintenance needs. We found a mix of good, fair, and poor conditions. Examples include this one at 100 Fisk Street in good condition, with the earlier fencing design:

An example of a bioswale in poor condition includes this one at 16 Miller Avenue near the Broad Street entrance of Roger Williams Park:

Since conducting this assessment, the bioswales that were in need of maintenance have been repaired, and our landscaping team will continue to provide future maintenance as well. The bioswales installed in front of homes have been the best maintained of the cohort.

Workforce Development: One of the goals of our project was to use the bioswale installations as both an employment and training opportunity for existing programs that Groundwork RI runs. Our GroundCorp landscape team was employed as the primary installation crew and has been the primary group conducting maintenance as well. In 2022, we worked with two young adult cohorts from Building Futures who were trained by GroundCorp to mix concrete, set the stone paver borders, and install the concrete splash pads on a few bioswales as well.

Monitoring and Results: Groundwork RI did not complete any scientific monitoring as part of this project. We conducted visual monitoring only to identify maintenance and repair needs and to note the

basic functionality of the bioswale during a rainstorm. In partnership with the Providence Stormwater Innovation Center (PSIC), however, two types of data monitoring for a variety of green stormwater infrastructure in Providence have recently taken place and results should be available in fall 2023. The first was documenting stormflows with time-lapse cameras, which was installed at our Opper Street bioswale location. The other involved installing water level sensors in the sites and recording readings every five minutes. They also recorded five-minute precipitation data as a comparison. One of Groundwork RI's sites in Roger Williams Park was monitored with both a camera and water level sensors. Additionally, the Providence DPW counted Groundwork RI's bioswales towards the City's stormwater credits, which need to be accrued in order for the City to be in compliance with a RIDEM consent order around municipal stormwater management. DPW has not yet quantified the pollutant reduction for the bioswales, but are planning to do so as part of a Total Maximum Daily Load (TMDL) watershed planning project they are developing later this year.

2.B. Next Steps & Recommendations

We have been making improvements and implementing repairs for all 57 bioswales throughout the project period utilizing SNEP funds, and we will continue to perform ongoing maintenance of all bioswales for the foreseeable future. We will continue to work with the RI Green Infrastructure Coalition to promote sustainable green infrastructure maintenance funding as well. We will also continue applying for grant funding to run workforce development programs as our existing job training program will be our primary method for conducting maintenance of the Providence bioswales.

We will also work on developing educational products around stormwater and the bioswale features, and use the bioswales as education and training sites for our adult job training and high school youth programs. Three of our staff have been certified as instructors by the Center for Watershed Protection for its Clean Water Certificate program. Participants who go through the entire training will receive a nationally-recognized and accredited certification in green stormwater infrastructure construction, maintenance, and inspection.

2.C. Compliance

The EPA reviewed and approved Groundwork RI's QAPP for this project. We worked closely with the Providence Department of Public Works on permitting for each bioswale. As part of the permitting process, we were required to gain property owner permission even for public right of way installations if the bioswale was being installed in front of someone's home or business/organization.

2.D. Project Partners

Groundwork RI worked with many partners over the course of this project. First and foremost, we had a great working relationship with the Providence Department of Public Works (DPW). DPW staff were invaluable in brainstorming during the very iterative design process, which was ongoing throughout the project period, helping us make decisions about design features that were the most practical, followed ADA requirements, and fit within the context of Providence's streetscape. DPW was game for trying and testing out new ideas out and were not afraid to go back to the drawing board with us when something failed or could be improved.

The Providence Parks Department was also a great partner in our efforts to install bioswales inside Roger Williams Park, as well as install bioswales outside other city parks such as Paul Grande Park in Silver Lake and Sessions Street Park on the East Side.

The Providence Neighborhood Planting Program (PNPP) and the Woonasquatucket River Watershed Council (WRWC) helped us identify locations for bioswales that complemented planned street tree plantings and find project locations in the Woonasquatucket River watershed, respectively. WRWC's River Rangers joined GroundCorp for bioswale installations at a number of locations as a training exercise. The resident-led Blackstone Parks Conservancy (BPC) was a key partner as well in the final stretch of the project period when we still needed to find many bioswale locations after scouring the four primary watersheds where we started the project.

At the beginning of our project, the RI Department of Transportation (DOT) reviewed the final project design, added comments, and tried to identify locations for our bioswales on state roads within their jurisdiction and within our priority watersheds. In the end, we were unable to install any bioswales on state roads as part of this project, but it was good to have their support. RIDOT has recently asked Groundwork RI to develop a budget and plan to reconstruct, replant, then maintain 18 linear bioswales along a road in Wakefield, RI for the next two years. This would not have happened without the SNEP grant helping our organization develop expertise in bioswale design, construction, and maintenance, and we are excited about these future opportunities.

The RI Green Infrastructure Coalition (GIC) helped promote our bioswale project through its email newsletter and at regular coalition meetings. Groundwork RI staff also presented our project plans and revised bioswale designs at two separate public events hosted by the GIC.

Our job training partners included Children's Friend, Open Doors, Garden Time, and Building Futures, all of whom provided student referrals to Groundwork's own training program or contracted with us to run classroom and field-based training programs for their client base. Training students joined GroundCorp in the field on a number of the bioswale installations.

2.E. Volunteer and Community Involvement

As Groundwork RI prioritizes employing local residents in the environmental projects we are leading, there was not a robust volunteer engagement component of our SNEP bioswale project. However, many community members were involved in the project as job training students (approximately 31 students over the course of the project), GroundCorp landscape employees (5), WRWC River Rangers (6) paid by WRWC, not our grant, to participate in the project, and as recipients of bioswales in front of their homes (around 17 homes). The rest of the bioswales were installed in front of parks, schools, and buildings housing nonprofit organizations.

2.F. Outreach & Communications

Our project's primary outreach methods to find bioswale locations and implement the project were door-to-door outreach, direct mailings, email newsletter communications, and social media posts. In order to find suitable bioswale locations our staff walked the watersheds where we were focusing our project, developed a list of potential sites, then conducted door to door outreach and direct mailings to

the list of homes and other entities like nonprofits and businesses that we generated in order to garner permissions for bioswale installations.

The three nonprofits we worked with were especially accommodating and great to work with. They were: ReFocus Community Center on Opper Street, Anchor Recovery Center on Reservoir Avenue, and Southside Community Land Trust's community garden on Charles Street. All of them were open and receptive from the moment we approached them about the project after having identified their properties as suitable locations. The remainder of the bioswale sites were in found in front of city parks, around schools, and other public locations. These only required coordination and communication with various departments in the City of Providence, primarily DPW and Parks, as well as occasionally with the area's representative on Providence's City Council.

3. Supporting Materials

The following supporting materials are included as attachments:

1- Final Design Plans showing cobblestone border and 8" round gabion vent
2- Older Design Plan Detail with fencing instead of cobblestone border, also showing curb cut dimensions, which are the same as current design
3- Outreach Flyers (English)
4- Outreach Flyers (Spanish)

4. Certification

The undersigned verifies that the descriptions of activities and expenditures in this progress report are accurate to the best of my knowledge; and that the activities were conducted in agreement with the grant contract. I also understand that matching fund levels established in the grant contract must be met.

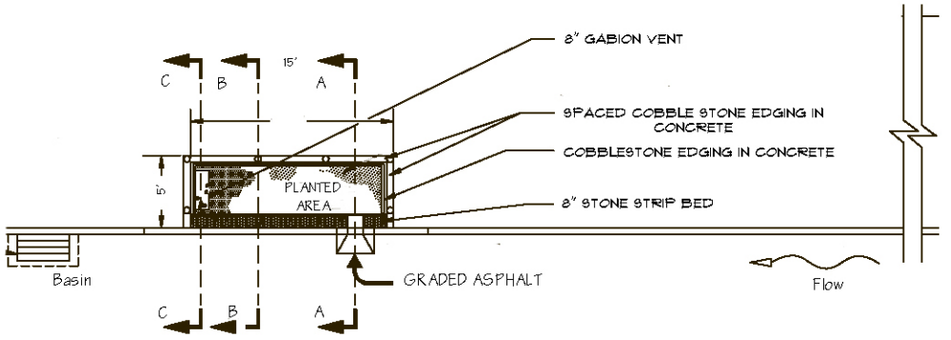
Grantee Signature:

Name: Amelia Rose

Job Title: Executive Director

Date: March 5, 2023

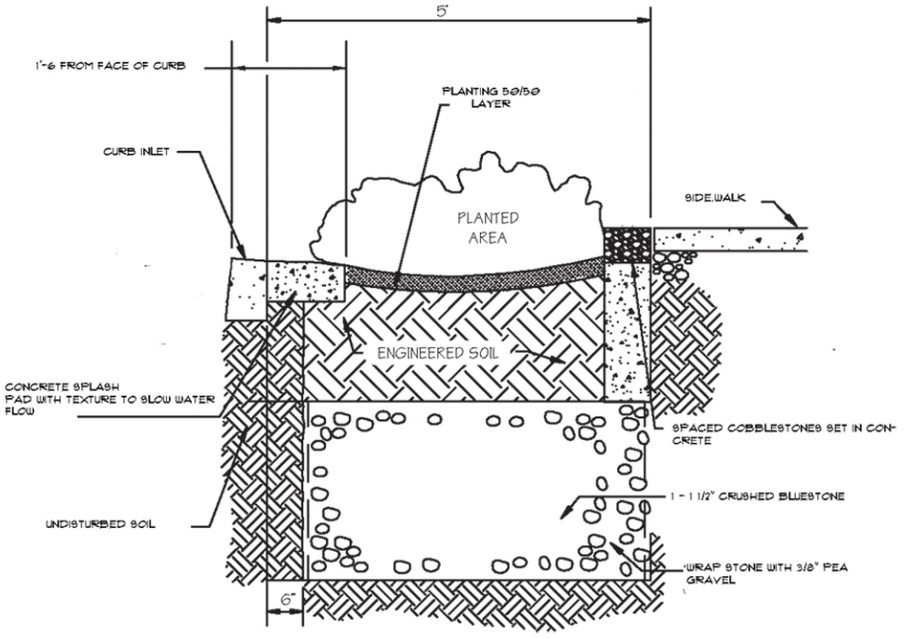
Organization: Groundwork Rhode Island



CROSS SECTION PLAN

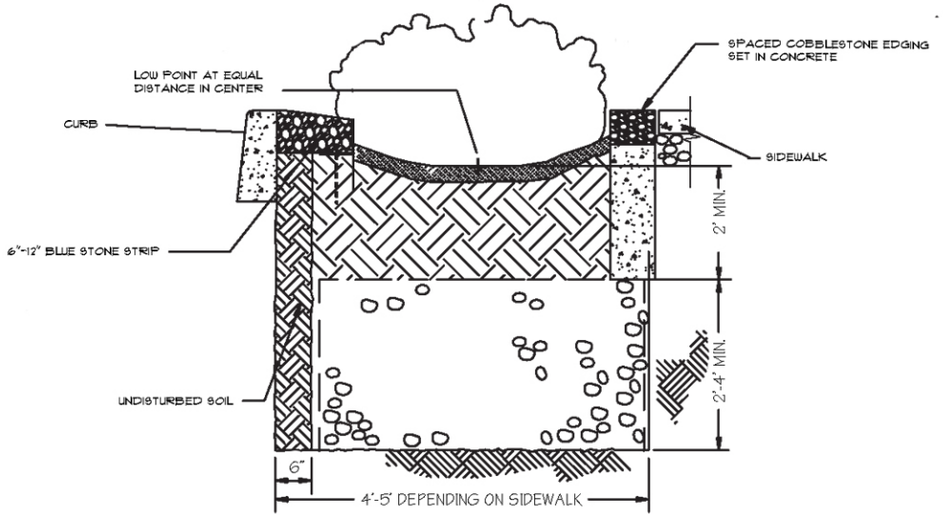
NOT DRAWN TO SCALE

NOTES:
MIN. OF 5' OFFSET FROM THE CENTER OF THE BASIN.
BOTTOM OF THE BIOSALE IS TO BE LEVEL AND NOT TO BE COMPACTED WHEN BACK-FILLED.
NO COMPACTION OF ANY LAYERS IS NEEDED.



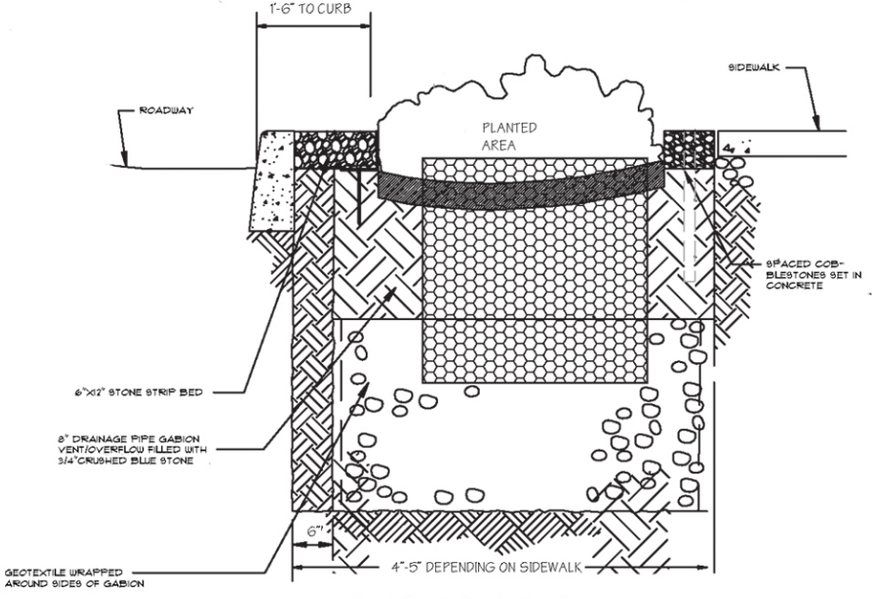
SECTION A-A

NOT DRAWN TO SCALE



SECTION B-B

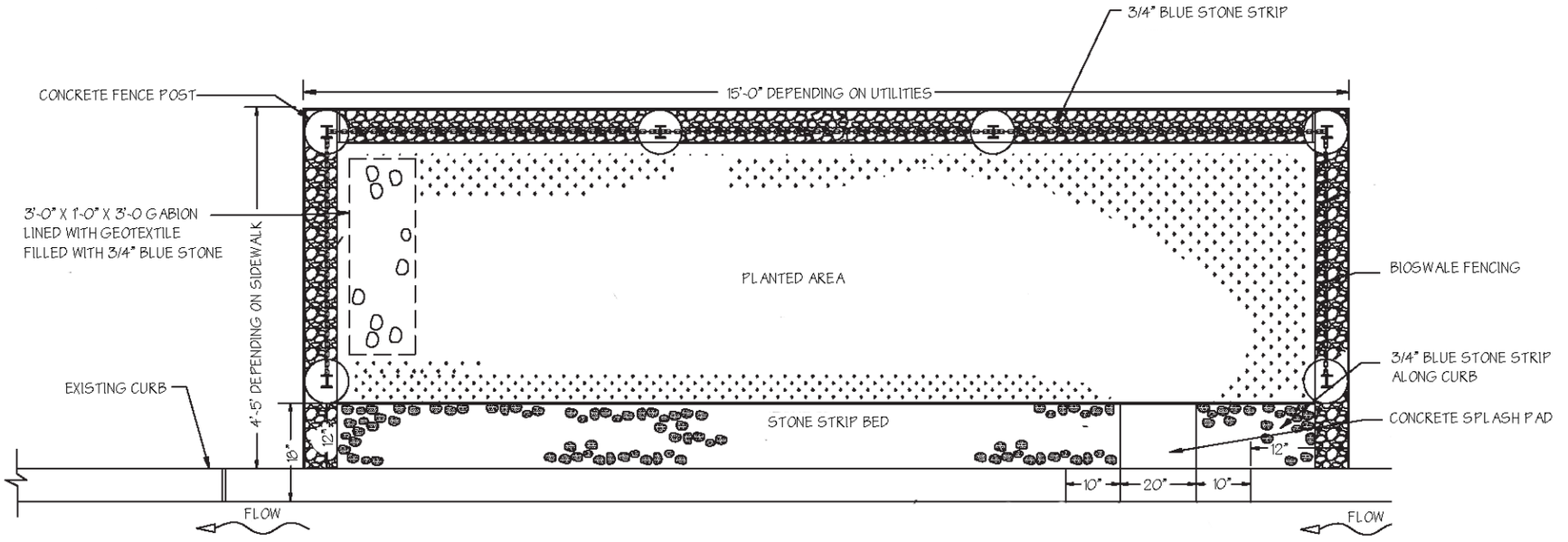
NOT DRAWN TO SCALE



SECTION C-C

NOT DRAWN TO SCALE

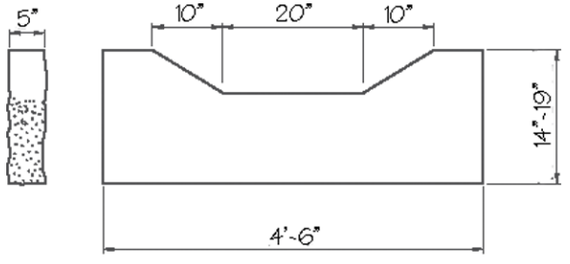
Not Drawn To Scale
Prepared By: Steven A. Ricci
October 2021
Providence RI.
Detail 1A
Bioswales
GROUNDWORK RHODE ISLAND



BIOSWALE PLAN VIEW

NOT DRAWN TO SCALE

NOTES:
ALL BIOSWALES WILL BE INSTALLED IN AREAS WHERE THE CITY DPW HAS GIVEN AUTHORITY AND APPROVAL.
SOIL ELEVATION WILL BE AT THE HIGHT OF THE INLET.



GRANITE CURB INLET DETAIL

NOT DRAWN TO SCALE

NOTES:
GRANITE CURB INLET WILL BE CUT FROM EXISTING CURB.
CURB HIGHTS MAY VARY BUT WILL NOT CHANGE THE SPLACE PAD WHICH IS TO BE INSTALLED AT STREET LEVEL WITH A 10% PITCH.

Not Drawn To Scale
Preparred By: Steven A. Ricci
September 2019
Providence RI.
Detail 2A
Bioswales
GROUNDWORK RHODE ISLAND

Providence's ponds and rivers need your help!

Roger Williams Park Ponds | Mashapaug Pond | West River | Woonasquatucket River | York Pond

Groundwork Rhode Island is looking for **tenants or property owners** who would like to receive a **FREE bioswale** in front of their **home or business**, and are willing to **help look after them** after planting!

Bioswales are planted areas located in the right-of-way in front of your home or business. 5 feet of soil are dug out and backfilled with stone and soil. A curb cut allows stormwater from the street to enter. The bioswales are usually 12 ft x 4 ft.

- ***This project will…***
- **CLEAN**: Filter out pollution with plants, stone, and soil.
- **COOL**: Minimize concrete, heat-holding surfaces.
- **PROTECT**: Absorb & intercept rain to reduce flooding.
- **INCREASE WELLNESS**: Create welcoming spaces.
- **SUPPORT** our **ECONOMY**: Create local jobs & training opportunities.

Interested? Have questions?
Contact us at: info@groundworkri.org | (401) 559-2204

Project partners include:

GROUNDWORK Rhode Island · PROVIDENCE NEIGHBORHOOD PLANTING PROGRAM · PROVIDENCE PARKS & RECREATION play · relax · explore · Providence Stormwater Innovation Center · SUSTAINPVD MAYOR JORGE ELORZA · WOONASQUATUCKET RIVER WATERSHED COUNCIL

Providence's ponds and rivers need your help!

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¡Los lagos y ríos de Providence necesitan su ayuda!

Roger Williams Park Ponds | Mashapaug Pond | West River | Woonasquatucket River | York Pond

Groundwork Rhode Island está buscando **arrenditarios o propietarios** que deseen recibir un **bioswale GRATIS** en frente de su **casa o negocio**, y estén dispuestos a **ayudar a cuidarlos** después de plantar!

Los bioswales son áreas plantadas ubicadas en el derecho de paso frente a su hogar o negocio. Se excavan 5 pies de tierra y se rellenan con piedra y tierra. Un corte en la acera permite que entren las aguas pluviales de la calle. Los bioswales suelen ser de 12 pies x 4 pies.

Este proyecto…

LIMPIA: Filtre la contaminación con plantas, piedras y tierra.

REFRESCA: Minimice las superficies de concreto que retienen el calor.

PROTEJE: Absorbe e intercepta la lluvia para reducir las inundaciones.

BIEN ESTAR: Crea espacios de bienvenida.

APOYA la **ECONOMÍA**: Crea trabajos locales y oportunidades de capacitación.

¿Tiene interés? ¿Preguntas?
Contactanos: info@groundworkri.org | (401) 559-2204

Los socios del proyecto incluyen:

GROUNDWORK Rhode Island · PROVIDENCE NEIGHBORHOOD PLANTING PROGRAM · PROVIDENCE PARKS & RECREATION play · relax · explore · Providence Stormwater Innovation Center · SUSTAINPVD MAYOR JORGE ELORZA · WOONASQUATUCKET RIVER WATERSHED COUNCIL

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Los bioswales son áreas plantadas ubicadas en el derecho de paso frente a su hogar o negocio. Se excavan 5 pies de tierra y se rellenan con piedra y tierra. Un corte en la acera permite que entren las aguas pluviales de la calle. Los bioswales suelen ser de 12 pies x 4 pies.

Este proyecto…

LIMPIA: Filtre la contaminación con plantas, piedras y tierra.

REFRESCA: Minimice las superficies de concreto que retienen el calor.

PROTEJE: Absorbe e intercepta la lluvia para reducir las inundaciones.

BIEN ESTAR: Crea espacios de bienvenida.

APOYA la **ECONOMÍA**: Crea trabajos locales y oportunidades de capacitación.

¿Tiene interés? ¿Preguntas?
Contactanos: info@groundworkri.org | (401) 559-2204

Los socios del proyecto incluyen:

GROUNDWORK Rhode Island · PROVIDENCE NEIGHBORHOOD PLANTING PROGRAM · PROVIDENCE PARKS & RECREATION play · relax · explore · Providence Stormwater Innovation Center · SUSTAINPVD MAYOR JORGE ELORZA · WOONASQUATUCKET RIVER WATERSHED COUNCIL