NYC Green Infrastructure

2014 Annual Report

NYC Environmental Protection

Bill de Blasio
Mayor

Emily Lloyd
Commissioner

Cover photo by Trust for Public Land

Emily Lloyd
Commissioner

Dear Friends,

I am pleased to share the 2014 Green Infrastructure Annual Report, which details the progress that the New York City Department of Environmental Protection (DEP) has made on the ambitious New York City Green Infrastructure Program. Green infrastructure plays a key role in addressing New York City's water quality challenges, and provides numerous environmental, social, and economic co-benefits, such as reducing urban heat island effect, improving air quality, and creating jobs in construction and maintenance.

DEP's Green Infrastructure Program is part of a broader commitment to improve water quality citywide, and we continue to pursue new ways of managing stormwater in light of climate change impacts and an evolving regulatory landscape. Our efforts are well complemented by OneNYC, the visionary blueprint for the New York City of the future, and a forthcoming permit with the New York State Department of Environmental Conservation to address stormwater runoff from the separate sewer system. As we continue to advance our holistic, long-term water quality goals, we remain committed to addressing stormwater in combined sewer areas, and are ever mindful of the financial impacts for our ratepayers.

This report summarizes the many achievements of the Green Infrastructure Program over the past year, during which time we:

- Met or exceeded the expected performance rate of green infrastructure for the Neighborhood Demonstration Areas;
- Advanced Right-of-way Bioswale designs with updated standards in August 2014, and added a standard design for a Right-of-way Rain Garden;
- Committed $36 million to support the City's Community Parks Initiative by constructing green infrastructure in underserved park spaces; and
- Constructed two new green infrastructure schoolyards through an ongoing partnership with the Trust for Public Land.

In the coming year, we will embark on a new level of collaboration with our fellow city agency partners, seek more opportunities to improve public spaces with green infrastructure, and work with private landowners to achieve benefits on new and existing properties. I encourage you to learn more in our latest update for 2014 and about the exciting ongoing and anticipated initiatives that will extend into 2015 and beyond.

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Sincerely,

Emily Lloyd
Commissioner

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Introduction

Right-of-way Bioswale, Brooklyn

At the start of 2014, DEP's Green Infrastructure Program ("the Program") was making great strides in advancing projects begun in earlier years and was moving forward at full capacity. As projects were completed and placed in operation, more project designs were initiated. By the end of the year, DEP had dozens of green infrastructure contracts implementing projects in critical combined sewer areas of Brooklyn, Queens, and the Bronx.

This 2014 Annual Report contains updates to DEP's ongoing programs such as the Green Infrastructure Grant Program ("the Grant Program"), the Green Roof Tax Abatement, the Parking Lot Stormwater Charge Pilot, green infrastructure maintenance, and green infrastructure project tracking and asset management.[1]

The Report builds upon the 2013 Report by discussing the construction of right-of-way green infrastructure in detail, as many New Yorkers are currently seeing construction activity in their neighborhoods. This year's Report provides updates on the impervious area managed through 2014, estimated impervious area managed through 2015, and Program funding. The report also includes a discussion of the 2012 CSO Order on Consent[2] ("the Order") milestones (Figure 1) and Program implementation strategy going forward.

This year's Adaptive Management section provides updates on DEP's Co-benefits Study and expansions to research and new designs being added and tested in the future. The co-benefits study and calculator bring DEP closer to being able to quantify the various environmental, social, and economic benefits of the Green Infrastructure Program. Most notably, the Post-Construction Monitoring Report for the Neighborhood Demonstration Areas ("Demonstration Areas") showed that within the Demonstration Projects stormwater runoff to the sewers decreased due to the implementation of green infrastructure. These findings confirm that green infrastructure performs as designed. The data collected in the Post-Construction Monitoring Report will help inform larger analyses on combined sewer overflow (CSO) reductions on a waterbody and Citywide level.

DEP is required by the Order to implement sufficient green infrastructure projects to control the equivalent of stormwater generated by one inch of precipitation on 1.5 percent of impervious surfaces Citywide in combined

[1] Past Green Infrastructure Annual Reports are available at www.nyc.gov/html/dep/html/stormwater/nyc_green_infrastructure_plan.shtml.

[2] The goal of the Green Infrastructure Program is to reduce combined sewer overflows (CSOs) by managing stormwater runoff with green infrastructure. Since the signing of the CSO Order on Consent ("the Order") in 2012, DEP has significantly scaled up green infrastructure planning and implementation toward the goal of managing the equivalent of stormwater generated by one inch of precipitation from 10 percent of impervious surfaces citywide within combined sewer areas by 2030. Order on Consent (DEC Case No. CO2-20110512-25, modification to DEC Case No. CO2-20000107-8)

areas by December 31, 2015. As the 2015 milestone date approaches, DEP will continue to evaluate the Program's progress over the last three years and will prepare to report on its accomplishments and lessons learned. While it is still early in 2015, DEP anticipates that the extraordinary efforts expended over the last three years may not result in sufficient managed acres to meet the 2015 milestone (see "Progress toward Implementation Goals"). As a proactive approach, DEP has begun to work with DEC to begin to develop a contingency plan, which would be submitted by June 2016, in accordance with the Order. The scope of this plan is still being determined, but DEP does expect that the 1.5 percent target will be reached by 2016. Therefore a discussion of adjusting the original interim milestones, which were designed to track progress and provide opportunity for Program course corrections, could be one of the elements considered in a contingency plan.

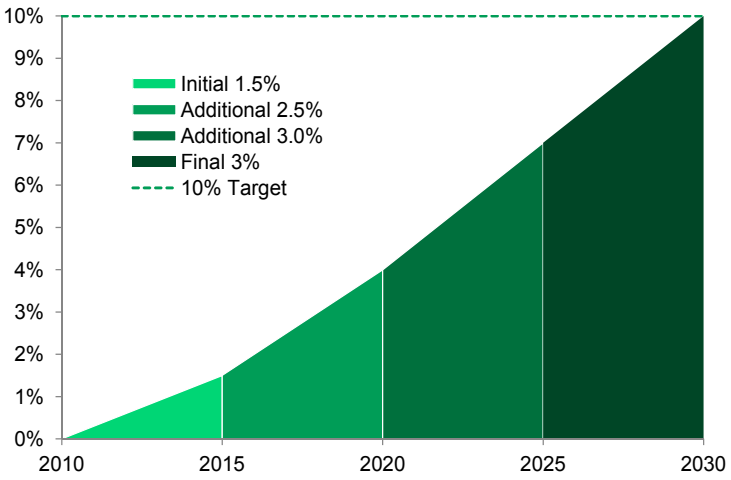
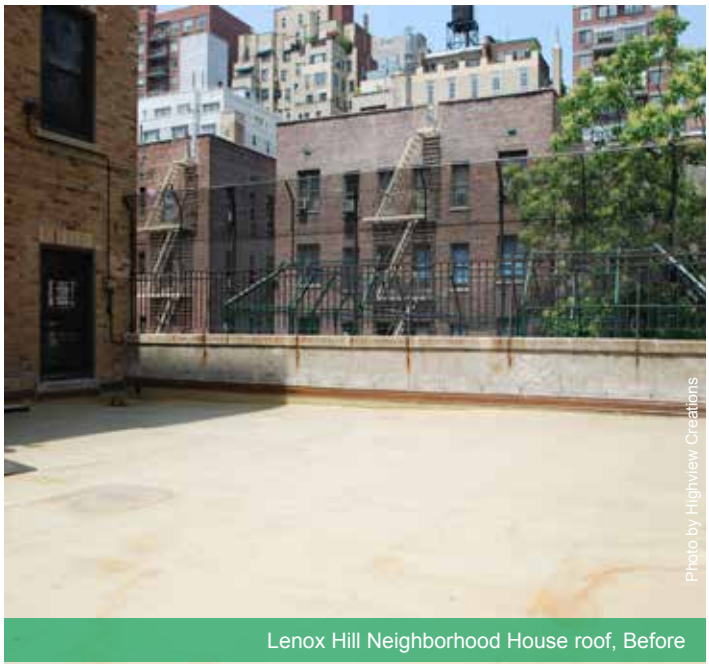


Figure 1: *2012 Consent Order Milestones*



Lenox Hill Neighborhood House roof, Before

Lenox Hill Neighborhood House roof, After

2014 Major Accomplishments

1

Implemented Area-wide green infrastructure in Priority CSO Tributary Areas

In 2014, DEP continued to spearhead the full-scale implementation of green infrastructure in Priority Combined Sewer Overflow (CSO) Tributary Areas. DEP and its partner agencies managed 42 Area-wide design and construction contracts in Brooklyn, Queens, and the Bronx.

2

Continued to grow the Green Infrastructure Grant Program

In 2014, DEP committed approximately $3 million for six new grant recipients. To date, DEP has committed more than $13 million to 33 Green Infrastructure Grant projects.

3

Continued to grow the green infrastructure schoolyards partnership with Trust for Public Land

In 2014 The Trust for Public Land, along with DEP, the New York City Department of Education and the New York City School Construction Authority completed green infrastructure schoolyards at J.H.S. 162 in Brooklyn and at J.H.S. 157 in Queens. DEP has funded six schoolyards to date.

4

Participated in 50 public meetings about the Green Infrastructure Program

DEP met with Community Boards, elected officials, academic and industry groups, and community organizations to provide information and updates on green infrastructure implementation.

5

Committed to creating green jobs

In October 2014, the City announced a commitment to support a high quality, local workforce that includes New Yorkers impacted by Hurricane Sandy. As part of this effort, DEP committed to creating more than 250 green jobs, including green infrastructure maintenance jobs, over the next several years.

6

Built upon the success of the standard designs for Right-of-way green infrastructure

In August 2014, DEP's Office of Green Infrastructure updated the standard designs for Right-of-way Bioswales and added a standard design for a Right-of-way Rain Garden and other green infrastructure construction details.

7

Completed the Green Infrastructure Co-Benefits Study and launched the Co-Benefits Calculator tool

DEP completed a study of the environmental, social, and economic co-benefits of green infrastructure practices. In addition, DEP developed an online comparative tool, the Co-benefits Calculator, which allows users to compare the costs and co-benefits of green infrastructure practices.

8

Committed $36 million to the Community Parks Initiative for green infrastructure construction

DEP partnered with the New York City Department of Parks & Recreation in the new Community Parks Initiative (CPI), a targeted capital investment program to reconstruct parks in underserved communities. DEP committed $36 million to Phase 1 of the initiative, which will cover green infrastructure construction costs at 29 CPI sites within combined sewer areas.

9

Achieved Order milestone for the Neighborhood Demonstration Area Post-Construction Monitoring Report

The Order includes milestone dates to construct and monitor green infrastructure in three Neighborhood Demonstration Areas. After certifying the on-time completion of the Demonstration Projects by spring 2013, DEP went on to meet the milestone for completion of the Post-Construction Monitoring Report in August 2014.

10

Successfully committed required Environmental Benefits Program funding

DEP successfully committed $3 million in Environmental Benefit Program funding toward the Green Infrastructure Grant Program, as required by the Order.

11

Continued development of the Project Tracking and Asset Management System

The Geographic Information System (GIS)-based tracking and asset management program will enable DEP to track and report on the Program's progress toward its goals, as well as to manage and monitor the operation and maintenance of its assets Citywide.

Photo by Highview Creations

Institutionalizing Green Infrastructure

Green roof at Bishop Loughlin High School, Brooklyn

Organizational Capacity

DEP's Office of Green Infrastructure (OGI) expanded in 2014 with six new engineering project managers, bringing the total staff to 21. The growing size of OGI parallels the expansion of the Program across the City's combined sewer areas. OGI staff includes engineers, planners, project managers, and administrative support staff who maintain the aggressive pace necessary to meet the Order requirements. DEP also funds three positions at the New York City Department of Parks & Recreation (DPR) and one position at the New York City Department of Transportation (DOT) to enable those agencies to support the Program.

Organizationally, OGI has worked hard over the last few years to overcome the initial growing pains of getting a program of this scale up and running. Administrative and practical challenges, such as contracting, bidding, budgets, project approvals, and staffing, have been effectively overcome as various City agencies and offices became familiarized with the Program. OGI is now managing projects more smoothly, adapting the Program to address field challenges, and expanding initiatives with new City agency partners.

In addition, DEP has continued to build on two Program areas: the Project Tracking and Asset Management system and Green Infrastructure Maintenance. Both programs provide critical services for managing the growing set of decentralized green infrastructure assets DEP will build in the coming years.

Project Tracking and Asset Management

In 2014, DEP continued the development of a GIS-based Project Tracking and Asset Management System capable of compiling, tracking, managing, mapping, reporting data, and providing asset management for thousands of green infrastructure assets throughout their life cycle.[3] DEP launched the GIS component of an interim tracking database in 2014, which has formalized the tracking process during Area-wide contract site selection and design. DEP expects that the full system will be completed in 2015.

The NYCityMap includes a green infrastructure theme[4] that enables the public to search for green infrastructure projects by address or by type. The map also allows the public to add a green infrastructure project (such as a

[3] DEP tracks each individual green infrastructure installation, or "asset." Assets in the City include Right-of-way Bioswales, Stormwater Greenstreets, Right-of-way Rain Gardens, and installations on public and private property such as rain gardens and other bioretention systems, permeable paving, subsurface systems or turf fields with infiltration capability, rainwater harvesting, and green and blue roofs.

[4] Search for projects under the "green infrastructure" theme at NYCityMap's web page, http://maps.nyc.gov/doitt/nycitymap/, or by searching an address from DEP's Green Infrastructure web site at www.nyc.gov/greeninfrastructure.

green roof or rain garden) to the map so that all can view the true scale of the implementation effort in the City. DEP continues to encourage individual property owners to add their projects to the NYCityMap. In 2015, DEP will start to populate this green infrastructure themed map with newly completed public projects on a regular basis.

Green Infrastructure Maintenance

Throughout 2014, DEP and DPR continued to provide maintenance for right-of-way green infrastructure locations in Brooklyn, Queens, and the Bronx. In 2015, DEP's Bureau of Water and Sewer Operations will take the lead on green infrastructure maintenance and lay the groundwork for an effort that will serve the City for years to come. As the Program grows over the next several years, DEP will hire new maintenance positions and will continuously evaluate the maintenance capacity of the crews going forward.

The maintenance of green infrastructure practices within publicly owned property is typically carried out by the owner agency, such as DOE's schoolyards. DEP has agreed to maintain the green infrastructure retrofits located on New York City Housing Authority (NYCHA) property.

Institutional Steps

Parking Lot Stormwater Charge Pilot Program

First initiated in 2011, the pilot program generates revenue for operation and maintenance of the City's wastewater system. The program applies a fee to privately owned standalone lots that contribute runoff to the City's wastewater system, but that do not receive City water service. DEP's stormwater charge increased from $0.06 to $0.063 per square foot in 2014, to account for rate structure increases. In 2014, the program billed 557 accounts for a total of $501,882. Property owners who implement green infrastructure practices are exempt from the stormwater charge; however, no green infrastructure exemptions have been given to date. The program started with a focus on large, impervious parking lots. In 2015, DEP will explore applying the stormwater charge to other impervious privately owned properties with minimal or no City water service.

Green Roof Property Tax Abatement

Green roofs provide considerable benefits to the City, but the expense of installation remains a barrier for many property owners. The New York City Green Roof Tax Abatement (GRTA) provides a means of offsetting these costs. An extension of the GRTA until 2018 and minor amendments were adopted into the City Administrative Code in 2014. In 2014, there were five green roof permits

Right-of-way green infrastructure maintenance crew, Queens

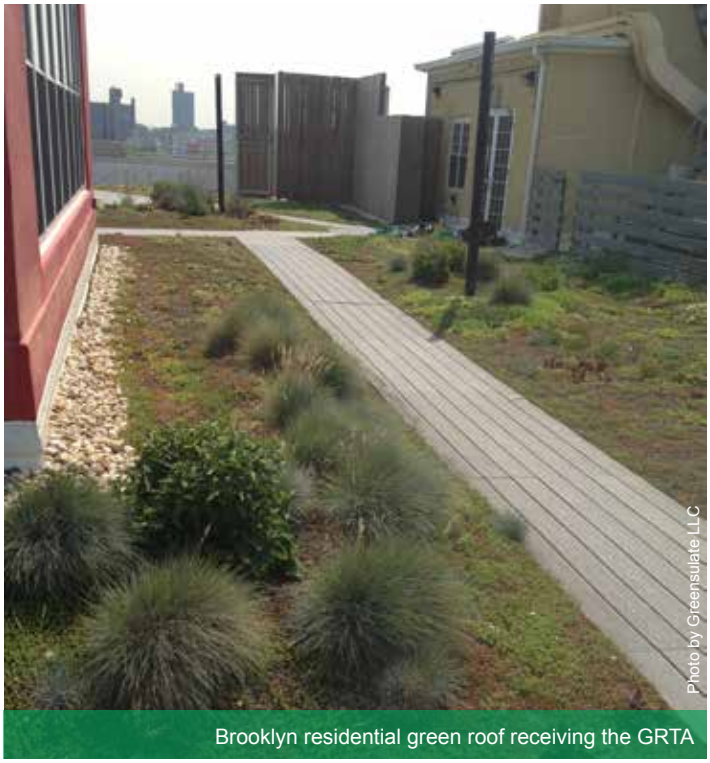


Photo by Greensulate LLC

Brooklyn residential green roof receiving the GRTA

filed with the New York City Department of Buildings (DOB) that indicated the intention to apply for the GRTA. Throughout 2014, DEP worked with DOB and environmental advocates to advise interested property owners, developers, and designers through the application process. For information about the GRTA, visit the DOB website.

Stormwater Performance Standard

DEP's stormwater performance standard ("Stormwater Rule") requires a more stringent stormwater release rate for new development than was previously allowed. DEP has committed to tracking new Site Connection Proposals (SCPs) and House Connection Proposals (HCPs) submitted to DEP that have been affected by the Stormwater Rule.[5] Since the rule took effect in 2012, DEP has certified more than 2,700 SCPs/HCPs and, of that, more than 260 sites were affected by the Stormwater Rule. The total contributing drainage area for all sites is approximately 98 acres.

Tables 1 and 2 present the breakdown of stormwater management types employed by applicants affected by the rule in 2014. These systems are primarily detention-based and designed to meet the reduced 0.25 cubic feet per second stormwater release rate. In 2015, DEP will develop a methodology to apply the area managed per the Stormwater Rule towards the Order milestones. More information on the Stormwater Rule is included in the 2013 Annual Report.

[5] DEP's Stormwater Rule tracking does not include SCP/HCPs certified by the Department of Buildings (DOB); hence, the Stormwater Rule may affect additional sites.

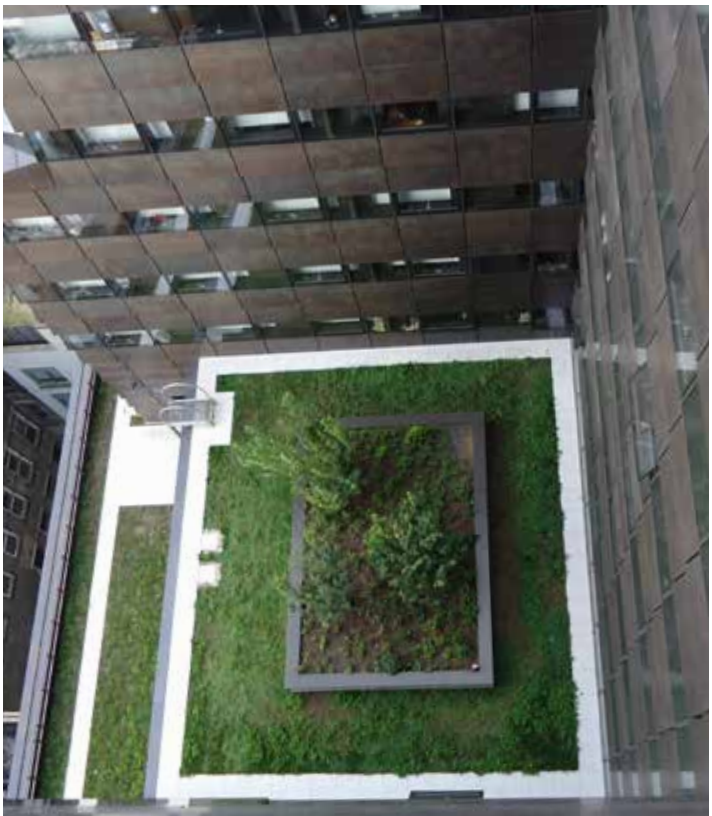
Stormwater Management Type[1]	Status	
	Planned[2]	Constructed[3]
Blue Roof	43	6
Blue Roof/Tank Combination	0	0
Drywell	6	0
Perforated Pipe	1	1
Rain Garden	0	0
Tank	85	14
Total	**135**	**21**

[1] Sites may contain more than one stormwater management system.
[2] Planned stormwater management projects are subject to change—e.g. building projects can be delayed or canceled, in which case a site connection will not be completed.
[3] Site/House Connection Proposals permitted and inspected by DEP.

Table 1: *Site and House Connection proposals by type, 2014*

Borough	Total Number of Sites
Manhattan	45
Bronx	10
Brooklyn	41
Queens	29
Staten Island	1
Total	**126**

Table 2: *Site and House Connection proposals by borough, 2014*



Green roof at New School University, Manhattan

Green Infrastructure and Long-Term Control Plans

Spring Creek constructed wetland, Brooklyn

DEP is developing Long-Term Control Plans (LTCPs) for 10 of the City's waterbodies pursuant to the Order. Through this process, DEP must also identify appropriate CSO controls necessary to achieve waterbody-specific water quality standards. The Order sets forth a schedule for the completion of the 10 LTCPs and one Citywide LTCP between 2013 and 2017 (see Table 3).[6] Each LTCP may include a mix of green and/or cost-effective grey infrastructure projects.

In 2012 DEP established the green infrastructure application rates shown in Table 4 using assumptions based on the best available knowledge to show how green infrastructure projects could be distributed across the City. In the course of developing each LTCP, DEP creates hydraulic and hydrologic watershed models[7] using these application rates in order to quantify the expected benefits of green infrastructure. However, until real projects are identified and reach final design, a reliable prediction cannot be made for how much green infrastructure will be built over the 20-year Order timeline. As the Program implementation is an iterative process, DEP will refine the targets for each waterbody as each Area-wide project is completed. DEP will ultimately manage the equivalent of 10 percent of impervious surfaces in combined sewer areas as stated in the Order.

In 2014, DEP resubmitted the LTCP for Alley Creek, and submitted LTCPs for Hutchinson River, Westchester Creek, and Flushing Creek. The Bronx River and Gowanus Canal LTCPs are currently in development and will be submitted to DEC in 2015. More information on the CSO Program and LTCPs is available on DEP's website at www.nyc.gov/html/dep/html/cso_long_term_control_plan/index.shtml.

CSO Watershed	LTCP Due Date
Alley Creek LTCP	Submitted to DEC June 2014
Westchester Creek LTCP	Submitted to DEC June 2014
Hutchinson River LTCP	Submitted to DEC September 2014
Flushing Creek LTCP	Submitted DEC December 2014
Bronx River LTCP	June 2015
Gowanus Canal LTCP	June 2015
Coney Island LTCP	June 2016
Flushing Bay LTCP	June 2016
Jamaica Tributaries & Bay LTCP	June 2017
Newtown Creek LTCP	June 2017
Citywide LTCP*	December 2017

**The Citywide LTCP shall include the East River and Open Waters*

***Table 3:** Long-Term Control Plan submittal schedule*

[6] Pursuant to the 2005 CSO Order on Consent, DEP submitted a LTCP for Paerdegat Basin, which was approved by DEC in 2007.

[7] DEP uses InfoWorks for all watershed modeling. InfoWorks is a commercially available product that is used to analyze urban hydrology and hydraulics. The InfoWorks model can utilize Geographic Information Systems (GIS) data, model continuous and event simulations, incorporate real time controls, model green and grey infrastructure, and perform water quality tracking within sewer systems.

Waterbody	Combined Sewer Impervious Area (ac)	Application Rates Total Target[1]	
		Managed Acres	Percent of Managed Acres
Initial Phases			
Alley Creek	1,490	45	3%
Bronx River*	2,331	322	14%
Coney Island Creek	694	7	1%
Flushing Bay*	4,049	522	13%
Flushing Creek*	5,923	479	8%
Gowanus Canal*	1,387	162	12%
Hutchinson River*	1,128	158	14%
Jamaica Bay & CSO Tributaries*	7,891	675	9%
Newtown Creek*	4,524	593	13%
Westchester Creek*	3,480	487	14%
Total Waterbodies	**32,897**	**3450**	**10%**
Future Phases			
CITYWIDE (Total Waterbodies + East River/Open Waters + Paerdegat Basin)	**78,749**	**7,875**	**10%**

**Priority Waterbodies*

[1] Projected green infrastructure application rates based on the metrics used in 2012 assessments. These rates will be adjusted as information becomes available from Area-wide construction contracts.

Table 4: *Waterbody-specific application rates for green infrastructure implementation*

Citywide Implementation

Rain Garden , Shoelace Park, Bronx

Area-wide Strategy: Priority CSO Tributary Areas

To meet the green infrastructure goals of the Order, DEP identified Priority Areas based on several criteria, such as CSO volume and frequency, projected benefits of projects constructed through DEP's Waterbody/Watershed Facility Plans,[8] or other planned system improvements. DEP also notes outfalls in close proximity to existing and future public access locations. DEP continues to review and expand the Priority Areas to ensure sufficient green infrastructure implementation to meet the 2030 Order goal.

In 2014 DEP added more than 29,000 gross acres to the Priority Areas, which now equal more than 68,000 gross acres. This represents more than 70 percent of the combined sewer areas of the City (see Figure 2). The identification of Priority Areas has enabled DEP to focus resources on specific CSO tributary areas, to analyze all potential opportunities, to saturate these areas with as much green infrastructure as possible, and to achieve efficiencies in design and construction. Working toward completion of the first milestone at the end of 2015, DEP has primarily focused on the Area-wide right-of-way contracts building Right-of-way Bioswales, Stormwater Greenstreets, Right-of-way Rain Gardens, and porous paving. DEP's standardized designs and procedures have been critical to supporting the systematic implementation of green infrastructure at a wide scale. Over the next 15 years, DEP expects to implement green infrastructure using an expanding array of tools. As right-of-way implementation continues and reaches its fullest extent over the long term, DEP will increasingly rely on other, more site-specific opportunities on public and private property. Accordingly, the proportion of program resources devoted to implementation will shift and diversify over time to include right-of-way installations, public and private property retrofits, and others.

Right-of-way bioswale, Brooklyn

[8] For more information on Waterbody/Watershed Facility Plans (WWFPs), visit www.nyc.gov/html/dep/html/cso_long_term_control_plan/index.shtml

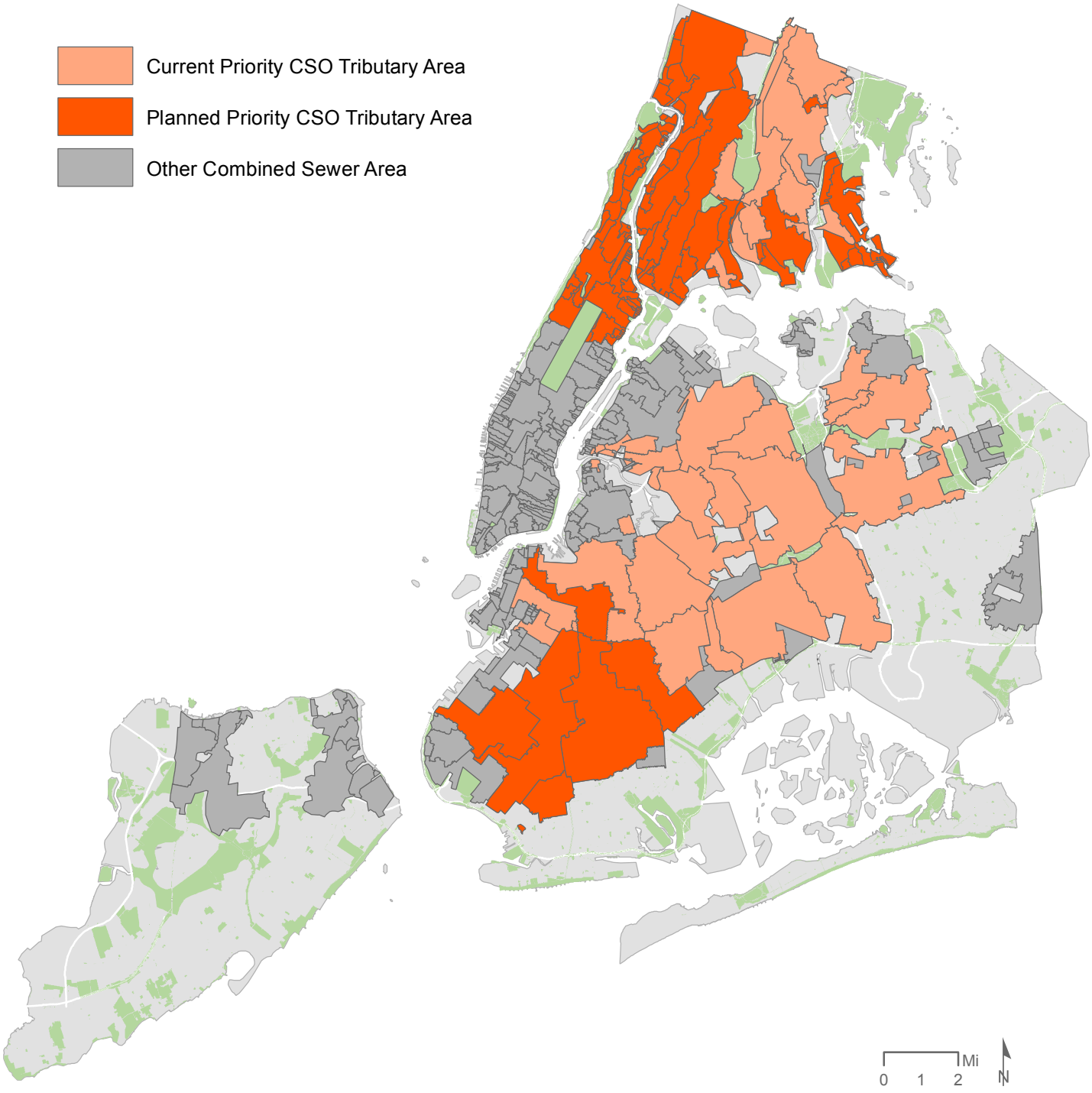


Figure 2: *Current and planned priority CSO tributary areas*

Right-of-way Area-wide Contracts

Design

In 2014, DEP with partner agencies managed 42 ongoing design contracts across the Priority Areas. DEP's typical design process begins with the consideration of a large number of potential sites, many of which will be deemed infeasible due to various field conditions. By and large, the challenges DEP faces in siting green infrastructure dictates the application rates in any given CSO tributary area. The siting criteria that are applied universally to all areas will always yield a different number of sites due to the unique characteristics of each neighborhood. DEP continues to develop solutions to common siting obstacles, as detailed below:

Street conditions:

- Siting challenges include existing trees, street furniture, residential driveways, bus stops, business entrances, loading zones, underground/overhead transit lines, etc.
- In response, DEP holds biweekly coordination meetings with DOT and DPR ensure that all sites meet safety requirements for traffic, transit, and pedestrians, and minimize impacts to existing street trees.

Subsurface conditions:

- In many areas across the City, high bedrock, high groundwater, clay-rich soils, and existing contamination can limit opportunities for siting green infrastructure.
- In response, DEP's environmental and geotechnical standards ensure that all green infrastructure will function properly and not create public concern.

Utility conflicts:

- Existing overhead/underground utilities can interfere with green infrastructure siting and feasibility, and can present hazards during geotechnical testing.
- In response, DEP's rigorous procedures, oversight, and accountability in the field minimize utility interference.
- In response, DEP developed design standards for protecting private service lines that run through green infrastructure installations in the right-of-way.

Staffing limitations:

- Staffing limitations at partner agencies for design walkthroughs and reviews can negatively impact project schedules.
- In response, DEP has provided staff to partner agencies and is exploring a field self-certification process to increase efficiency.

The results of DEP's right-of-way siting and design process in the 26W-003 (Jamaica Bay) Area-wide contract are shown in Figure 3. DEP surveyed each block within the Priority Area to site all potential locations for right-of-way green infrastructure practices. Once the neighborhood "walk through" was completed, the identified sites were then advanced to geotechnical investigations and survey work. Those sites with favorable geotechnical and survey results advanced to contract plans, and 866 right-of-way green infrastructure practices are in construction at this time.

The Project Tracking and Asset Management System stores critical information on the reasons why potential right-of-way green infrastructure sites were deferred during site selection. This data enables DEP to reevaluate those locations at a later date as new types of green infrastructure are developed. See the "Adaptive Management & Lessons Learned" section for an example of DEP's response to siting challenges through innovative design.

Right-of-way Bioswale, Brooklyn

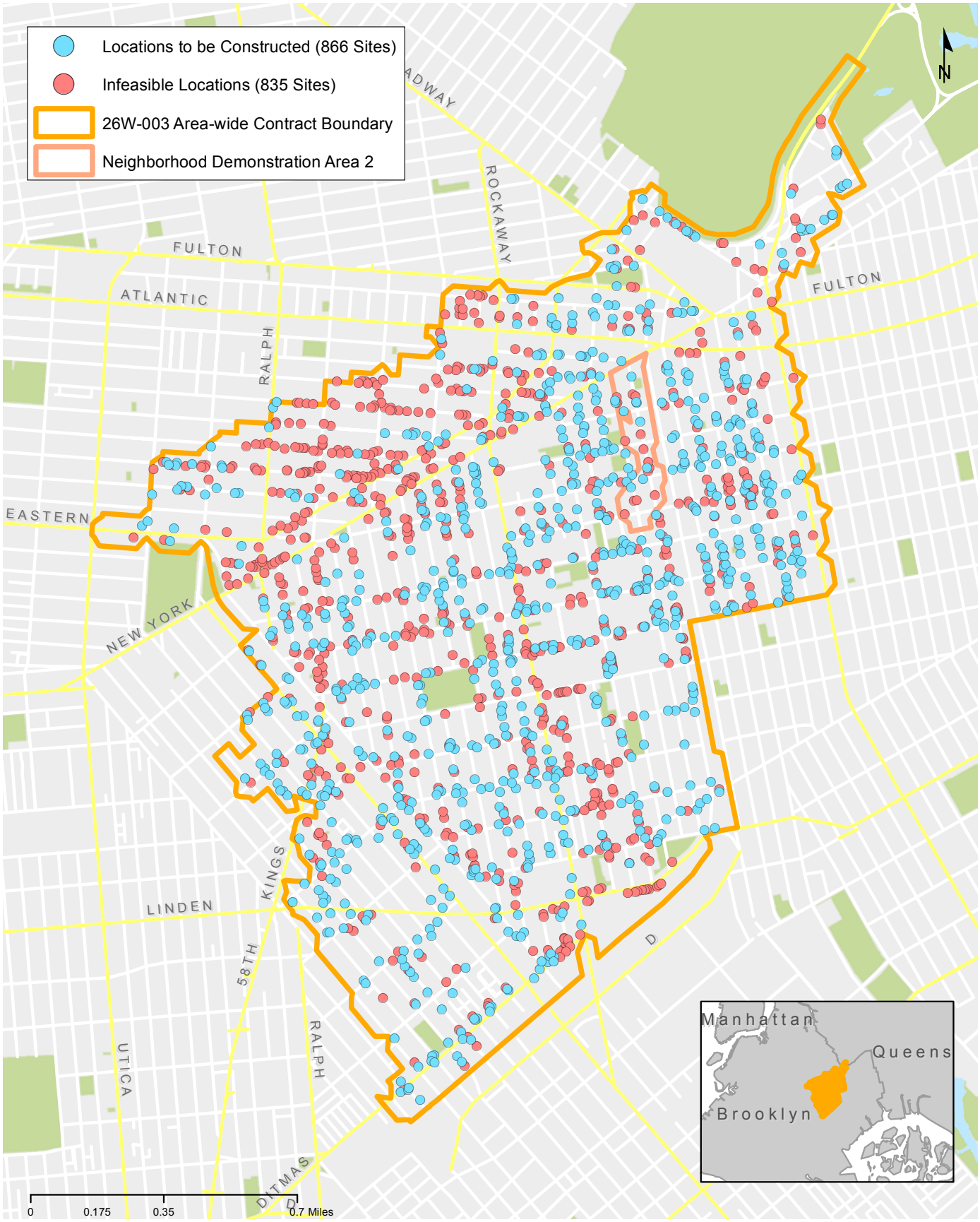


Figure 3: *Right-of-way green infrastructure locations considered during design, 26W-003 Priority Area*

Construction

In 2014, construction of six right-of-way Area-wide contracts began in several neighborhoods across the City. DEP anticipates beginning construction in additional areas throughout 2015 (see Figure 4). In order to achieve efficiencies in costs and construction practices, right-of-way construction is sequenced in groups of 100-200 Right-of-way Bioswales and approximately 10 stormwater greenstreets. Construction begins soon after DEP approves and signs the final contract plans and issues a Notice to Proceed to the contractor. It takes approximately 10 months to complete construction of each group. Figure 5 presents a typical construction sequence for green infrastructure in the right-of-way.

In addition to conducting outreach during planning and design phases, DEP also prepares for green infrastructure construction by providing regular updates to community boards, local elected officials, environmental organizations, and local groups on the status of the work. Prior to the start of construction, DEP provides maps (Figure 6) and lists of the green infrastructure locations within the construction area to all community boards and elected officials.

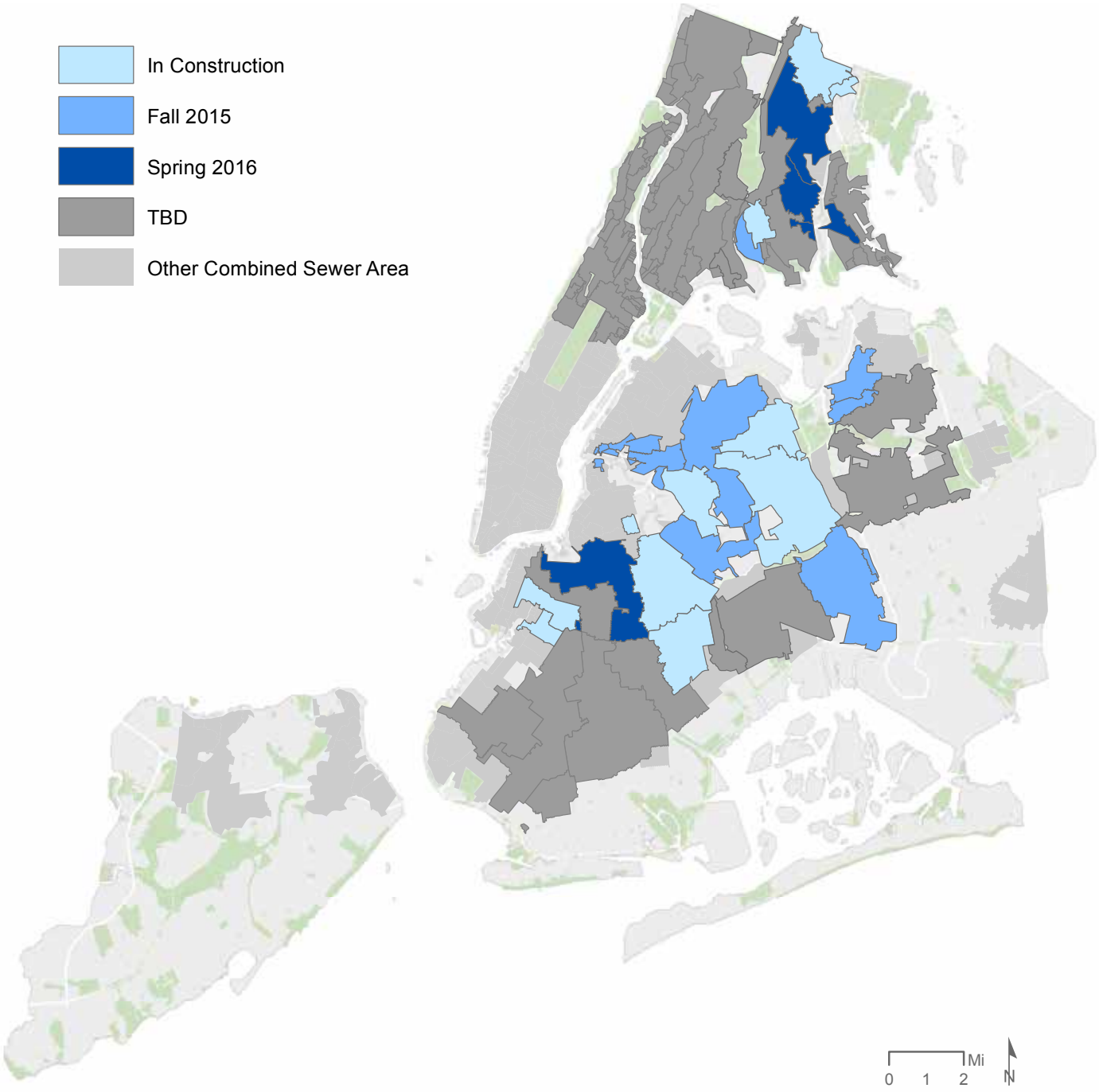
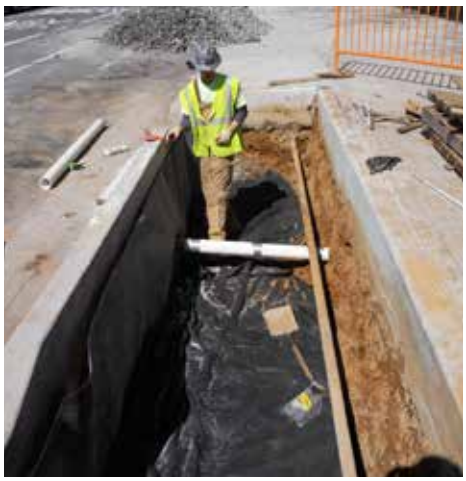


Figure 4: *Projected construction start dates for Area-wide green infrastructure contracts, as of April 2015*

The contractor spray paints the length and width of the bioswale on the sidewalk. These borders are then cut with a saw.

The sidewalk and curb are removed and the material underneath is excavated to a depth of five feet.

The excavated bioswale is backfilled with broken stone, which is wrapped with geotextile fabric to prevent the next layer of soil from clogging void spaces in the stone layer.



If private utility service lines run through the bioswale, they are fitted with a protective sleeve.

The sidewalk and curb that were removed for the installation are replaced in kind. The new curb has one or two curb cuts that allow water to flow in and out of the bioswale.

The engineered soil contains sand, which allows for quick infiltration. The soil is graded to allow water to pond at the center of the bioswale during a rainstorm.

A steel tree guard is installed to protect the plants from foot traffic on the sidewalk. The tree guard posts are set in a concrete footing for stability.

All bioswales feature water- and drought-tolerant perennials that can survive in city streets. Bioswales include trees wherever possible.

Several factors can affect the estimated 10-month construction schedule for a typical bioswale, including permit approval, material procurement timelines, allowable planting seasons and weather conditions.

Figure 5: *Typical Construction Sequence for a Right-of-way Bioswale*

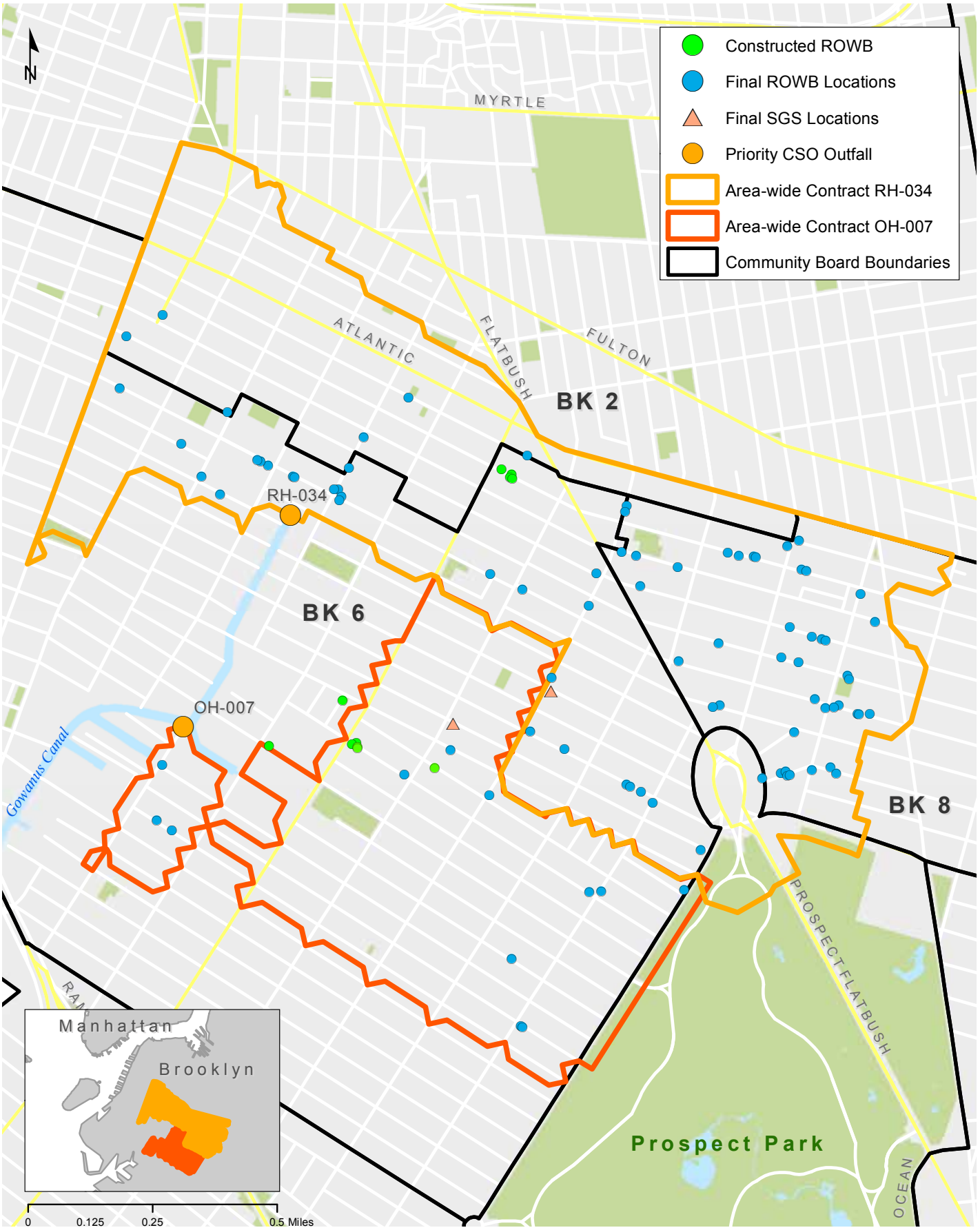


Figure 6: *Example construction notification map distributed prior to construction, Gowanus Canal Priority Area*

Leading up to and during construction, DEP and its partner agencies deploy Community Construction Liaisons (CCLs) to field offices as resources for residents, institutions, and businesses. There are five CCLs currently working on active construction projects. They distribute informational brochures and door hangers (Figure 7) to property owners and provide regular updates during construction to all area residents. The door hangers include the CCL's direct contact information for problems or questions during construction. These materials also include DEP's new green infrastructure "hotline" (718-595-6500), and an outreach email address (gioutreach@dep.nyc.gov). If a resident or community member has a question about green infrastructure planning or construction, they can reach a DEP representative for more information using these tools, which are also the DEP website at www.nyc.gov/greeninfrastructure.

Figure 7: *Door hanger front and back (left) and informational brochure (right), distributed prior to and during construction*

Public Property Retrofit Projects

In addition to standardized green infrastructure installations in the right-of-way, another key tool in meeting the 10% goal in the Order will be green infrastructure retrofits on public property. In 2014, DEP continued to work diligently with partner agencies to identify the best opportunities to retrofit parks, playgrounds, schoolyards, NYCHA properties, public parking lots, libraries, and others with green infrastructure. DEP also continued to promote its public-private partnerships as a vehicle for green infrastructure implementation on City-owned property. See the "Public-Private Partnerships" section for more information.

As with right-of-way green infrastructure, the goal for public property retrofits is to manage 1" of rainfall over a site's impervious surfaces such as driveways, pathways, paved sitting areas or recreation courts, rooftops, and others. Types of green infrastructure retrofits may include bioretention practices (such as rain gardens or swales), permeable paving materials, subsurface detention systems or synthetic turf fields with infiltration capacity, and others. Appropriate types of green infrastructure retrofits on public property are selected based on a site's particular characteristics, the needs of the owner agency and the surrounding community. DEP continues to work with agency partners to identify feasible retrofit locations that are also suitable complements to existing site conditions and programming. For example, as pictured at right DEP installed a subsurface detention system with infiltration capacity below a resident parking lot at NYCHA's Hope Gardens Houses.

Typical challenges for implementing public property retrofit projects include incompatible site uses or programming needs, presence of hazardous materials, underground vaults, planned capital improvements, and other conflicts. Often times there is extensive disrepair of a site or buildings that can require matching funds which are not available. In order to sort through the hundreds of possible public properties, DEP screens large numbers of potential sites with partner agencies to identify opportunities and challenges early in the process. When sites prove infeasible due to the above challenges, DEP and partner agencies consider alternate sites.

DEP's site screening process begins with GIS mapping, interagency and capital planning coordination, and research into existing agency records and as-built drawings. Sites passing this stage then proceed to a feasibility

Pre-construction markout of retention/detention system

Installation of storm chambers, broken stone and new pipes

Parking lot paving restoration

analysis, which involves environmental assessments and geotechnical investigations. Sites deemed feasible are then able to proceed with the design. While these steps can add considerable time to the schedule, careful analysis is necessary for the long-term success of each project. To date, DEP and partner agencies have identified a number of public properties for green infrastructure retrofits (Figure 8 and Table 5). Sites listed as "potential" in Table 5 are undergoing initial screening. Sites in "preliminary design" are in the later stages of feasibility analysis, including environmental assessments and geotechnical testing. DEP will provide updates in future Annual Reports on these projects as they move forward.

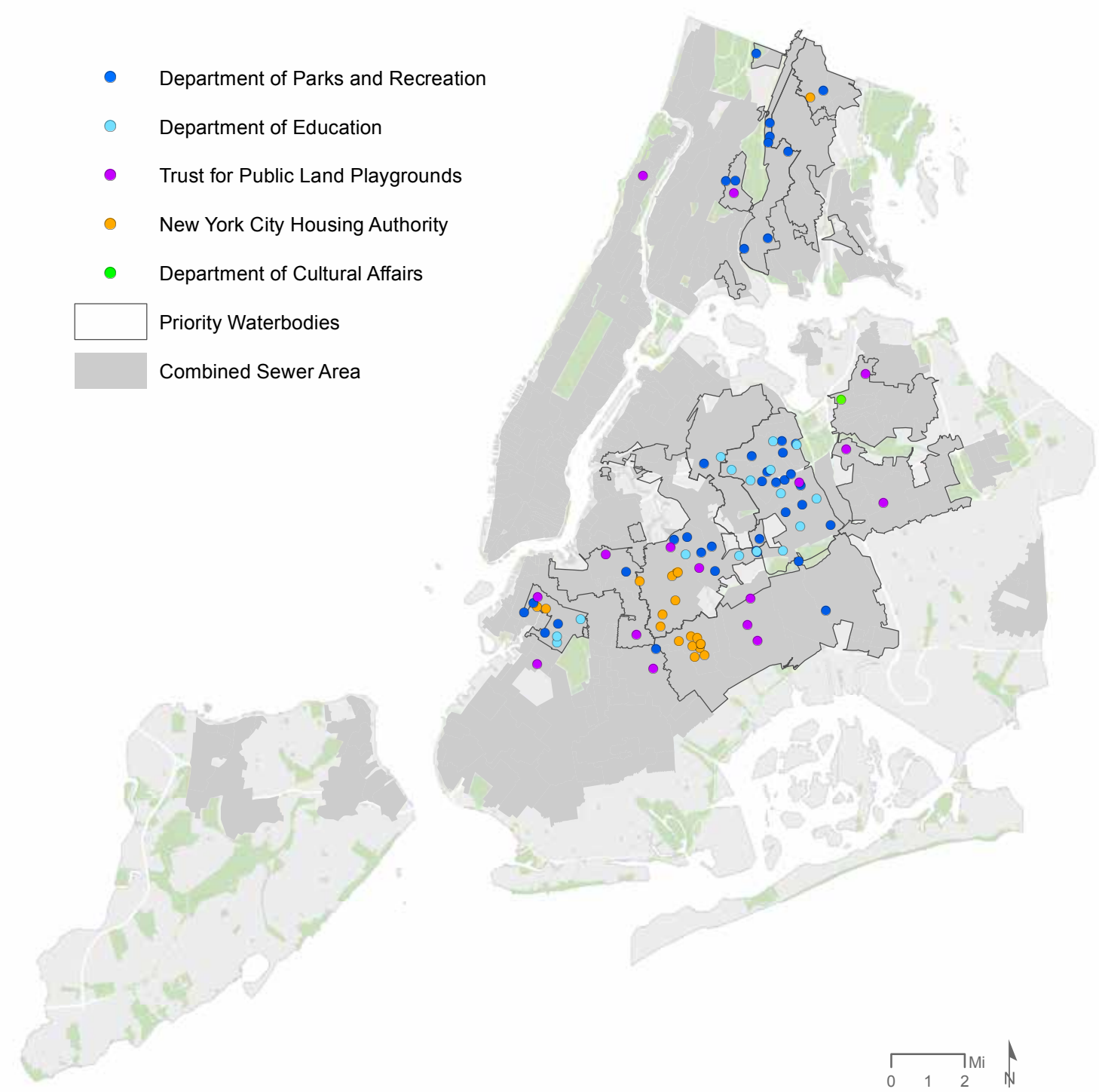


Figure 8: *Public property retrofit locations*

Site Name	Status	Actual/Projected Completion Date
Parks (DPR)		
Watson Gleason Playground	Prelim. Design	Winter 2015
Washington Park	Potential	Fall 2016
Carroll Park	Potential	Fall 2016
Grover Cleveland Park	Potential	Fall 2016
Benninger Playground	Potential	Fall 2016
Middle Village Playground	Potential	Fall 2016
Starr Playground	Potential	Fall 2016
Ehrenreich-Austin Playground	Potential	Fall 2016
Hoffman Park	Potential	Fall 2016
Newtown Playground	Potential	Fall 2016
Lost Battalion Hall Rec Center	Potential	Fall 2016
Grand Slope	Potential	Fall 2016
Forest Park-Victory Field	Potential	Fall 2016
Real Good Park	Potential	Fall 2016
Corona Golf Playground	Potential	Fall 2016
Josephine Caminiti Playground	Potential	Fall 2016
Park of the Americas	Potential	Fall 2016
Stars & Stripes Playground	Potential	Winter 2016
Whalen Grove Triangle	Potential	Winter 2016
Quarry Ballfields	Potential	Winter 2016
Mazzei Playground	Potential	Winter 2016
Zimmerman Playground	Potential	Winter 2016
Magenta Playground	Potential	Winter 2016
Woodlawn Playground	Potential	Winter 2016
Parkside Playground	Potential	Winter 2016
Colgate Close Park	Potential	Winter 2016
Noble Playground	Potential	Winter 2016
Big Bush Park	Potential	TBD
Veterans Grove	Potential	TBD
P.O. Nicholas Demutiis Park	Potential	TBD
Sumner Playground	Potential	TBD
Arthur Somers Playground	Potential	TBD
Jointly Operated Playgrounds (DOE/DPR)		
Boerum Park / Cobble Hill Sch.	Prelim. Design	Spring 2016
Pinocchio Playground	Prelim. Design	Spring 2016
Park Slope Plgd / P.S. 282	Potential	Fall 2016
Evergreen Park / P.S. 68	Potential	Fall 2016
Rosemary's Playground	Potential	Fall 2016
Annadale Playground / P.S. 175	Potential	Fall 2016
Russell Sage Plgd / JH.S. 190	Potential	Fall 2016
The Painter's Plgd / P.S. 174	Potential	Fall 2016
Horace Harding Plgd / P.S. 206	Potential	Fall 2016

Site Name	Status	Actual/Projected Completion Date
Schools (DOE)		
P.S / M.S. 194	Constructed	Oct. 2013
John Jay Educational Campus	Prelim. Design	Spring 2016
P.S. 321 William Penn School	Prelim. Design	Spring 2016
P.S. 91 Richard Arkwright	Prelim. Design	Spring 2016
P.S. 81 Jean Paul Richter	Prelim. Design	Spring 2016
P.S. 139 Rego Park	Prelim. Design	Spring 2016
I.S. 119 Glendale	Prelim. Design	Spring 2016
P.S. 9 Teunis Bergen	Prelim. Design	Fall 2016
P.S. / I.S. 113 Isaac Chauncey	Prelim. Design	Fall 2016
P.S. 144 Col Jeromus Remsen	Prelim. Design	Fall 2016
I.S. 5 Walter Crowley	Prelim. Design	Fall 2016
P.S. 102 Bayview	Prelim. Design	Fall 2016
P.S. 303	Prelim. Design	Fall 2016
P.S. 13 Clement C Moore	Prelim. Design	Fall 2016
P.S. 12 James Colgate	Prelim. Design	Fall 2016
P.S. 28 / Thomas Emanuel ECC	Prelim. Design	Fall 2016
Housing Developments (NYCHA)		
Hope Gardens-Demonstration	Constructed	Sep. 2013
Seth Low-Demonstration	Constructed	Sep. 2013
Gowanus	Prelim. Design	Fall 2016
Wyckoff	Prelim. Design	Fall 2016
Edenwald Houses	In Construction	Fall 2018
Brevoort	Potential	TBD
Brownsville	Potential	TBD
Carter G Woodson	Potential	TBD
Garvey	Potential	TBD
Glenmore Plaza	Potential	TBD
Hope Gardens / Bushwick II	Potential	TBD
Howard	Potential	TBD
Kingsborough	Potential	TBD
Kingsborough Extension	Potential	TBD
Roosevelt II	Potential	TBD
Saratoga Village	Potential	TBD
Seth Low	Potential	TBD
Tilden	Potential	TBD
Van Dike I / II	Potential	TBD
Cultural Centers (DDC/DCLA)		
Flushing Town Hall	In Construction	Spring 2016

Table 5: *Status of public property green infrastructure retrofit projects*

Community Parks Initiative

In addition to DEP's ongoing efforts to site green infrastructure in parkland and playgrounds, in fall 2014 DEP committed $36 million towards green infrastructure construction as part of the new City Parks Initiative (CPI) launched by DPR. This new $130 million capital program targets park improvements in underserved neighborhoods throughout the City. In Phase 1 of the CPI, DPR will reconstruct 34 parks in their target areas, 29 of which are within combined sewer areas (see Figure 9). For a complete list of CPI Phase 1 sites, see the DPR website at www.nycgovparks.org/.

Types of green infrastructure practices built on parkland will vary depending on the needs of each community and the particular characteristics of each site. In general, types of green infrastructure installed could include bioretention practices such as rain gardens, permeable paving, and subsurface detention systems or synthetic turf fields with infiltration capacity. DPR aims to maximize management of stormwater runoff from impervious surfaces both on the CPI site and from adjacent right-of-way. Going forward, DEP will continue to collaborate with DPR in support of green infrastructure implementation in the CPI Phase 1 projects and in future phases of the program.

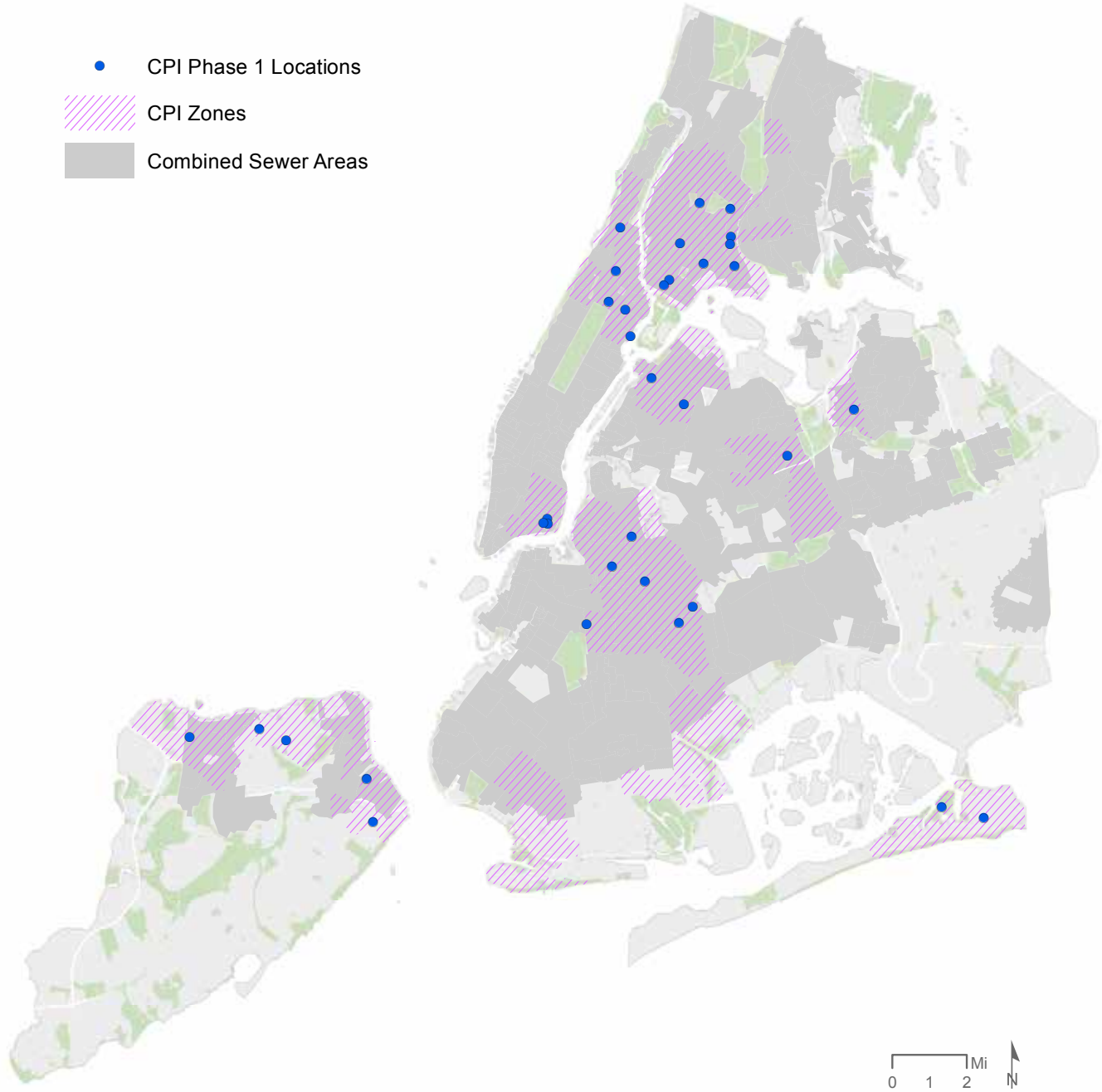


Figure 9: *Community Parks Initiative Phase 1 sites*

Public-Private Partnerships

Green Infrastructure Schoolyards

Since 2011, DEP has partnered with the not-for-profit Trust for Public Land (TPL), SCA, and DOE to renovate neighborhood school playgrounds, committing up to $20 million over four years. This partnership is a successful component of DEP's strategy to leverage public-private partnerships to improve public property using green infrastructure retrofits. In 2014, the partnership continued its efforts to screen and identify project sites, expanding into all combined sewer areas Citywide. To date the partnership has built six schoolyards, and design is complete at two additional sites. Together the six built sites manage three acres of impervious area and more than 2.1 million gallons of stormwater annually.

Looking ahead, the partnership recently added seven new schoolyards to the schedule, three of which are in design (see Table 6 and Figure 8). Sites listed as potential are undergoing initial suitability analysis. Sites in preliminary design are in the later stages of feasibility analysis. The partnership will continue to identify potential schoolyard sites in combined sewer areas that meet multiple goals. J.H.S. 162 in Brooklyn is featured in the case study on page 37.

J.H.S. 157-Queens playground, Before

J.H.S. 157-Queens green infrastructure playground, After

School Name	Borough	Status	Actual/Projected Completion Date
P.S. 65 Cesiah Toro Mullane School	Brooklyn	Constructed	September 2013
J.H.S. 218 J.P. Sinnott Brooklyn	Brooklyn	Constructed	September 2013
P.S. 261	Brooklyn	Constructed	September 2013
J.H.S. 162 The Willoughby	Brooklyn	Constructed	September 2014
J.H.S. 157 Stephen A Halsey	Queens	Constructed	September 2014
C.S. 300 I.S. 191 / P.S. 129 / P.S. 234	Bronx	In Construction	June 2015
P.S. 75 Robert E. Peary School	Queens	Design	Winter 2015
P.S. 120	Queens	Preliminary Design	Fall 2016
J.H.S. 185 Edward Bleeker School	Queens	Design Final	Fall 2016
I.S. 71	Brooklyn	Design	Fall 2016
P.S. 295 / I.S. 88	Brooklyn	Design	Winter 2016
I.S. 232 / 581 / 585	Manhattan	Potential	Spring 2017
P.S. 48	Bronx	Potential	Spring 2017
I.S. 390 / Kipp Academy	Brooklyn	Potential	Fall 2017
I.S. 250 / RFK Community Middle School / Queens School of Inquiry	Queens	Potential	Fall 2017

***Table 6:** Status of Trust for Public Land green infrastructure playground projects*

Green Infrastructure Grant Program

Since its introduction in 2011, the Grant Program has sought to strengthen public-private partnerships and public engagement in regards to the design, construction and maintenance of green infrastructure on private property. To date, the Grant Program has committed more than $13 million to 33 private property owners to build green infrastructure projects in combined sewer areas (see Table 7 and Figure 10). Additionally, the Order required the Grant Program to commit $3 million of Environmental Benefits Program (EBP) funds to grant projects by 2014.[9] In January 2015, DEP certified the fulfillment of this requirement.

Two grant recipients completed construction of their projects in 2014: Albert Einstein College of Medicine completed construction of a green roof in the center of campus in the Bronx in November 2014; and the Banana Kelly Community Improvement Association completed construction of a green roof, cisterns, and rain garden systems at a multi-building affordable housing renovation project in the Bronx in July 2014. Banana Kelly's project, Kelly Street Green, is pictured below and featured in the case study on page 39.

DEP surveys grant applicants after each yearly grant cycle, and regularly implements respondents' suggestions for improving the application and submission process. Survey results indicated a desire for more opportunities to apply for the grant during the year and for pre-meetings with DEP on possible projects before application development. In response, DEP offered two 2014 submission deadlines, one in the spring and one in the fall.

In advance of both deadlines, DEP offered workshops in the Bronx, Brooklyn, Manhattan and Queens. Also in 2014, applicants were able to meet with DEP engineers before the applications were due. This allowed applicants to receive substantive feedback on their conceptual plans and proposals and submit stronger applications. DEP also continued to simplify and improve its online application. By the end of the year, the DEP review committee selected six projects and committed approximately $3 million across three boroughs. Various types of green infrastructure will be constructed, including green roofs, rooftop farms and rain gardens.

DEP expanded and enhanced its outreach efforts to private property owners last year. With the help of other City agencies such as the Mayor's Office of Sustainability and the New York City Economic Development Corporation (EDC), DEP targeted owners of properties having large impervious areas such as industrial lots, hospitals, and universities. DEP also met with real estate managers and Business Improvement Districts. The ultimate goal of this outreach is to educate private property owners about the importance of sustainable stormwater management and encourage these owners to apply for Grant Program funding. DEP will continue to conduct outreach and simplify the grant application process and anticipates launching a rolling admission process in 2015. This process will allow applicants to submit proposals as soon as they are complete.

Kelly Street Green, Before

Kelly Street Green, After

[9] EBP Projects are undertaken by DEP in connection with the settlement of an enforcement action taken by New York State and DEC for violations of New York State law and DEC regulations.

Grant Project Name	Borough	Status	Actual/Projected Completion Date
Brooklyn Navy Yard	Brooklyn	Constructed	Apr. 2012
Queens College	Queens	Constructed	Oct. 2012
Lenox Hill Neighborhood House	Manhattan	Constructed	Jun. 2013
The New School University*	Manhattan	Constructed	Jul. 2013
Osborne Association	Bronx	Constructed	Sep. 2013
Gil Hodges Community Garden	Brooklyn	Constructed	Nov. 2013
Bishop Loughlin Senior High School	Brooklyn	Constructed	Dec. 2013
Banana Kelly Community Improvement Association*	Bronx	Constructed	Jul. 2014
Albert Einstein College of Medicine*	Bronx	Constructed	Nov. 2014
Poppenhusen Institute	Queens	Constructed	Apr. 2015
Ballet Tech Foundation*	Manhattan	Design Final	Spring 2015
Fifth Avenue & 46th Street Association*	Manhattan	Design Final	Spring 2015
Phoenix Restoration Building	Brooklyn	Design Final	Spring 2015
South Bronx Economic Development Corp.-Jasmine Court*	Bronx	Design Final	Spring 2015
South Bronx Economic Development Corp.-Venture Center*	Bronx	Design Final	Spring 2015
Forest House Affordable Housing	Bronx	Design Final	Summer 2015
Local 1 Plumber's Union	Queens	Design Final	Summer 2015
Pratt Institute*	Brooklyn	Design Final	Summer 2015
Related Companies	Manhattan	Design Final	Summer 2015
The Church of St. Luke & St. Matthew*	Brooklyn	Design Final	Summer 2015
Wildlife Conservation Society (Bronx Zoo)	Bronx	Design Final	Fall 2015
Montefiore Medical Center-Wakefield Campus	Bronx	In Design	Summer 2015
Bedford Stuyvesant Restoration	Brooklyn	In Design	Fall 2015
New York Botanic Garden	Bronx	In Design	Fall 2015
20 Lafayette L.L.C.	Brooklyn	In Design	TBD
Gowanus Arts	Brooklyn	In Design	TBD
Jewish Association Serving the Aging (JASA)	Manhattan	In Design	TBD
Madani Halal	Queens	In Design	TBD
Montefiore Medical Center-Moses Campus	Bronx	In Design	TBD
Paradise Garden	Bronx	In Design	TBD
Queens College Dining Hall	Queens	In Design	TBD
Salmar Building	Brooklyn	In Design	TBD
Two Bridges Neighborhood Council	Manhattan	In Design	TBD

** Indicates EBP project*

Table 7: *Status of Green Infrastructure Grant Program projects*

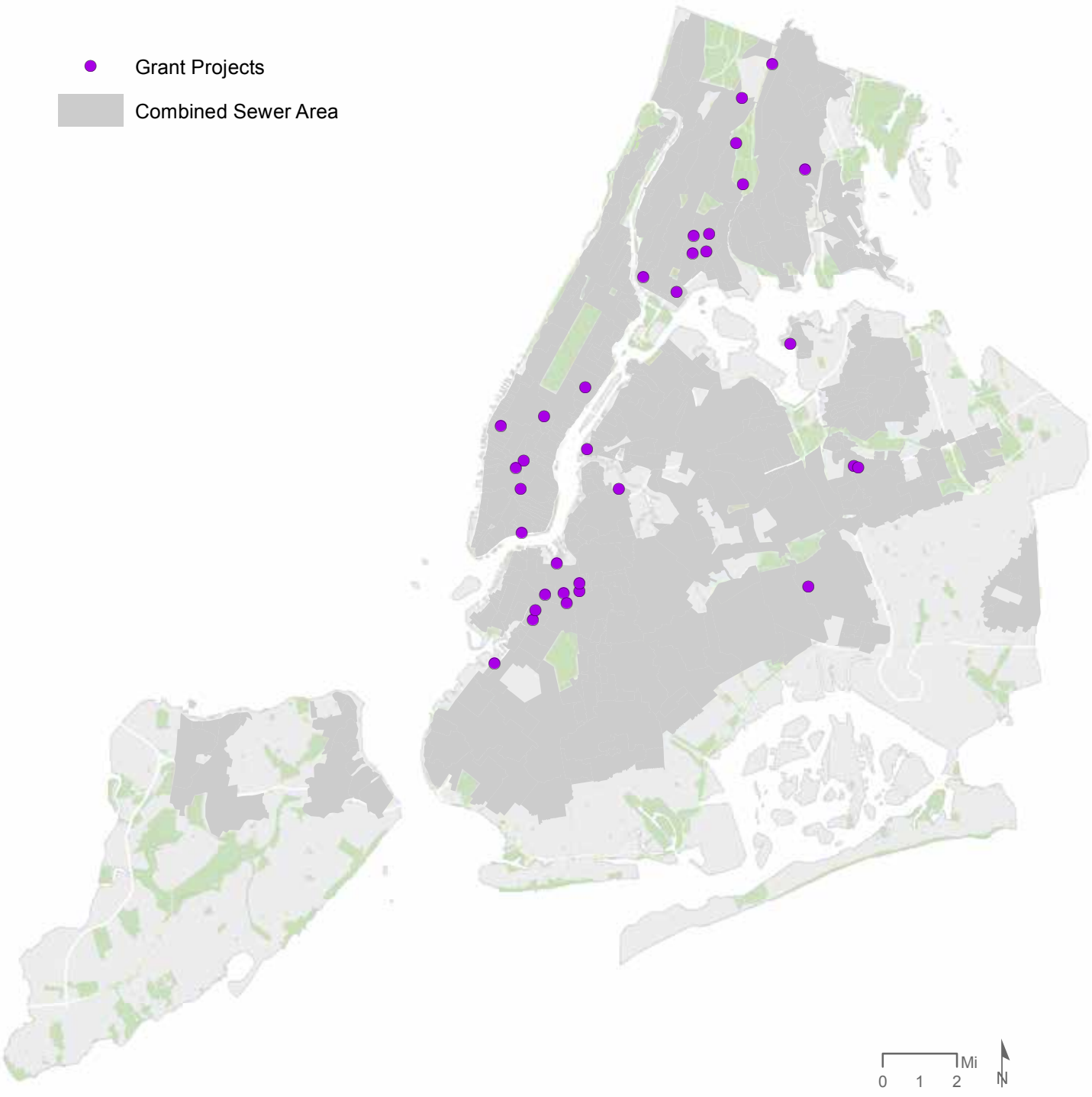


Figure 10: *Green Infrastructure Grant Program projects*

Public Outreach and Engagement

Beginning in 2014, much of DEP's direct education and engagement with the public has been through design and construction notification for the Area-wide contracts. These interactions have been opportunities for DEP to also explain the many benefits of green infrastructure. DEP continues to meet regularly with local elected officials, community boards, environmental organizations, and civic groups on many topics. For instance, DEP provides updates for their districts on the scale of the green infrastructure efforts, responds to questions and concerns, and provides information on construction timelines and impacts. Also see the "Area-wide Right-of-way Contracts" section for further description of DEP's construction notification and outreach activities.

In 2014, DEP expanded and restructured the Green Infrastructure Steering Committee and formally established a Water Infrastructure Steering Committee. As a result, the Water Infrastructure Steering Committee now includes a larger variety of environmental stakeholders, environmental justice organizations, design and engineering professionals, community based organizations, and government entities such as Region 2 of the USEPA and DEC. The committee meets periodically on critical DEP initiatives such as the Long-term Control Plans, the Municipal Separate Storm Sewer System (MS4) permit, and resiliency planning.

DEP held 13 Long-term Control Plan public meetings for Westchester Creek, Hutchinson River, Flushing Creek, and the Gowanus Canal in 2014. At these meetings, DEP's Bureau of Wastewater Treatment presented water-quality data, grey infrastructure design and construction projects, and potential alternatives for CSO controls. OGI presented the most up-to-date information on green infrastructure design and construction in the individual watersheds. For each LTCP, the public is encouraged to provide feedback, comments and suggestions on the grey and green infrastructure planning and analysis. More information is available in the "Green Infrastructure and Long Term Control Plans" section of this report.

DEP created BioswaleCare with MillionTreesNYC to engage local residents in environmental stewardship for green infrastructure in the right-of-way. DEP offered one BioswaleCare workshop in 2014 in partnership with The Church of St. Luke and St. Matthew in downtown Brooklyn. During a typical workshop, DEP and DPR staff provide information about the trees, plant species, and bioswale function. Participants are able to practice caring for the bioswale by clearing inlets and outlets, removing weeds, and using tools to maintain the grading. Throughout 2014, DEP also met with multiple City agencies and neighborhood organizations to discuss future models for stewardship programming. As construction completes on Area-Wide bioswale contracts in 2015, DEP will offer more workshops and engagement opportunities.

Green infrastructure workshop, Grow Our Grassroots Conference

Throughout the year, DEP participated in numerous workshops and conferences around the City and country. The City-based events served as a venue to educate New Yorkers about DEP's efforts to reduce CSOs and improve water quality through the construction and maintenance of green infrastructure. These events included the Grow our Grassroots Summit with MillionTreesNYC, the New York City Housing Authority Grows with its Gardens Annual Conference, and DEP's ongoing participation in the City's urban agriculture task force. National conferences provided opportunities for DEP to present the Program to other municipalities and share best practices. These conferences included the Green Infrastructure & Water Management in Growing Metropolitan Areas conference at the Patel College of Global Sustainability, the United States Environmental Protection Agency's (USEPA's) webinar on Building Climate Resilience with Green Infrastructure, the Water Environment Federation's Annual Technical Conference and the USEPA's 2nd Annual Green Infrastructure Summit.

Progress toward Implementation Goals

Green roof at New School University, Manhattan

Built and Planned Green Infrastructure

Since the establishment of the Program, DEP has built green infrastructure assets throughout the City's combined sewer area, both on private property and publicly owned property, including the right-of-way. Green infrastructure assets typically include bioinfiltration practices (Right-of-way Bioswales and Rain Gardens, Stormwater Greenstreets, rain gardens, swales), permeable paving, subsurface detention systems with infiltration capability, synthetic turf fields with infiltration capability, stormwater harvesting and reuse systems, blue roofs, and green roofs.

Table 8 reflects the progress DEP has made in 2014 and projects further progress for 2015. The table sums the acres managed by "Total Waterbodies" without East River/Open Waters, and the acres managed by "Total Citywide," which includes East River/Open Waters.[10] While green infrastructure contracts are underway for parts of the East River/Open Waters watershed, DEP has prioritized and initially invested resources for green infrastructure in other combined sewer areas tributary to waterbodies that do not comply with existing water quality standards. By implementing the Program in this manner, DEP hopes to achieve real water quality benefits from the projects and either remove or limit the reliance on grey infrastructure in these areas.

- The first three columns show (from left to right) the total impervious area within the combined sewer areas of the City, the 10 percent impervious area managed goal for the 2030 milestone, and the 1.5 percent impervious area managed goal for the 2015 milestone.

Photo by C. Hamby

Right-of-way Bioswale, Brooklyn

[10] The waterbodies included in East River/Open Waters watershed, namely the East River and Hudson River, already meet the existing water quality standards and are cleaner than they have been in a century due to extensive investment by DEP in grey infrastructure improvements.

- The “2010-2014 Built” columns show the cumulative amount of impervious area managed by green infrastructure constructed between 2010 and 2014: 31 acres for Total Waterbodies and 53 acres for Total Citywide.
- The “2015 Planned” columns project all green infrastructure assets that will be constructed, will be in construction, or will have a registered contract with a Notice to Proceed by December 31, 2015. Assets shown here are projected to manage 495 impervious acres once completed.
- The “Total 2010-2015” column sums the acres managed from the “2010-2014 Built” and “2015 Planned” columns and is shown as total acres managed and the percent of impervious acres managed per waterbody as compared to the 10 percent of IACS column.[11] Based on the best information currently available, DEP is projecting that 1.3 percent of impervious area managed in the Waterbodies and 0.7 percent Citywide by 2015.

The 1.3 percent impervious area managed in the Waterbodies is less than the 1.4 percent anticipated in the 2013 Annual Report and the Citywide managed area remained unchanged at 0.7 percent from 2013 to 2014. In the development of the 2013 Annual Report, DEP optimistically projected success rates and anticipated design and construction timelines. In this 2014 Annual Report, those projection methods and timelines have been adjusted to more accurately reflect the Program.

Due to the design and field experience gained over the last year, DEP is now able to better project the number of sites to be completed by a given date. As Area-wide construction work was initiated, the timelines for design completion, contract registration, mobilization, and construction sequencing were better understood. This has enabled DEP to better anticipate project schedules based on actual progress and lessons learned.

Looking ahead, DEP anticipates meeting the 2015 Order requirement by the end of 2016 (Table 9). Based on these projections, DEP expects to be well situated to continue implementation of the Program at a more efficient rate going forward, particularly related to advancing the public property projects that are in design now. Additionally, DEP is making efforts to increase participation in the Grant Program and working to develop other incentives for private property owners to install green infrastructure.

DEP will consider issues such as implementation challenges, field conditions, timelines, monitoring results, and costs as part of a contingency plan under the Order. As the Order allows DEP to employ adaptive management principles for green infrastructure, the contingency plan would aim to refine and reframe the green infrastructure implementation goals in more realistic terms by building on experience.

[11] At present, impervious area managed because of the Stormwater Rule is not included in Tables 8 and 9. As noted in “Institutionalizing Green Infrastructure,” New York City’s Stormwater Rule is intended to reduce stormwater flow rates to the combined sewer system. DEP will develop a methodology to apply the area managed per the Stormwater Rule towards the Order milestones and present these results in 2015

Waterbodies	Impervious Area within Combined Sewer Tributary, IACS (ac)	10% of IACS Tributary (ac)	1.5% of IACS Tributary (ac)	2010-2014 Built		2015 Planned		Total 2010-2015	
				Number of Assets	IACS Managed (ac)	Number of Assets[1]	IACS Managed (ac)	Total IACS Managed (ac)	Total Percent of IACS Managed
Alley Creek	1,490	149	22	0	0.0	0	0.0	0.0	0.0%
Bronx River*	2,331	233	35	35	8.7	9	5.1	13.8	0.6%
Coney Island Creek	694	69	10	0	0.0	0	0.0	0.0	0.0%
Flushing Bay*	4,049	405	61	54	5.0	838	73.2	78.2	1.9%
Flushing Creek*	5,923	592	89	14	2.3	472	39.8	42.1	0.7%
Gowanus Canal*	1,387	139	21	18	2.1	92	6.2	8.3	0.6%
Hutchinson River*	1,128	113	17	22	1.4	84	8.1	9.5	0.8%
Jamaica Bay & CSO Tributaries*	7,891	789	118	56	7.7	1,101	109.6	117.3	1.5%
Newtown Creek*	4,524	452	68	27	3.3	1,862	151.9	155.2	3.4%
Paerdegat Basin	4,725	473	71	1	0.0	0	0.0	0.0	0.0%
Westchester Creek*	3,480	348	52	3	0.3	759	62.7	63.1	1.8%
Total Waterbodies	**37,622**	**3,762**	**564**	**230**	**30.9**	**5,217**	**456.7**	**487.6**	**1.3%**
East River & Open Waters (ER/OW)	41,127	4,113	617	52	21.6	406	38.4	60.0	0.1%
Total Citywide[2]	**78,749**	**7,875**	**1,181**	**282**	**52.5**	**5,623**	**495.1**	**547.6**	**0.7%**

** Priority waterbodies*
[1] Projected sites that will either be constructed, in construction or have a registered contract with a Notice to Proceed
[2] Total Other Waterbodies plus ER/OW

Table 8: *Built and planned green infrastructure assets and impervious area managed, 2010-2015*

Waterbodies	Impervious Area within Combined Sewer Tributary, IACS (ac)	10% of IACS Tributary (ac)	1.5% of IACS Tributary (ac)	Total 2010-2015		Total Projected 2010-2016	
				Total IACS Managed (ac)[1]	Total Percent of IACS Managed	Total IACS Managed (ac)[2]	Total Percent of IACS Managed
Alley Creek	1,490	149.0	22.4	0.0	0.0%	0.0	0.0%
Bronx River*	2,331	233.1	35.0	13.8	0.6%	13.8	0.6%
Coney Island Creek	694	69.4	10.4	0.0	0.0%	0.0	0.0%
Flushing Bay*	4,049	404.9	60.7	78.2	1.9%	78.2	1.9%
Flushing Creek*	5,923	592.3	88.8	42.1	0.7%	236.6	4.0%
Gowanus Canal*	1,387	138.7	20.8	8.3	0.6%	8.3	0.6%
Hutchinson River*	1,128	112.8	16.9	9.5	0.8%	9.5	0.8%
Jamaica Bay & CSO Tributaries*	7,891	789.1	118.4	117.3	1.5%	213.0	2.7%
Newtown Creek*	4,524	452.4	67.9	155.2	3.4%	184.3	4.1%
Paerdegat Basin	4,725	472.5	70.9	0.0	0.0%	0.0	0.0%
Westchester Creek*	3,480	348.0	52.2	63.1	1.8%	63.1	1.8%
Total Waterbodies	**37,622**	**3,762.2**	**564.0**	**487.6**	**1.3%**	**806.9**	**2.1%**
East River & Open Waters (ER/OW)	41,127	4,113.0	617.0	60.0	0.1%	375.7	0.9%
Total Citywide[3]	**78,749**	**7,875.2**	**1,181.0**	**547.6**	**0.7%**	**1,182.6**	**1.5%**

** Priority waterbodies*

[1] Projected sites that will either be constructed, in construction or have a registered contract with a Notice to Proceed

[2] Projected locations in active contracts with partnering agencies that will be constructed in 2016. Projections are based on the results of previous contracts

[3] Total Other Waterbodies plus ER/OW

***Table 9:** Estimation of built and planned green infrastructure assets and impervious area managed, 2010-2016*

Green Infrastructure Program Budget

As part of the initial goal to meet the 2015 Order milestone, DEP agreed to encumber $187 million toward the implementation of green infrastructure by December 31, 2015 to show DEP's commitment to reducing CSOs using green practices. To date, DEP has exceeded that requirement and has encumbered over $200 million in capital funding and almost $8 million in expense funding toward the Program. In addition, the Order required DEP to set aside $5 million as EBP funding: $3 million for the Grant Program and $2 million for the Demonstration Projects. Both of those EBP funding commitments have been met. Program-wide, DEP works to ensure that all costs stay competitive and that economies of scale are realized for all contracts. As an example, DEP's updated average cost for a 20' x 5' Right-of-way Bioswale is $26,200 as of 2014, which is nearly $10,000 less than the reported costs in the 2012 Annual Report (Table 10).

Project Phase	Average Cost
Design, Survey & Geotechnical Investigation	$7,700
Construction[1]	$16,500
Construction Management	$2,000
Total	**$26,200**

[1] Average construction cost is based on a typical 20' by 5' Right-of-way Bioswale.

***Table 10:** Average Right-of-way bioswale design and construction cost*

In Area-wide contracts the design, survey, and geotechnical investigation costs can represent a higher percentage of the total cost per location than typical construction projects. This detailed design work is critical to the ultimate success of the Program to ensure each site functions properly. Therefore, DEP is conservatively requiring geotechnical investigations at most proposed green infrastructure locations. As the Program progresses, DEP will evaluate its procedures and criteria as needed to keep costs reasonable while ensuring that all built green infrastructure practices will be functional over the long term.

Capital Funding

The Program has now encumbered over $200 million with another $850 million budgeted over the next 10 years (Table 11). Capital funding covers costs such as site selection, design, construction, and construction management for green infrastructure projects. This capital funding will support green infrastructure contracts undertaken by DEP and agency partners, including the Area-wide contracts, the Grant Program, TPL partnership projects, and retrofit projects with other City agencies.

Fiscal Year	Encumbered Capital Funding
FY12	$9,015,345
FY13	$15,943,969
FY14	$152,935,549
FY15[1]	$31,400,000
TOTAL	**$209,294,863**

Fiscal Year	Approved FY 2016 Preliminary Ten Year Plan
FY15[2]	$64,182,816
FY16 - FY25	$786,171,000
TOTAL	**$850,353,816**
PROGRAM GRAND TOTAL[3]	**$1,059,648,679**

[1] Encumbered to date
[2] FY15 Remaining
[3] Estimated total based on the total encumbered and the Approved FY16 Preliminary 10 Year Plan

***Table 11:** Green Infrastructure Program capital budget*

Expense Funding

The Program's approved and proposed expense budget through FY17 is $40 million, which covers operational costs, such as maintenance of green infrastructure, office and field staff, materials, equipment, and other non-capitally eligible programmatic needs (Table 12).

Fiscal Year	Expense Funding (Actual Expended)
FY12	$615,295
FY13	$3,269,689
FY14	$3,892,778
TOTAL	**$7,777,762**

Fiscal Year	Approved and Proposed Expense Budget
FY15	$9,702,305
FY16[1]	$14,139,945
FY17[1]	$16,769,259
TOTAL[1]	**$40,611,554**

[1] At the time of this publication, the OGI Expense Budget for FY16-17 has not yet been approved by the Mayor's Office of Management and Budget. Proposed costs are pending and should not be considered final.

***Table 12:** Green Infrastructure Program expense budget*

Adaptive Management & Lessons Learned

Rain garden at Hope Gardens Houses, Brooklyn

DEP's adaptive management strategy includes regular monitoring of green infrastructure performance, continuous evaluation of lessons learned in the field, furthering the understanding of green infrastructure co-benefits, and development of additional cost-effective tools to implement. The Neighborhood Demonstration Areas Post-Construction Monitoring Report and the Co-Benefits Study described below were significant achievements in 2014.

Neighborhood Demonstration Areas

The Order required DEP to implement three Demonstration Areas, monitor the projects, and report on the results. The three projects culminated in August 2014 with the submission of the Post-Construction Monitoring Report, which was reviewed by DEC and then revised and resubmitted by DEP in January 2015. The Post-Construction Monitoring Report results showed a decrease in stormwater runoff entering the combined sewers in all three areas after the construction of the green infrastructure practices. For storms less than or equal to one inch, the runoff entering the combined sewers at the manhole where the flow meters were installed decreased by 20 to 23 percent across all three areas.

In terms of impervious surfaces managed, Demonstration Areas 1 and 2 managed 17.9 and 18.7 percent, respectively, almost doubling the Order goal of 10 percent. Due to the limited space available to install green infrastructure practices in Demonstration Area 3, only 5.1 percent of the impervious surfaces were managed. However, when considering the aggregate area from all three Demonstration Areas, the managed area was calculated as 14.3 percent, which surpasses the goal.

The Post-Construction Monitoring Report results showed that the right-of-way green infrastructure practices met or exceeded the expected performance rate. This suggests that the current model for estimating the capacity of green infrastructure practices as described in the Post-Construction Monitoring Report is slightly conservative but appropriate for planning purposes. Other findings from the study include improved performance for Right-of-way Bioswales with stone gabions compared to those without them. As a result, DEP has added stone gabions to the Right-of-way Bioswale design standards.

DEP will utilize the analyses completed as part of the Post-Construction Monitoring Report to extrapolate the CSO reductions per waterbody in a Performance Metrics Report due in June 2016. The Performance Metrics analysis will also utilize data from other site-scale pilots and monitoring.

The Post-Construction Monitoring Report is available on DEP's website at www.nyc.gov/dep. A summary of the Demonstration Areas is shown in Table 13 and a full description is available in the 2013 Annual Report.

Green Infrastructure Neighborhood Demonstration Area	Milestone Date	Certification Date
26th Ward Neighborhood Demonstration Area		
1. Submit Engineering Report and Design	March 2012	March 30, 202
2. Notice to Proceed to Construction	June 2012	June 20, 2012
3. Complete Construction	December 2012	December 31, 2012
4. Submit Post-Construction Monitoring Report	August 2014	August 31, 2014 / January 21, 2015
Hutchinson River Neighborhood Demonstration Area		
1. Submit Engineering Report and Design	April 2012	May 31, 2012
2. Notice to Proceed to Construction	August 2012	July 24, 2012
3. Complete Construction	April 2013	April 30, 2013
4. Submit Post-Construction Monitoring Report	August 2014	August 31, 2014 / January 21, 2015
Newtown Creek Neighborhood Demonstration Area		
1. Submit Engineering Report and Design	July 2012	July 10, 2012
2. Notice to Proceed to Construction	October 2012	October 25, 2102
3. Complete Construction	May 2013	May 10, 2013
4. Submit Post-Construction Monitoring Report	August 2014	August 31, 2014 / January 21, 2015

Table 13: *Neighborhood Demonstration Area project summary*

Updated Green Infrastructure Standard Designs

In 2014, OGI continued to update the Standards for Green Infrastructure in order to adapt to commonly encountered field limitations. For instance, OGI noted high concentrations of sites not meeting the minimum criteria of nine feet from the surface to the bedrock or groundwater below. After careful analysis of the geotechnical data for such locations, OGI developed a new standard design for a Right-of-way Rain Garden, which is shallower than the Right-of-way Bioswale and has minimum criteria of seven feet from the surface to bedrock or groundwater.

Right-of-way Rain Gardens are similar to Right-of-way Bioswales in footprint size and physical composition. However, while Right-of-way Bioswales are typically four feet six inches deep, Right-of-way Rain Gardens are only three feet deep (Figure 11). Due to the thinner layer of engineered soil, Right-of-way Rain Gardens do not have sufficient rooting space for trees. Instead, they include perennials, grasses, and groundcover plants. The updated standard design drawings are available on DEP's website at www.nyc.gov/greeninfrastructure.

Permeable Pavement Pilot Program

In 2013, the New York City Council passed Local Law 80 requiring DEP and DOT to embark on a study of three permeable pavement installations in the City's streets and sidewalks. Throughout 2014, the agencies worked together to identify pilot locations in the Gowanus Canal, Hutchinson River, and Flushing Bay Priority Areas, and developed

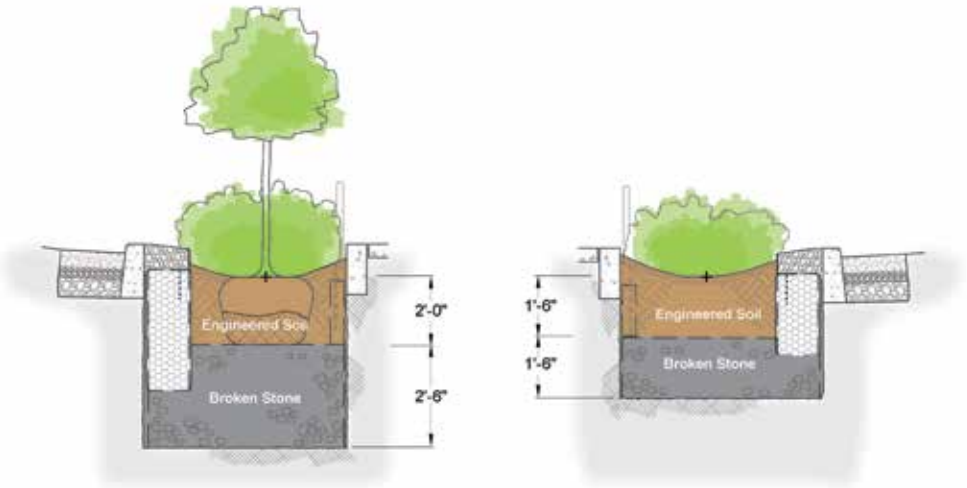


Figure 11: *Profile of standard Right-of-way Bioswale and standard Right-of-way Garden*

the monitoring protocol. Performance and operational monitoring data will be collected pre- and post-construction. Weather data will be collected near each pilot project and flow data will be collected in the sewers that collect runoff from the streets in the project area. DEP and DOT will submit study findings to the City Council in 2016.

Green Infrastructure Pilot Monitoring

In the 2013 Annual Report, DEP reported the complete findings of the three-year Pilot Monitoring program. The next round of monitoring, data collection, and analysis will be carried out through the research and development program described in the next section.

Green Infrastructure Co-Benefits Study

Green infrastructure is an effective means of stormwater management, which at the same time provides numerous additional benefits, or co-benefits, when compared to grey infrastructure. In 2014, DEP completed an effort to identify, characterize, and quantify the co-benefits of green infrastructure practices constructed through the Program and its pilot projects. The co-benefits listed below consist of environmental, social, and economic factors that extend beyond the direct stormwater management benefit that green infrastructure provides.

- Carbon Sequestration: Refers to the process of plants growing and storing carbon-containing biomass in their plant structure or in the soil. Green infrastructure introduces new vegetation, and absorbs CO2 from the atmosphere.
- Urban Heat Island Mitigation: The urban heat island effect is a phenomenon where urban surfaces capture significant amounts of heat, raising urban air temperatures, which during the summer increases energy costs for cooling and increases the rate of heat-related stress, illness and even death. This effect can be mitigated by using vegetation and other surfaces that reflect more solar radiation and store less heat than common urban surfaces like asphalt and concrete.
- Reduced Building Energy Demand: In addition to reducing the urban heat island effect, urban trees can reduce cooling needs during the summer through direct shading and green roofs can reduce heating and cooling by increasing roof insulation.
- Urban Habitat: Green infrastructure has the potential to support biodiversity by providing foraging and potential nesting habitat for pollinators and other beneficial wildlife within the urban environment.
- Air Quality: Through natural respiration processes, vegetation in green infrastructure physically and chemically removes pollutants from the air.
- Quality of Life: Green infrastructure, when implemented with easy public access and in areas with scarce existing vegetation provides significant community benefits, which can be reflected in increased property values, crime mitigation and enhancing the public's health and psychological state.
- Reduced Stormwater Treatment Needs: By retaining runoff during a typical storm event and preventing it

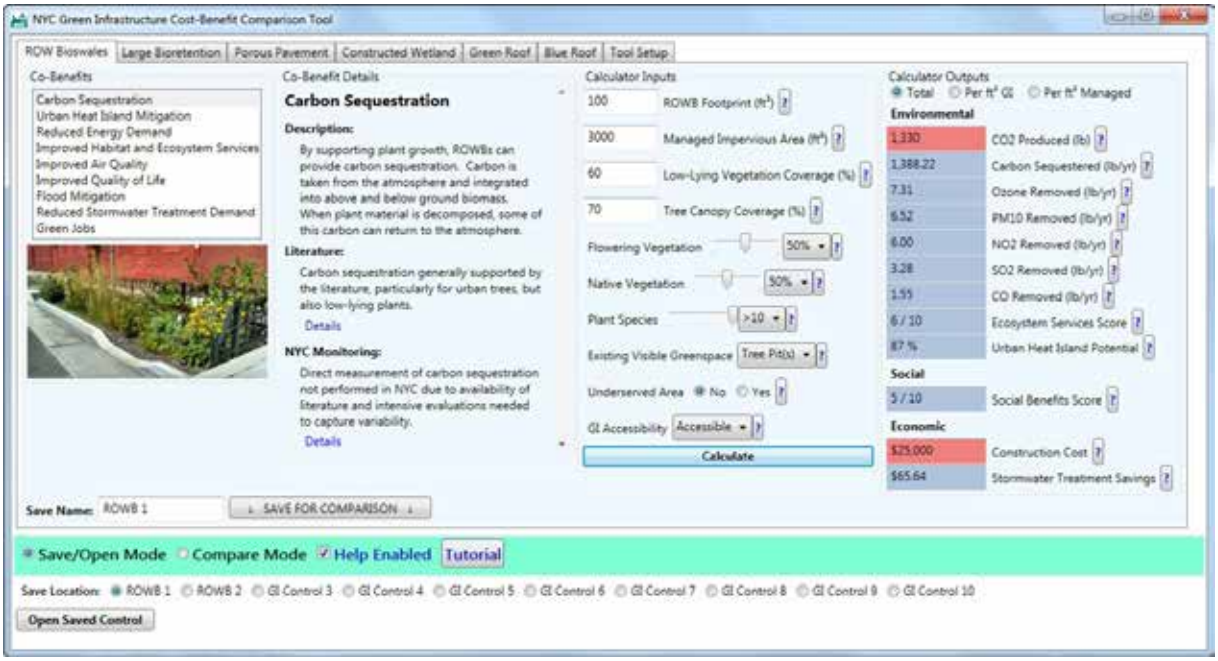


Figure 12: *Online Green Infrastructure Co-Benefits Calculator*

from reaching the wastewater treatment facility, costs associated with electricity and chemicals pumping and treatment are avoided.

- Green Jobs: Implementation of green infrastructure will create new job opportunities or sustain existing jobs especially in the operation and maintenance fields for workers who may otherwise be unemployed or underemployed.

The study and calculator quantify the co-benefits for six different types of green infrastructure typically used in New York City (Right-of-way Bioswales, larger bioretention areas, porous pavement, constructed wetlands, blue roofs, and green roofs). The co-benefits for these types of infrastructure were quantified using information collected in a literature review, pilot monitoring activities, and life cycle analyses of the environmental and economic costs of construction and maintenance. The literature review consisted of more than 100 peer-reviewed references and monitoring or modeling studies conducted in New York City, the US, and internationally. The pilot monitoring consisted of monitoring vegetation coverage using time-lapse cameras, measuring temperature with temperature sensors and infrared cameras, and soil health and pollinator observations. The life cycle analysis used a life cycle database, Sima-Pro, for calculating long term greenhouse gas emissions represented in kilograms of carbon dioxide equivalent (kg CO_2 eq) and long term construction and maintenance costs for each green infrastructure practice.

All of the findings were incorporated into an online Co-benefits Calculator. The Calculator allows users to input green infrastructure parameters (size of area, number of trees, vegetation coverage) and calculate the costs and non-stormwater benefits for that of different green infrastructure practices. Assumptions used in the Calculator (Figure 12) can be changed to reflect new information. To access the Co-Benefits Calculator, and for more information on the findings of the study, go to http://nycgicobenefits.net/ using Internet Explorer.

Findings

While summarizing the identified co-benefits in a single metric is challenging due to the wide variety and different perspectives on value, the study and the Co-Benefits Calculator seek to present a range of co-benefits in a non-subjective way that allows green infrastructure planners and designers identify and communicate additional benefits of green infrastructure practices in communities.

On a per square foot of green infrastructure practice basis, the study found that larger bioretention cells generally offer the highest level of benefit across all the co-benefit categories (Figure 13). This is due primarily to the inclusion of trees and the fact that bioretention cells have larger total areas that provide higher quality habitat and moderate economic and environmental costs. Right-of-way Bioswales offer the same level of co-benefits as bioretention cells, but at a higher environmental and economic cost due to added structures and materials to perform within the tightly constrained urban environment. In contrast, green roofs generally provide low or moderate levels of co-benefits, but also have some of the lowest environmental and economic costs. Not surprisingly, blue roofs and porous pavement, both of which do not contain vegetation, have the fewest co-benefits, but moderate or low costs.

Figure 13: *Relative co-benefits per square foot per type of green infrastructure practice*

Green Infrastructure Research and Development Program

In 2013, DEP initiated a comprehensive research and development program, which will move ahead in 2015 after encountering a contract-related delay in 2014. DEP has dedicated $10 million over five years towards this effort, which will support the Program by reviewing long-term performance success, ensure cost-effectiveness of maintenance, and conduct cost-benefit analyses of various green infrastructure designs. In addition, the scope of work will support DEP's development of LTCPs and other water quality related compliance documents, fill data gaps DEP has identified through previous green infrastructure monitoring activities, and review DEP's current modeling framework for calculating co-benefits. DEP will then incorporate these results into the overall Program.

DEP's objectives for this research and development program are to: evaluate and continue to expand DEP's monitoring program; develop and implement a green infrastructure monitoring protocol; evaluate the data collected and make recommendations for the Program at multiple scales and in various conditions (e.g., land use, topography, etc.); analyze the costs of current and proposed green infrastructure designs; evaluate and advise on appropriate maintenance practices and protocols; and recommend additional tools or materials that can advance the performance of green infrastructure.

Examples of scientific data collection, analyses, and/or technical research that the research and development program may include:

- Quantify stormwater inflow, outflow, infiltration, and evapotranspiration
- Monitor engineered soil mixes for optimal infiltration rates, stormwater capacity, and plant growth
- Study stormwater lateral infiltration
- Monitor green roofs and growing media types
- Recommend optimal vegetation selection based on stormwater management and ecological goals
- Monitor multiple tree species' water uptake/ evapotranspiration rates
- Review and advise on maintenance practices, levels of effort, and thresholds for performance
- Evaluate design and construction costs for built green infrastructure practices
- Quantify potential green infrastructure co-benefits or sustainability metrics, including temperatures and cooling effects of vegetated green infrastructure practices
- Review existing and new technologies that can maximize stormwater detention
- Review existing and develop new innovative modeling algorithms to capture the performance of green infrastructure elements at various spatial scales

Permeable Pavers and Synthetic Turf, P.S. 261, Brooklyn

Case Study:
Trust for Public Land and J.H.S. 162

Project Owner: New York City Department of Education

Project Location: 1390 Willoughby Avenue, Brooklyn

CSO Tributary Area: Newtown Creek, NCB-083

Technologies: Synthetic Turf Field, Rain Garden, Permeable Pavers, Shade Trees

Impervious Area: 12,734 square feet

Annual Storage Volume: Estimated 400,000 gallons

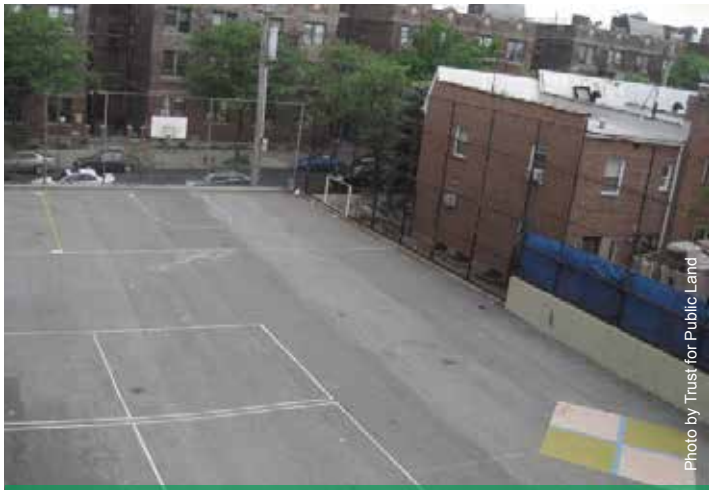
Status: Construction complete September 2014

Green Infrastructure Construction Costs: $151,700

The green infrastructure playground at J.H.S. 162 is located in the Newtown Creek CSO Tributary Area and features a rain garden, a synthetic turf field, and permeable pavers and trees. Together, these green infrastructure practices capture the first inch of rainfall from more than 12,000 square feet of impervious area, managing more than 400,000 gallons of stormwater annually.

Early in the design process, TPL conducted geotechnical investigations to ensure that stormwater could infiltrate adequately into the soil beneath the playground. TPL worked with a group of sixth and seventh grade J.H.S. 162 students in spring 2012 to explore conceptual playground designs. TPL's designers typically base the final size and location of each green infrastructure element on the needs of the school, the underlying soil conditions, and the size of the impervious area to be managed. For each playground project, DEP engineers review the hydraulic calculations and green infrastructure design.

At the lowest point of the playground at J.H.S. 162, the designers and students sited a rain garden with water-tolerant plants and engineered soil to maximize storage and infiltration. A new synthetic turf field and permeable pavers and trees store and infiltrate stormwater with an underlying layer of broken stone. The new asphalt is graded to direct stormwater towards the green infrastructure installations. In addition, to promote even infiltration across the site a system of subsurface perforated pipes connect the green infrastructure practices.



J.H.S 162 playground, Before

J.H.S. 162 green infrastructure playground, After

After playground construction, TPL introduced a classroom curriculum at J.H.S. 162 that relates directly to the new green infrastructure outside. In three classroom sessions, the sixth graders created a topographical model of an urban watershed and drainage basin, and investigated the City's combined sewer system through the "Sewer in a Suitcase" model. The students added their stormwater capturing playground to the Climate and Urban Systems Partnership's online crowd-sourced map and saw how it relates to green infrastructure projects elsewhere in the City. The map allowed them to view all of New York City's stormwater drainage basins and find the specific Newtown Creek CSO outfall their playground connects to during a CSO event. This investigation also allowed the students to make observations about Newtown Creek, the problems of CSOs and flooding, and to discuss how green infrastructure helps improve water quality and make the City more resilient.

TPL raised a portion of the total project budget from the MetLife Foundation. Former New York City Councilmember Diana Reyna and SCA also contributed construction funds. DEP covered the construction cost of the green infrastructure, about 27 percent of the project's overall construction budget of $566,250. This mix of funding sources represents a successful public-private partnership, meeting the goals of all parties: educational opportunities, upgraded facilities, water quality improvement, increased access to public open space, and other co-benefits.

The playground was officially opened with a ribbon-cutting ceremony held on September 18, 2014. In attendance were Trust for Public Land New York State Director Marc Matsil, TPL New York City Playgrounds Program Director Mary Alice Lee, J.H.S. 162 Principal Barbara DeMartino, former J.H.S. 162 Assistant Principal Tom Carty, DEP Commissioner Emily Lloyd, DEP Deputy Commissioner Angela Licata, DEP Assistant Commissioner Magdi Farag, Deputy Brooklyn Borough President Diana Reyna; New York State Assemblymember Maritza Davila, Kevin Worthington from City Councilmember Antonio Reynoso's office, and MetLife Foundation Program Director April Hawkins.

Opening ceremony, J.H.S 162, Brooklyn

Ribbon cutting event, J.H.S 162, Brooklyn

Case Study:
Banana Kelly Community Improvement Association

Project Owner: Banana Kelly Community Improvement Association

Project Location: 916-928 Kelly Street, Bronx

CSO Tributary Area: East River, HP-025

Technologies: Green roof, Cisterns, Permeable Pavers

Impervious Area: 10,611 square feet

Right-of-way Impervious Area: 54.8 acres

Annual Storage Volume: Estimated 250,500 gallons

Status: Construction complete summer 2014

Grant Award: $237,000

DEP collaborated with the Banana Kelly Community Improvement Association, the Workforce Housing Group (WHG), the New York City Department of Housing Preservation and Development and GrowNYC on the design and installation of the Kelly Street Green community garden. Kelly Street Green was the final stage of a 16-month rehabilitation of five buildings for affordable housing on Kelly Street in the Hunts Point-Longwood section of the Bronx. Seeing potential in the unused and blighted backyard space, WHG applied for a Green Infrastructure Grant and worked with GrowNYC on the design and implementation of the garden plan.

The project features a 1,400 square foot green roof and more than 2,700 square feet of gravel and permeable pavers with infiltration systems. Eight water cisterns collect roof runoff for the raised planters in the 3,675 square foot garden. Together the green infrastructure systems manage more than 250,000 gallons annually. DEP contributed nearly $237,000 for green infrastructure design and construction and the project partners raised an additional $100,000 for other aspects of the garden.

GrowNYC provided technical assistance throughout planning and construction, and now has an active role in managing the garden. Two full time caretakers live on Kelly Street, work as educators and community advocates, and foster residents' understanding of stormwater management, maintenance, gardening and food production. The garden is now a vital component of the buildings' community development, hosting art projects, community celebrations, and healthy living programming. In the first year, the community harvested more than 450 pounds of produce. The project partners estimate that as much as $43,000 can be generated from sales each growing season. More information on Kelly Street Green is available at http://www.kellystgreen.com.

Banana Kelly Community Improvement Association, Inc. is a community development corporation in the Hunts Point-Longwood section of the South Bronx. Their mission includes healthy living initiatives and have implemented four sustainability projects to date. WHG is a for-profit affordable housing development firm working collaboratively to reposition distressed properties in the metropolitan area as long-term affordable housing resources.

DEP Commissioner Lloyd at Kelly Street Green's opening celebration

2015 Action Plan

1. DEP and partner agencies will begin or continue right-of-way green infrastructure construction in approximately 13,000 gross acres of the Bronx, Brooklyn, and Queens.

2. DEP will begin to initiate new Area-wide green infrastructure contracts within the additional 29,000 gross acres of Priority Areas in northern Manhattan, Brooklyn, the Bronx and Queens.

3. In alignment with OneNYC water management initiatives, DEP will initiate a study of incentives for green infrastructure development on private property to understand the application in New York City.

4. DEP anticipates that up to five Green Infrastructure Grant projects will be completed this year. Also in 2015, DEP will expand the Grant Program by accepting application on a rolling basis and by developing a new "mini" grant program to incentivize smaller green infrastructure improvements.

5. DEP will initiate seven new green playground reconstruction projects in partnership with the Trust for Public Land, the New York City School Construction Authority, and the `New York City Department of Education. The partnership will continue identifying additional sites.

6. DEP will continue to work with partner agencies to identify feasible green infrastructure retrofits on public properties, including schoolyards, parks and playgrounds, NYCHA properties, libraries, and others.

7. DEP will continue planning for the creation of more than 250 local green jobs, including jobs for the maintenance and operations of green infrastructure.

8 DEP will continue to partner with DPR to implement green infrastructure at Community Parks Initiative sites throughout the combined sewer areas of the City.

9 DEP will implement a five-year research and development program. A multi-disciplinary team will perform research and development services to assist the City in continuing the efficient implementation of the Green Infrastructure Program.

10 DEP will launch the GIS-based Project Tracking and Asset Management System. This system will be used to track thousands of decentralized green infrastructure assets, and serve as asset management tool to support DEP's green infrastructure maintenance teams.

11 DEP will continue to work with DOT to plan and implement permeable pavement pilot projects in Gowanus Canal, Flushing Bay, and Hutchinson River Priority Areas

12 DEP will conduct a thorough review of the Program's progress toward the Order milestones and work with DEC to develop a contingency plan to refine and reframe the green infrastructure implementation goals in more realistic terms by building on lessons learned to date.

13 DEP will continue to engage local communities in green infrastructure stewardship. DEP will offer six BioswaleCare workshops in Brooklyn, Queens and the Bronx and explore other models and partnerships for stewardship programming.

List of Acronyms

CSO	Combined Sewer Overflow
DCLA	New York City Department of Cultural Affairs
DDC	New York City Department of Design and Construction
DEC	New York State Department of Environmental Conservation
DEP	New York City Department of Environmental Protection
DOB	New York City Department of Buildings
DOE	New York City Department of Education
DOT	New York City Department of Transportation
DPR	New York City Department of Parks and Recreation
EBP	Environmental Benefits Program
EDC	New York City Economic Development Corporation
GIS	Geographic Information System
HCP	House Connection Proposal
IACS	Impervious Area within Combined Sewer Tributary
LTCP	Long-Term Control Plan
MTNYC	MillionTreesNYC
NYCHA	New York City Housing Authority
OGI	Department of Environmental Protection's Office of Green Infrastructure
Order	2012 Amended Consent Order
SCA	New York City School Construction Authority
SCP	Site Connection Proposal
TPL	Trust for Public Land
WWFP	Waterbody/Watershed Facility Plan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