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A photograph of the Philadelphia skyline, including the Comcast Center and the Comcast Tower, reflected in the water of a river. The foreground is filled with lush green trees and bushes.

**SUSTAINABLE FUNDING FOR**  
**Philadelphia's**  
**GREEN CITY, CLEAN WATERS PLAN**

Advancing Implementation on  
Private and Non-City Public Lands





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**THE ENVIRONMENTAL FINANCE CENTER AT THE UNIVERSITY OF MARYLAND** is part of a network of university-based centers across the country that works to advance finance solutions to environmental challenges. Our focus is protecting natural resources by strengthening the capacity of decision-makers to analyze challenges, develop effective financing methods, and build consensus to catalyze action. Through research, policy analysis, and direct technical assistance, we work to equip communities with the knowledge and tools they need to create more sustainable environments, more resilient societies, and more robust economies. The Environmental Finance Center is housed within the School of Architecture, Planning, and Preservation.

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# Soak It Up, Philly!

## How green tools manage stormwater

### The challenge

During heavy storms, rainwater overwhelms the sewer system, sending pollutants into our creeks and rivers.

### The solution

The *Green City, Clean Waters* program promotes the use of green tools that capture stormwater before it enters sewers. Green means we use plants, trees and stone to filter, store and manage stormwater more effectively.



**PHILADELPHIA**  
**WATER**

**Green City, Clean Waters**

Setting the national standard for environmentally-friendly stormwater management in our communities.

**Partners and sponsors:**  
School District of Philadelphia  
Philadelphia Parks and Recreation  
Trust for Public Land  
Mural Arts Program

# Project Background

The City of Philadelphia adopted the Green City, Clean Waters (GCCW) plan in 2011 as part of its regulatory obligation under the Clean Water Act to reduce pollution resulting from combined sewer overflows. The 25-year plan envisions the City implementing approximately 9,564 greened acres (GA)<sup>1</sup> (34% of the combined sewer impervious areas) with green stormwater infrastructure (GSI), which along with other stormwater practices will capture 85% of baseline annual wet weather flow into the sewer system. The plan represents a transition from managing stormwater based solely on a gray infrastructure system to managing stormwater through a hybrid system that incorporates both gray and green infrastructure. The implementation cost was initially estimated at \$2.4 billion and updated to \$4.5 billion in 2021.<sup>2</sup>

The GCCW plan implementation has generated significant benefits, including \$60 million added to local economies and expansion of the local GSI industry (an estimated 430 jobs), according to a five-year review by the Sustainable Business Network and Econsult Solutions issued in 2016. The report found that GSI is generally cheaper than conventional built infrastructure, which is vital in keeping rates affordable, while also creating additional neighborhood benefits.<sup>3,4</sup>

The goal of this project, with support from the William Penn Foundation, is to consider the sustainability of the funding and financing strategies that support reaching the target set out in the GCCW plan for the City's hybrid stormwater management system, with specific focus on private non-residential land and non-City owned public land. The University of Maryland Environmental Finance Center (EFC) convened a research team that included significant expertise in green stormwater infrastructure program development and financing. The research team included the following organizations and individuals:

## RESEARCH TEAM:

### University of Maryland Environmental Finance Center

Stephanie Dalke, Program Manager  
Pia Iolster, Project Manager  
Pierre Gaunard, Graduate Student

### The Water Center at the University of Pennsylvania

Howard Neukrug, Director  
Ellen Kohler, Director of Applied Research and Programs  
Erica DePalma, Senior Water Systems Program Manager

### WaterNow Alliance

Cynthia Koehler, Executive Director  
Caroline Koch, Water Policy Director

### PennFuture

Jessica O'Neill, Senior Attorney  
Emma Bast, Staff Attorney

### Natural Resources Defense Council

Larry Levine, Senior Attorney and Director Urban  
Water Infrastructure, Healthy People & Thriving  
Communities Program

### The Nature Conservancy

Craig Holland, Senior Director of Investments,  
Healthy Cities  
Julie Ulrich, Director of Urban Conservation,  
Pennsylvania/Delaware Chapter

PWD identified staff to support information requests for this project. They participated in monthly project calls, provided information in response to requests, or engaged with research team members during individually scheduled meetings. This panel included:

**Central Finance**

Eugene McCauley  
Raimundo Rosado  
Nana Boateng

**PWD Finance**

Melissa LaBuda  
Lawrence Yangalay

**GSI Unit**

Jessica Brooks  
Elizabeth Svekla  
Beth Anne Lutes

**Legal**

Ji Jun

**Communications and Engagement**

Glen Abrams

**Operations**

Chris Palmer  
Ben Jewell

**Office of Watersheds**

Melanie Garrow

**Capital Projects**

Trisha Grace

Since the initiation of the project in September 2020, the PWD GSI unit revised its Strategic Implementation Plan and identified critical actions to meet the GCCW plan goals. It also revised its grants program, which was structured into two grant programs targeting non-residential private properties: the Stormwater Management Incentives Program (SMIP) and the Greened Acre Retrofit Program (GARP). The grant program is now structured around the type of applicant (“Grant Manager”) seeking a grant rather than having the two separate programs. The applicant’s team structure (e.g., property owner vs vendor/third-party entity) determines how the grant is managed and how funding is administered. The rubric criteria used to evaluate grant applications was also revised to include community impacts as a factor in grantmaking decisions alongside an increase in the weighting for vegetated projects.<sup>5</sup> Also, the FY2021 grants program budget was eventually restored to \$33 million. All of these changes have been accounted for in the final recommendations.

The research team partnered with Green Stormwater Infrastructure Unit staff at the Philadelphia Water Department (PWD) to align the project with challenges identified by PWD staff. The final research questions are set out below.

# RESEARCH QUESTIONS

Background and project assumptions when the research questions were developed in the fall of 2020:

- Projects on public property are funded through capital funds.
- Private property programs are funded through operating funds.
- The two current grant programs for non-residential private properties are the Stormwater Management Incentives Program (SMIP) and the Greened Acre Retrofit Program (GARP).<sup>6</sup>
- Reduced impervious surfaces provide credits that reduce stormwater bills.
- Due to COVID 19, the [FY2021] grants program budget has been reduced from \$25 million to \$5 million.<sup>7</sup>

Given these conditions, how can the City effectively support, incentivize and finance stormwater project implementation on private land while achieving a balance between stormwater rate revenue and stormwater credits to reach the GCCW implementation target by 2036?<sup>8</sup>

1. Based on a review of the history of the current program, what could be improved to better enable implementation at sufficient scale to meet the 2036 implementation goal?
  - a. Is the current grant program and credit structure still effective? If not, does it need to be modified or completely redesigned?
  - b. Are there significant opportunities through the development of implementation agreements with specific public and/or institutional property owners?
2. Are there accounting approaches and revenue mixes that provide access to adequate resources to meet the GCCW implementation target by 2036? What are the advantages and disadvantages of these approaches?
3. Are there policy changes needed to better realize community benefits and ensure racial equity in the implementation of the program?
4. Are there significant efficiency gains to considering the broader stormwater management challenge in the city across both combined sewer and MS4 areas?

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1 PWD definition: One greened acre (GA) is equivalent to an acre of impervious surfaces in the combined sewer service (CSS) service area, for which stormwater runoff is managed at 1-inch depth using GSI.

2 Philadelphia Water Department Statement No.7A. Direct Testimony of Black & Veatch Management Consulting, LLC on behalf of The Philadelphia Water Department. January 2021.

3 The Economic Impact of Green City, Clean Waters: The First Five Years, Sustainable Business Network 2016 at 7, 42. [https://www.sbnphiladelphia.org/wp-content/uploads/2021/04/Local-Economic-Impact-Report\\_First-Five-Years-GCCW\\_full-downloadable-web2.pdf](https://www.sbnphiladelphia.org/wp-content/uploads/2021/04/Local-Economic-Impact-Report_First-Five-Years-GCCW_full-downloadable-web2.pdf).

4 A more recent report produced by SBN and Fourth Economy (2021), GSI – A Tool for Economic Growth and Recovery in Pennsylvania, estimates the total amount of jobs added by GCCW to be 1,200.

5 Stormwater Grants Application Guide, Philadelphia Water Department, 2021 at 2, 20-21. <https://water.phila.gov/pool/files/stormwater-grants-application-guide.pdf>.

6 After the research question and assumptions were drafted, PWD made changes to the structure of the grants program, as described on the preceding page.

7 The grants program budget for 2021 was later increased to \$33 million.

8 As specified in the 2011 Consent Order Agreement signed between the City of Philadelphia and the Pennsylvania Department of Environmental Protection.

# Current Green City, Clean Waters Program Status—Non-residential Private and Non-City Public Property

The core of the Green City, Clean Waters (GCCW) plan is a commitment to implement projects that will result in approximately 9,564 greened acres (GA) over 25 years. In 2021, when the research team carried out its analysis, GCCW was 10 years, or 40%, into its implementation period. The projects envisioned by the plan will transition the City's stormwater management system from a gray-based system to a hybrid system with both gray and green features to improve the overall system performance, particularly in terms of water quality impacts on local waterways.

As set out in the plan,

A Greened Acre is an acre of impervious cover that is retrofitted to utilize Green Stormwater Infrastructure (GSI) which manages stormwater using source controls such as infiltration, evaporation, transpiration, decentralized storage, alternative stormwater routing, reuse and others . . . This quantity can include the area of the stormwater management feature itself, as well as the area that drains to it . . . One Greened Acre is equivalent to one inch of managed stormwater from one acre of drainage area or 27,158 gallons of managed stormwater.<sup>9</sup>

The plan's long-term vision involves creating amenities for the people who live and work in the City, including:

- Large-scale implementation of green stormwater infrastructure to manage runoff at the source on public land and reduce demands on sewer infrastructure.
- Requirements and incentives for green stormwater infrastructure to manage runoff at the source on private land and reduce demands on sewer infrastructure.
- A large-scale street tree program to improve aesthetics and manage stormwater at the source on City streets.
- Increased access to and improved recreational opportunities along green and attractive stream corridors and waterfronts.
- Preserved open space utilized to manage stormwater at the source.
- Converted vacant and abandoned lands to open space or redeveloped responsibly.
- Restored streams with physical habitat enhancements that support healthy aquatic communities.
- Additional infrastructure-based controls when necessary to meet appropriate water quality standards.<sup>10</sup>

As characterized in the plan, the goal is “to regain the resources in and around streams that have been lost due to urbanization, both within the City of Philadelphia and in the surrounding counties, while achieving regulatory compliance objectives in a “cost-effective manner.”<sup>11</sup> In addition to reducing the volume of stormwater runoff entering



the combined sewer system, the plan’s objectives also include enhancing community spaces, contributing to the local economy, and providing additional environmental benefits. These are often known as “triple bottom line” (TBL) benefits and many of them are supplied by the vegetated features of GSI projects rather than simply the volume of stormwater captured. Vegetated GSI practices help filter out air pollution, reduce heat islands, support wildlife, increase property values, enhance recreational opportunities, and provide additional open space.<sup>12</sup>

PWD acknowledges that reaching the plan’s GA targets will require implementing projects on private and non-City public land. PWD uses two mechanisms to achieve GA on these lands: compliance with PWD’s stormwater regulations and incentivizing stormwater projects through the Stormwater Grants program with fee credit provisions.

Currently, the stormwater fee generates approximately \$175 million per year that is used to support operating expenses, according to documents from the City’s most recent water rate case.<sup>13</sup> Both stormwater regulation compliance and the grants program are supported with operating funds. These funds pay for staff time across the stormwater program as well as the incentive grants themselves.

Philadelphia’s work on private property has been successful in meeting its GA benchmarks to date. The September 2021 Annual Report stated that a total of 1,888 GA had been implemented; 715 of those GA (38%) were completed through the Stormwater Grants program, 684 GA (36%) were implemented as a result of compliance with the stormwater regulations, and 489 GA (26%) came through public retrofits. As of November 2021, PWD reported that it has implemented 2,152 GA and met its 10-year implementation target (23% of the overall GCCW target). The GCCW Plan envisions a substantial rate of increase in GA implementation over the remaining plan years (see Table 1).

**TABLE 1. GCCW Plan Benchmarks**

GCCW Plan Year (from inception)	Planned gains in GA from previous 5-year GCCW benchmark*	Cumulative GA GCCW benchmark
5	744	744
10	1,404	2,148
15	1,664	3,812
20	2,612	6,424
25	3,140	9,564

\*For example, from Plan Year 0 to Plan Year 5, the target was to implement 744 GAs, and from Plan Year 6 to Plan Year 10, the target was an additional 1404 GAs for a total of 2148 GAs.

9 PWD Implementation and Adaptive Management Plan, December 2011, at 1-3.

10 LTCP Update GCCW at 1-2: [http://archive.phillywatersheds.org/ltcp/LTCPU\\_Section01\\_Introduction.pdf](http://archive.phillywatersheds.org/ltcp/LTCPU_Section01_Introduction.pdf).

11 LTCP Update GCCW at 1-2: [http://archive.phillywatersheds.org/ltcp/LTCPU\\_Section01\\_Introduction.pdf](http://archive.phillywatersheds.org/ltcp/LTCPU_Section01_Introduction.pdf).

12 See Philadelphia Water Department website: <https://water.phila.gov/green-city/>.

13 See Testimony of Black and Veatch, Schedule BV - 1, January 15, 2021 at 38. <https://www.phila.gov/media/20210216172716/PWD-Statement-No.-7A-Direct-Testimony-And-Schedules-of-Black-and-Veatch-Supplemented-as-of-Formal-Filing.pdf>.

# PWD's Stormwater Grants Program



The Stormwater Grants program (also referred to as the incentives program) works with property owners, project managers and developers to provide payments for the design and construction of stormwater projects on non-residential private properties. PWD partners with the Philadelphia Industrial Development Corporation (PIDC)<sup>14</sup> to offer its stormwater grants on commercial, industrial, multifamily and institutional properties.

Funding for this program comes from the City's operating budget; since 2015, it has included the following amounts:

**TABLE 2. Available Grants Program Funding per Fiscal Year (beginning in FY2015)**

FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22
\$13,455,000	\$11,450,000	\$16,900,000	\$27,500,000	\$25,000,000	\$25,000,000	\$33,000,000	\$20,000,000

Table 3 summarizes implementation information over a portion of the stormwater grants program's history. It helps demonstrate that, generally, costs per GA are increasing.

**TABLE 3. Stormwater Grant Program GA Costs and Implementation Rates (2012-2019)**

Project Award Year	Total Number of Completed/ Verified Projects Awarded	Total Number of Parcels	Average As-Built GA of Projects	Total As-Built GAs	Average As-Built Cost per GA
2012	10	13	16.02	160.20	\$93,044
2013	12	14	1.52	16.76	\$120,959
2014	17	23	8.46	160.69	\$109,477
2015	9	8	10.50	94.53	\$111,710
2016	33	37	5.48	169.81	\$139,314
2017	45	50	4.50	166.83	\$210,564
2018	6	7	3.56	14.22	\$189,874
2019 <sup>15</sup>	3	3	0.20	0.20	\$238,175
<b>Totals</b>	<b>135</b>	<b>155</b>	<b>6.28</b>	<b>783.24</b>	<b>\$151,640</b>

The average cost per GA has varied but generally increased from \$93,000 to more than \$230,000. These increases in average costs can be explained by multiple factors, including initial selection of projects that were easier and less costly to implement. There has also been a shift in the types of stormwater practices that have been prioritized, in part because PWD has adjusted grant criteria to encourage projects that have more vegetated components or provide other added community benefits that go beyond simple stormwater volume capture. Projects that provide TBL benefits tend to be smaller and more dispersed and have higher per-GA cost ratios. Inflation will also contribute more significantly to cost increases in the near future.

<sup>14</sup> PIDC is a non-profit organization founded by the City of Philadelphia and the Chamber of Commerce for Greater Philadelphia in 1958 to spur investment, support business growth, and foster developments that create jobs, revitalize neighborhoods, and drive growth in the City.

<sup>15</sup> 2019 information is incomplete and 2020 and 2021 totals were not provided in the available data.

# Analysis of Program Effectiveness on Private and Non-City Public Lands



PWD has successfully implemented the GCCW to meet its 10-year GA goal. Meeting this benchmark is a significant achievement, especially because it required pivoting the City's approach to stormwater management, investing in new and innovative programs, and taking on risks not normally embraced by governmental entities. The City has made significant progress in hybridizing the City's stormwater system to include both gray and green infrastructure and improving the functionality of the system overall in terms of volume and water quality.

However, in order to meet the overall plan target by 2036, this research effort confirmed the need to make adjustments to the program, with a specific focus on implementation on non-residential private and non-City public lands. To reach the GCCW goal of 9,564 GAs by 2036, PWD will need to substantially increase the supply of projects. As discussed below, the greatest opportunity and need is on private and non-City public land, as opposed to City-owned properties. Because many of the easier to implement projects on private and non-City public land—the low-hanging fruit—have already been accomplished in the early years of GCCW, changes are needed to bring in GAs on properties that have not engaged in the program to date. These projects will likely be smaller or more complicated, making them more costly to implement on a per-GA basis, but this situation will also present new opportunities for delivering stormwater retention and the other co-benefits of GSI to neighborhoods that may not have seen as many projects in prior years.

Based on data from completed and current projects, the premise of this analysis is that the City needs to implement an additional 6,000 GAs across all types of land ownership to reach the GCCW plan target by 2036. Currently, the stormwater grants program represents approximately 37-38% of the completed GAs. Thus, to maintain the stormwater grants program at its current rate of implementation, PWD would need to be investing in today's dollars more than \$444 million over the next 15 years or around \$30 million per year, assuming a stable estimated construction expense of about \$200,000 per GA<sup>16</sup> (grant applications are currently considered cost effective if they request no more than \$200,000 per GA).<sup>17</sup> That level of funding represents about 17% of PWD's current annual operating revenue from the stormwater fee and it is \$10 million (or 50%) higher than the budgeted amount of \$20 million for the stormwater grants program in PWD's FY22 budget (see [Table 2](#)). Given that this high-level analysis does not include inflation or cost increases related to changing project complexity, actual costs per GA will be higher and will require increasing grant program budgets over the next 15 years. The estimated \$30 million per year budget is the minimum amount needed in the near term, but this annual funding need will likely approach \$60 million within 10 years.

Another challenge is that funding for the stormwater grants program can fluctuate from year to year, undermining the predictability needed to ensure a strong program going forward. While PWD's cost of services report shows a steady annual budget of \$25 million for the grants program over the next five years, and funding for the program in 2021 was robust, the actual amount of funding available has varied (see [Table 2](#)). These funds are not all expended in the year they are allocated, adding to the appearance of variability. This is due in part to some grant applications receiving design funds in one cycle and construction funding in another, which makes it difficult for applicants to gauge their competitiveness and contributes to uncertainty about the prospects of receiving a grant. Nonetheless, any variability in available funding for the grant program (particularly decreases) sends a message of instability if it is not accompanied by a stated commitment to a minimum level of funding coupled with actual grant expenditures at or above that minimum level.

Through interviews with developers and during a workshop that the Sustainable Business Network coordinated with its members to get feedback on the stormwater grants program, several stakeholders expressed that the perceived

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<sup>16</sup> This cost estimate does not include any avoided revenue attached to credits nor does it account for cost increases due to more complex projects or inflation.

<sup>17</sup> [2021 PWD Stormwater Grants Application Guide Version 3.0](#), p. 20.

variability in the funding and the uncertainty of receiving a grant has discouraged them from investing in proposal development for the program. Some have sought philanthropic support to cover these costs partly because of this instability. These hurdles impact who, where, and what kind of projects are proposed through the existing grant program, limiting the delivery of co-benefits from these grant-funded projects, especially in locations that currently lack GSI. Steady investments in these programs are essential for project developers on private land who must make substantial investments of time and resources to develop grant proposals without any guarantee of getting a grant to realize a return on that investment.

As mentioned earlier, the GCCW plan envisioned achieving TBL outcomes that are strongly linked to the community greening effects provided by the vegetated features of GSI projects. To evaluate their progress towards accomplishing these outcomes through GCCW, PWD conducted a review of projects in 2018 that cataloged the number of stormwater management practices (SMPs) and the amount of impervious area treated by SMPs that included vegetated practices, grouped by land ownership category. This review showed that 70% of SMPs implemented by the City on public land through 2018 included vegetated practices, which were treating about 70% of those projects' drained area (DA).<sup>18</sup> However, on private property and through PWD's stormwater grants program, the percentages of vegetated practices were much lower—34% of SMPs on private land and 38% of SMPs implemented through PWD's stormwater grants program, accounting for 33–35% of those projects' directly connected impervious area (DCIA).<sup>19</sup> This means that approximately 60–70% of private land and incentive program projects up until 2018 did not include vegetated practices. This is expected for private development projects that are complying with stormwater regulations, as they typically want to maximize the number of units on a site and will employ space-saving underground storage rather than above-ground vegetated SMPs to meet their stormwater retention requirements. The grant program, however, is perhaps the best avenue for projects that integrate more vegetated practices and produce the most TBL benefits for the nearby community, but this was not necessarily the case for the first few years of program implementation.

Because PWD seeks to improve the delivery of TBL outcomes as part of GCCW, they recognized the importance of adapting their programming to boost the proportion of GSI projects with vegetation or other features benefiting the community. In 2021, PWD adjusted their grant scoring criteria to encourage more vegetated practices in projects and this appears to be having the desired effect, as more of the applications and most of the selected grant awards for FY22 included vegetated solutions.

Another factor influencing the success of delivering TBL outcomes to Philadelphians via GCCW is the location of GSI projects. To date, PWD has generally sought to distribute GSI projects evenly across the City, under the assumption that everyone will benefit to some extent from reduced combined sewer overflow (CSO) incidents and improved water quality in targeted water bodies.<sup>20</sup> The TBL benefits of GSI, however, tend to have a more geographically limited impact. Studies have shown that community benefits, such as cooling or improved mental health, diminish as distance from a green space (such as a vegetated GSI project) increases.<sup>21</sup> Similarly, one would expect that localized stormwater flooding could be reduced by nearby GSI features but not by projects located further away (unless they were strategically designed to reduce those specific flood impacts). This geographic limitation of TBL benefits delivery must be taken into account to assess whether everyone who needs the full range of benefits from GCCW projects is receiving them.

A number of entities in Philadelphia have completed studies and developed tools that indicate that there are areas within the City that lack environmental amenities (like tree canopy, green space, and GSI features) and experience higher air temperatures, poorer air quality, and repeated stormwater and riverine flooding. Populations in these same neighborhoods tend to be composed of more people of color and rank higher on social vulnerability and environmental justice indices, meaning that they experience higher rates of poverty, crime, physical and mental health issues, and

unemployment. These neighborhoods also may not be experiencing redevelopment at the same rates as other neighborhoods, resulting in fewer GSI features being installed through private development projects. This combination of factors leads to the assumption that the current approach (distributing GSI projects across the City without targeting more investment to certain neighborhoods) is not a reliable way to deliver TBL benefits to the neighborhoods and populations that need them the most. More information on this topic, including assessments, maps, and tools, is detailed in [Recommendation 4](#) and in [Appendix C](#).

The next step, aside from continuing to monitor the results of recent programmatic adjustments on the ground, will be to consider implementing some of the other recommendations in this report. These recommended actions will help project developers continue adding more above-ground features to their projects and will lead to more targeted deployment of SMPs in neighborhoods that would benefit the most from the added greening and other community benefits. In addition, planning to accommodate higher costs per GA in the future will further enable PWD to support projects that have more greening components but may otherwise not be considered cost effective.

The research team is aware that some of these conclusions are well understood by PWD. It is important for other City officials, residents, and stakeholders to understand these challenges in order to support the needed adaptations to meet the GCCW plan targets and vision.

### Conclusions of Analysis:

- **Issue:** The current stormwater grants program funding history has not resulted in a strong implementation market on non-residential private and non-City public land.
  - **Solution:** PWD’s stormwater grants programming needs to be funded at a higher and more consistent level annually (as mentioned above, starting at about \$30 million per year in current dollars) just to maintain the current rate of implementation. Predictable and sufficient funding for the stormwater grants program is essential to build a strong GSI implementation market.
- **Issue:** Until recently, project implementation on non-residential private land has not sufficiently prioritized the delivery of TBL benefits, resulting in a lower amount of vegetated GA than envisioned by the GCCW plan.
  - **Solution:** PWD and the City must clarify the City’s TBL priorities and make additional programmatic adjustments to support more projects with vegetation on non-residential private and non-City public lands.
- **Issue:** Racial equity has not been an explicit priority for the stormwater grants program, resulting in projects being spread across the City rather than being implemented in places the projects’ benefits are needed the most.
  - **Solution:** PWD should continue to adjust its community outreach strategies and stormwater grants program criteria to target more resources to underserved communities and neighborhoods, leading to projects that deliver quantifiable benefits to these communities and improve racial equity in GCCW program outcomes.

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18 Personal communication, Jessica Brooks, April 30, 2021.

19 Directly Connected Impervious Area (DCIA) is an impervious surface that is directly connected to the drainage system; it is basically comparable to Drained Area (DA), which is used to measure City projects.

20 Personal communication, PWD staff, October 1, 2020.

21 Fushcia-Ann Hoover, Sara Meerow, Zbigniew J. Grabowski & Timon McPhearson (2021) Environmental justice implications of siting criteria in urban green infrastructure planning, *Journal of Environmental Policy & Planning*, 23:5, 665-682, DOI: [10.1080/1523908X.2021.1945916](https://doi.org/10.1080/1523908X.2021.1945916).

# Recommendations





The research team developed a set of recommendations based on what we learned from interviewing PWD and other City professionals, as well as parties who engage with the City’s stormwater ordinance and PWD’s incentives programs. They are also informed by the research team’s experience and research into programs and policies in other urban areas in the country.

There may be much in these recommendations that is familiar to PWD and others in the GCCW plan. They may reflect ideas and policies that PWD is already considering or has considered in the past. In these instances, this report serves to emphasize the value of those ideas and underscore the need for their continued consideration or renewed consideration because of changed circumstances. All of these recommendations will support the need to implement a sufficient number of GAs to meet the program’s goals, particularly by helping bring in more quality projects on non-residential private and non-City public lands. As implementation across the City continues, PWD will need to recruit projects located on smaller parcels, consider more complicated projects, establish new partnerships, and recruit new landowners to help deliver the next phase of GSI projects. This phase of plan implementation will be more challenging than the first phase—adaptation and renewed energy to find new partners and new funding sources will be required.

While each of the following recommendations should be considered individually first, they will be most impactful if deployed in strategic combinations. Selecting among and balancing between the recommendations will allow PWD to design its GSI stormwater grants programming for non-residential private and non-City public lands to meet specific policy and revenue goals while increasing the supply of GA projects. The research team has developed four potential demonstration scenarios found in [Appendix D](#).

**TABLE 4. Alignment of Conclusions with Recommendations**  
(Darker shades indicate how strongly a recommendation supports each conclusion.)

RECOMMENDATIONS	CONCLUSIONS		
	Strong Private/ Non-City GSI Implementation Market	Clear Triple Bottom Line/ Co-benefits	Racial Equity in Program Outcomes
Rec 1 - Continue and Expand Collaborations			
Rec 2 - Ensure Stable Funding for Private/Non-City GSI Using All Financing Methods-Including Capital Revenues			
Rec 3 - Clarify the City’s Triple Bottom Line Priorities			
Rec 4 - Prioritize Racial Equity in Stormwater Grant Program Design			
Rec 5 - Identify More Quality Private/Non-City GSI Projects through a Community Greening Grants Program			
Rec 6 - Add Flexibility to Project Delivery with Pay for Performance Contracts			
Rec 7 - Pair Any Grant Programs with a Pre-Development Fund			
Rec 8 - Amend SW Ordinance to Realize More Greened Acres on Private/Non-City Land			

Because PWD has less control over projects on non-residential private and non-City public lands, the program requires more outreach to these parties, more flexibility in program implementation, and more delivery strategies that fit landowners' different needs. The GSI stormwater grants program has started to move in this direction, and should continue to do so, to maximize the TBL outcomes from GSI projects. These additional changes will take a significant commitment of staff time and resources. PWD will need to decide whether it is best suited to continue leading this work or whether an existing or new third-party entity would be more effective and efficient at managing an updated grants program (see [Recommendation 5](#)). A third-party entity would also potentially make it easier to attract new external philanthropic, corporate, and grant funding.

Three of the recommendations below include a potential role for a third-party entity. PWD has partnered with third parties in other settings, such as the Partnership for the Delaware Estuary that oversees the Schuylkill Action Network as part of its Source Water Protection program. PWD also partners directly with multiple watershed organizations in the region to achieve source water protection and water quality improvements. It is understood that this structure has been previously considered for GSI implementation; it should be reconsidered for the next phase of GSI implementation. PWD could also consider PIDC as a potential organization to take on this new role.

**Note:** The research team had a fixed amount of time and resources from a private funder for this project. The recommendations outlined below represent the level of refinement and detail that could be achieved within the current scope. Many important questions remain and some of those questions depend on policy questions to be addressed by PWD. The team appreciates the amount of time that PWD and other City staff have committed to supporting this project as well as their level of professionalism, expertise, and commitment to the public good that they have demonstrated throughout all of the team's interactions with them.

## RECOMMENDATION 1

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### Continue and Expand Collaborations

To maximize the impact of any investments, PWD and the City must expand on existing successful collaborations between other City agencies and departments, as well as with external partners who have vested interests in achieving the TBL outcomes of the GCCW plan. Collaboration can result in City revenues delivering multiple City priorities instead of just a singular compliance priority and in increasing the efficiency and effectiveness of City-wide program delivery. When these priorities fall outside the typical purview of PWD, interdepartmental collaboration can fill in gaps in expertise to help GCCW be more successful at achieving TBL goals.

To achieve the GCCW TBL goals, cross-departmental collaboration will need to encompass policy development and financial planning, project planning and design, and project implementation. Ideally, continued investment in existing and new collaborations would be endorsed and enabled as high up in the City's organizational structure as possible—i.e., the Mayor's Office or the City Manager's Office—but it can still be catalytic if operationalized through the Office of Infrastructure, Transportation and Sustainability.

PWD already has several successful collaborations across City departments on public land that can serve as models for expansion into private land. PWD collaborates with the Department of Streets to incorporate green stormwater infrastructure into street projects. Additionally, PWD has also collaborated with the School District of Philadelphia and the Southeastern Pennsylvania Transportation Authority (SEPTA) to implement projects on their properties. As demonstrated by these models, the outcomes are best when collaboration is initiated during the budgeting process; it is more challenging if collaboration starts at the project development stage.

To identify more quality GSI projects on non-residential private and non-City public land, PWD will need to develop new collaborations with different City departments and entities as well as with non-residential private and non-City public landowners, such as the Philadelphia Parking Authority and the Archdiocese of Philadelphia. The City-wide ReBuild program for neighborhood improvements, which has required collaboration across several City departments, could also serve as a model for PWD.

Increased collaboration with other City entities, external partners, and community stakeholders will be key to attaining GCCW goals on private and non-City public land. Building new relationships—and strengthening existing ones—will help raise awareness about GSI incentive programs and boost the supply of GSI projects, especially in neighborhoods that have not yet seen the benefits of GSI associated with private development projects. PWD has recognized the need to improve the racial diversity of participants in their Public Involvement and Participation Plan (PIPP) processes as well as the need to evaluate the role of the green stormwater steering committee in GCCW work.<sup>22, 23</sup> Improving these engagement efforts—especially making them more participatory, rather than focused on one-way communications—and developing new partnerships with community-based organizations will provide avenues for incorporating more TBL objectives in future projects supported by the stormwater grants program. The research team acknowledges that the PWD GSI unit is well situated, given its skills and expertise, to identify the best existing collaborations to expand and new ones to initiate if they are given the resources and flexibility to do so; the Pennsylvania Environmental Council's (PEC) contractual work around these processes can also help inform new partnerships and engagement processes.

## CASE STUDIES

*The City of Hampton, Virginia, has a cross-departmental Resilient Hampton team that meets bi-weekly and discusses how to address water issues and integrate resiliency across the City to best secure funding for these efforts.*

*The City of San Francisco, California, is implementing a Joint Benefits Authority (JBA) that includes multiple municipal departments involved in one green infrastructure (GI) project and in paying for specific co-benefits of the project.*

*Austin's Rain Catcher Pilot Project (RCPP) is currently funded by three City departments after the Watershed Protection Department examined how green stormwater infrastructure benefited other departments and developed partnerships with them.*

See [Appendix A](#) for more information.

## RECOMMENDATION 2

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### Ensure Stable Funding for the Stormwater Grants Program Using All Financing Methods Available—including Capital Revenues—to Develop a Strong Non-residential Private and Non-City Public GSI Market

PWD has a couple of strategies available to increase and stabilize funding for the GSI stormwater grants program. These strategies include using capital funds to support the program and/or raising the stormwater fee. Using capital funds is the simplest and most effective strategy in terms of providing PWD with the most flexibility in program

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<sup>22</sup> Personal communication, Pennsylvania Environmental Council staff, November 2020.

<sup>23</sup> Personal communication, Glen Abrams, December 2020.

design and delivery, as well as the best way to increase the amount of funds available for GSI projects.<sup>24</sup> Once a more stable budget for the stormwater grants program is ensured, PWD needs to be more transparent and provide better information on past and present funding levels in order to reduce uncertainty and encourage developers' participation in the program.

At its core, the GCCW plan improves the City's existing stormwater management system by investing in a hybrid of gray and green stormwater infrastructure that manages both water quantity and water quality by reducing the number of combined sewer overflow (CSO) events, among other outcomes. All elements of this hybrid system are part of realizing these improvements, including projects that manage stormwater on non-residential private land and non-City public land so that runoff either does not enter the gray part of the system, is delayed in entering the gray part of the system, and/or is cleaner when it enters the gray part of the system.

PWD would need to invest at least \$30 million annually in incentive programs just to maintain the current rate of GSI project implementation on non-residential private and non-City public lands. Because PWD needs to increase the rate of GSI project implementation to reach the GCCW plan goals and because of increasing costs over time, the needed annual investment will also need to increase between now and 2036. Unforeseen events—like the COVID pandemic—can significantly impact revenues from ratepayers. To account for these types of disruptions, PWD must use all available financing methods to ensure sufficient and predictable funding of the stormwater grants program over time to accomplish GCCW goals and provide the TBL benefits to City residents outlined in the plan.

Accessing capital markets, i.e., debt financing, to fund the GSI stormwater grants program can provide the enabling conditions for a strong implementation market over the remaining phases of plan implementation. While the use of debt for this purpose is a policy determination for PWD and the City, the research team has found that there do not appear to be either legal or accounting barriers to doing so.<sup>25</sup> Specifically, the City's ability to debt finance its drinking water and wastewater systems is derived primarily from certain statutes and ordinances that authorize the issuance of revenue bonds for the purpose of financing projects or improvements to the "system," which are defined broadly enough to include improvements on private property. Boiled down, the legal question about the use of bond proceeds to finance GSI on private land turns on the City acquiring a sufficient interest in the relevant property. As indicated in the attached Legal Memorandum (see [Appendix B](#)), documentation of this interest could take various forms, from an easement of some kind to a simple contract between the City and the property owner pursuant to which the property agrees to use the GSI installation as contemplated.<sup>26</sup>

Moreover, there is precedent for the City to use revenue bond proceeds in connection with public benefit improvements on private property. This finding was confirmed when the City Council passed the Neighborhood Improvement District Management Authority ordinance in March 2021, demonstrating one way capital revenue can be used on private property.<sup>27</sup> It should be used by PWD to further the improvements to the City's hybridized stormwater management system.

Using capital revenue to ensure sufficient and predictable funding<sup>28</sup> for the GSI stormwater grants program could take on several different forms:

- (1) PWD could use capital revenue to fund the entire stormwater grants program at a minimum level of \$30 million per year (in 2021 dollars);
- (2) PWD could pilot small amounts of capital investments in a set of identified projects, meeting selected requirements, on non-residential private or non-City public land while continuing to fund the stormwater grants program for a combined total of at least \$30 million per year;

(3) PWD could use capital revenue to fund one annual \$10 million Pay-for-Performance contract (as set out in Recommendation 6) each year over a set number of years for projects on non-residential private or non-City public lands while continuing to fund the stormwater grants program at a minimum level of \$20 million per year.

Another method to raise needed revenue is the stormwater fee. The City and PWD are well aware that increasing stormwater rates will increase the revenue available for the City's stormwater management program. The rate determination by the City's Water, Sewer and Storm Water Rate Board from June 2021 included rate increases but at levels lower than requested by PWD.<sup>29</sup>

The stormwater fee for residential properties (i.e., billing and collection charge to cover customer costs) is a flat fee. For non-residential/commercial properties, the fee is calculated using an equation that includes a gross area unit charge and an impervious area unit charge. Since the element of the rate structure that relates most directly to the amount of runoff generated at a site is the impervious area unit charge, PWD could seek an increase in that unit charge on non-residential properties to increase the amount of resources or funds available for the incentive programs. However, the way that all rates are calculated and allocated across all classes of ratepayers may make this proposal infeasible. Increasing all stormwater rates involves a complex set of factors addressed in the rate case setting and is not a topic that can be appropriately addressed in the context of this project.

An additional incentive strategy that could be used to generate more GA is tax abatement. The City already uses tax abatement for other purposes, but this could be set up and offered to landowners who implement stormwater management voluntarily. This strategy would not directly stabilize or increase PWD's funding for GSI but would instead decrease the number of GA they must pay for through the grants program, potentially decreasing their revenue needs. Because abatements are not currently enabled for stormwater management, this would likely require legislative action. If this strategy has not been considered in the past, it deserves further discussion to understand its potential impact.

Another strategy for reducing PWD's GSI funding needs would be to adjust their stormwater credits. Although evaluating the impacts of credits on the incentives program was an initial focus on this project, any adjustments the credit calculation directly implicates rates and the relevant PWD panel members were not able to engage with the research team on this topic, so adjustments to the credit system were not considered in more depth for this project.

PWD does not control the speed or outcome of rate decisions or the City's legislative process. However, PWD does control the decision to access capital markets in the form of municipal bonds, SRF or WIFIA loans, or other forms of debt to finance GSI project implementation on private land. Doing so would provide PWD with more financing flexibility in achieving the GCCW plan goals. Using capital funds for these projects holds the most potential to catalyze success.

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24 PWD may want to consult with bond counsel with regard to any specific new issuance that includes funding for the GSI program.

25 See Appendix B, a legal memorandum supporting the legality of using capital revenues to implement stormwater management projects, including green stormwater infrastructure, on private land.

26 See Appendix B, a legal memorandum supporting the legality of using capital revenues to implement stormwater management projects, including GSI, on private land (pp 3-4), as well as the 2012 Ballard Spahr memo.

27 Ibid.

28 As explained earlier, an annual funding level of \$30 million does not account for increasing costs in the future.

29 See Testimony of Black and Veatch, Schedule BV - 1, January 15, 2021 at 38. <https://www.phila.gov/media/20210216172716/PWD-Statement-No.-7A-Direct-Testimony-And-Schedules-of-Black-and-Veatch-Supplemented-as-of-Formal-Filing.pdf>.

## CASE STUDIES

*The Milwaukee Metropolitan Sewerage District (MMSD) issued in 2020 the first-ever Certified Climate Bond; some of the proceeds will be used to finance green infrastructure, including investing \$20 million between 2020–2023 in community-based GSI facilities located on private property.*

*The Seattle Public Utilities Commission finances its RainWise program with municipal bonds proceeds using the GASB 62 regulated operations accounting approach. The program supports the installation of GSI on private properties without the need to establish easements on the properties.*

*Buffalo, NY, issued in 2021 the largest Environmental Impact Bond in the USA that will provide upfront capital on a large scale to fund projects on private properties.*

See [Appendix A](#) for more information.

## RECOMMENDATION 3

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### Clarify the City's Triple Bottom Line/Co-Benefit Priorities

The GCCW plan is an important element of Philadelphia's vision as a vibrant and sustainable City as reflected on PWD's website. Achieving this vision extends beyond the traditional scope of the Department's work, but the desired TBL (or co-benefit) priorities of GSI projects have not been defined as clearly as the program's stormwater capture goals (i.e., GA targets). If PWD and the City want to increase the yield of co-benefits from GSI projects, they need to define and prioritize the desired co-benefits, agree upon mechanisms for achieving them via GCCW, and adjust programs accordingly. The process of identifying and selecting which co-benefits and related equity outcomes are most important to support through the Stormwater Grants program, and then selecting metrics through which to measure progress, would best be done in partnership with other City departments and relevant cross-departmental initiatives.

Given the City's need to maximize the impact of every dollar of revenue spent to achieve as many City-wide objectives as possible, City departments and agencies have a shared interest in identifying and prioritizing TBL benefits—including stormwater management benefits—of any project that PWD supports with City revenue. GSI sits at the intersection of environmental management, social needs, and public policy. Likewise, other City departments have plans that seek to achieve social, environmental and economic benefits for City residents. PWD staff would benefit from continuing to collaborate with colleagues who have expertise and insights into how to measure the full set of benefits—physical and mental health, flood mitigation, community development, employment, real estate improvement, business environment, sustainability—that can be elements of green infrastructure projects. Clarification of desired co-benefit priorities should be done through a racial equity and environmental justice-oriented lens to ensure that future programmatic adjustments help drive better outcomes for underserved communities.

Adopting shared definitions of TBL co-benefits and metrics to measure TBL outcomes would also enable City agencies and departments to communicate more effectively about where, when, and how to collaborate to create a thriving, vibrant City. The Office of Sustainability uses the term "visions" to identify community benefits. These visions and associated metrics are outlined in *Greenworks: A Vision for A Sustainable Philadelphia*.<sup>30</sup> PWD should partner with the Office of Sustainability to initiate and complete cross-departmental adoption of TBL benefit definitions and metrics. Setting goals or targets for co-benefits of GSI and tracking them will improve transparency and accountability. It will also make it easier for entities outside PWD, including private funders, to understand what they could invest in (beyond stormwater volume capture) and for project developers to understand what PWD is prioritizing and cultivate those co-benefits in potential projects. PWD could also leverage these grant program

elements to draw in specific landowner types—such as campuses—whose interests might align well with the co-benefits delivered to the campus community by these GSI features.

Other cities cite a variety of potential TBL benefits and track associated metrics that could support Philadelphia's broader vision for a thriving City. Examples include:

- Health improvements
- Increases in life expectancy of residents
- Heat-island/heat stress reduction
- Air quality improvements
- More equitable distribution of park acreage
- Reductions in nuisance/regular flooding
- Increases in household income
- Reductions in unemployment/increased employment
- Access to healthy food
- Increases in homeownership across racial and ethnic groups
- Energy savings
- Carbon reduction benefits<sup>31</sup>

The stormwater grants program should be adjusted to further incentivize certain GSI features that produce the desired co-benefits. PWD has already adjusted their grant criteria (via their scoring rubric) for this purpose, but this can be strengthened based on the results of the co-benefit definition and prioritization process. Weighting more heavily the features that deliver TBL outcomes encourages grant applicants to include them in proposed projects so they are more competitive. The existing stormwater grants program criteria, particularly the Greening and Community Impacts categories, have served as a starting point for the program, but other City plans and initiatives should now be taken into account. These should include any specific equity objectives and co-benefits that have been laid out in the Long Term Control Plan (LTCP) or other regulatory documents as well as newer initiatives around the City that are seeking to advance equity and environmental justice objectives. These include the: Philly Tree Plan, Urban Agriculture Plan, Environmental Justice Advisory Commission (in formation as of late 2021), Hazard Mitigation Plan, Climate Change and Health Advisory Group (past) and forthcoming Climate and Health Adaptation Plan, Philadelphia Climate Action Playbook, and climate change adaptation plan (Growing Stronger). The nascent Environmental Justice Advisory Commission would serve as a particularly appropriate venue for identifying and prioritizing racial equity objectives that can be addressed in part through GSI. The co-benefit/TBL metrics that were identified through the collaborative prioritization process should be incorporated into the stormwater grants program to evaluate applications and to track progress. More detail is provided on ways to adjust the grants program in [Appendix C](#).

To support project developers in adding features that boost TBL benefits of GSI projects, PWD can select a tool or combination of tools that developers can easily use to assess and score the co-benefits of their potential projects and assist with grant application development. There are co-benefit tools and calculators available that provide information on features that can be added to a GSI project and quantify the additional benefits provided beyond stormwater capture. Ideally, these tools will enable developers to do this assessment without having to hire consultants

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30 [https://www.phila.gov/media/20161101174249/2016-Greenworks-Vision\\_Office-of-Sustainability.pdf](https://www.phila.gov/media/20161101174249/2016-Greenworks-Vision_Office-of-Sustainability.pdf).

31 Economic Framework and Tools for Quantifying and Monetizing the Triple Bottom Line Benefits of Green Stormwater Infrastructure, the Water Research Foundation, Project No. 4852/SIWM4T17, 2021.

or have specialized knowledge of the methods of quantification. Potential tools include the Center for Neighborhood Technology’s [“The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental and Social Benefits,”](#) the [National Tree Benefit Calculator](#), and the [Tree Equity Score](#).

There are also several mapping resources and spatial tools for identifying areas that would benefit most from investments in GSI that are currently being developed and tested by City entities and partner organizations. In addition to being useful for PWD and the City to identify priority locations for GSI projects, these mapping tools could help project developers identify opportunities that would better match PWD’s goals. PWD has participated in meetings and provided data to some of these projects, which include the Philly Tree Plan, the Trust for Public Land’s Climate-Smart Cities tool, and the Academy of Natural Sciences’ mapping of priority storm sewersheds and expanded environmental justice indicators.

*For more detailed discussion and additional resources, see [Appendix C](#).*

## **RECOMMENDATION 4**

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### **Ensure Racial Equity in GSI Implementation**

Most co-benefits of GSI projects are spatially constrained. In other words, the co-benefits of GSI diminish quickly as distance from the project increases. If no spatial criteria are taken into consideration when making GSI investment decisions, communities meant to benefit may not actually receive the co-benefits of the project. By strategically targeting investments to neighborhoods that lack GSI and have other socioeconomic vulnerabilities, PWD can make sure that GSI co-benefits are being delivered to communities that need them the most while also addressing historic environmental injustices. In addition, because GSI associated with redevelopment projects only happens in certain neighborhoods and is driven primarily by market forces, the stormwater grants program is an important pathway for advancing equity-related objectives, as it has more flexibility than PWD’s other mechanisms for accomplishing GA targets.

While GSI projects generally need to happen across the entire CSO area, PWD should prioritize certain neighborhoods and/or project types in order to deliver co-benefits to neighborhoods that have suffered from sustained lack of investment and rank higher with regards to socioeconomic and environmental justice disparities. This spatial prioritization would ideally be linked to work under Recommendation 3 (to define and prioritize the desired co-benefits of GSI projects) and lead to the selection of areas that would be uplifted and benefit the most by installation of GSI projects with more co-benefits as opposed to projects that prioritize stormwater volume capture alone. PWD can employ one of the mapping resources or spatial tools to that are currently being developed and tested by City entities and partner organizations to identify areas that would benefit most from investments in GSI, as mentioned in [Recommendation 3](#) and detailed in [Appendix C](#).

In order to implement more GSI projects in places that need them the most, PWD will need to continue to engage neighborhoods and community organizations, building partnerships and collaborations. PWD has already undertaken a Public Involvement and Participation Plan (PIPP) process in partnership with the Pennsylvania Environmental Council for the MS4 areas in the City. This kind of process would also be useful in the CSO basins to identify key areas and their particularized needs, information it can use to set goals and recruit more green projects.

As cities have turned to GSI solutions when reinvesting in their stormwater systems, there has been a rise in concern about unintended impacts—crucially, the displacement of residents who are poor, working-class, and/or people of



color—in areas where GSI and other forms of greening are installed. PWD should work with other City departments to take steps to mitigate these effects through good planning and adoption of anti-gentrification policies.

To ensure that the stormwater grants program supports GSI in places that need the associated TBL benefits the most, PWD must remove barriers to funding access for quality projects that will provide significant co-benefits in these areas. This research found that the process of obtaining project development funds constitutes a significant barrier in several ways. Developers who are small, new, or money-constrained face hurdles because they may not have the expertise or up-front funding to prepare an application. Providing reliable funding for pre-development grants and more initial technical support to community groups could help address this issue. Also, allowing higher per-GA expenses may lead to more projects being proposed that will provide TBL benefits to areas lacking GSI currently. The timeline of obtaining GSI funding is also a barrier, because a long decision process translates to delays and added expense, pushing GSI projects out of reach for affordable housing developments, for example, and making alignment with other funding sources difficult. Finally, more outreach to underserved communities and small developers is critical to bolster awareness of the availability of these funds.

Removing barriers, engaging communities, planning to avoid gentrification, recruiting private landowners, and helping develop quality projects—are all needed to address racial equity and will require sustained investment from PWD in staff and resources. Accomplishing this will likely require additional targeted outreach efforts and increased grant program funding for vegetated GSI projects in neighborhoods that have been identified as priorities by PWD and/or the City.

*For more detailed information, see [Appendix C](#).*

## CASE STUDY

*Buffalo, New York, developed a Green Infrastructure Equity Index that incorporates elements of existing green infrastructure indexes and racial equity analysis tools that will be used to guide implementation of GSI on private properties.*

*See [Appendix A](#) for more information.*

## RECOMMENDATION 5

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### Consider a City-wide Community Greening Grants Program to Access More Opportunities on Private and Non-City Public Lands

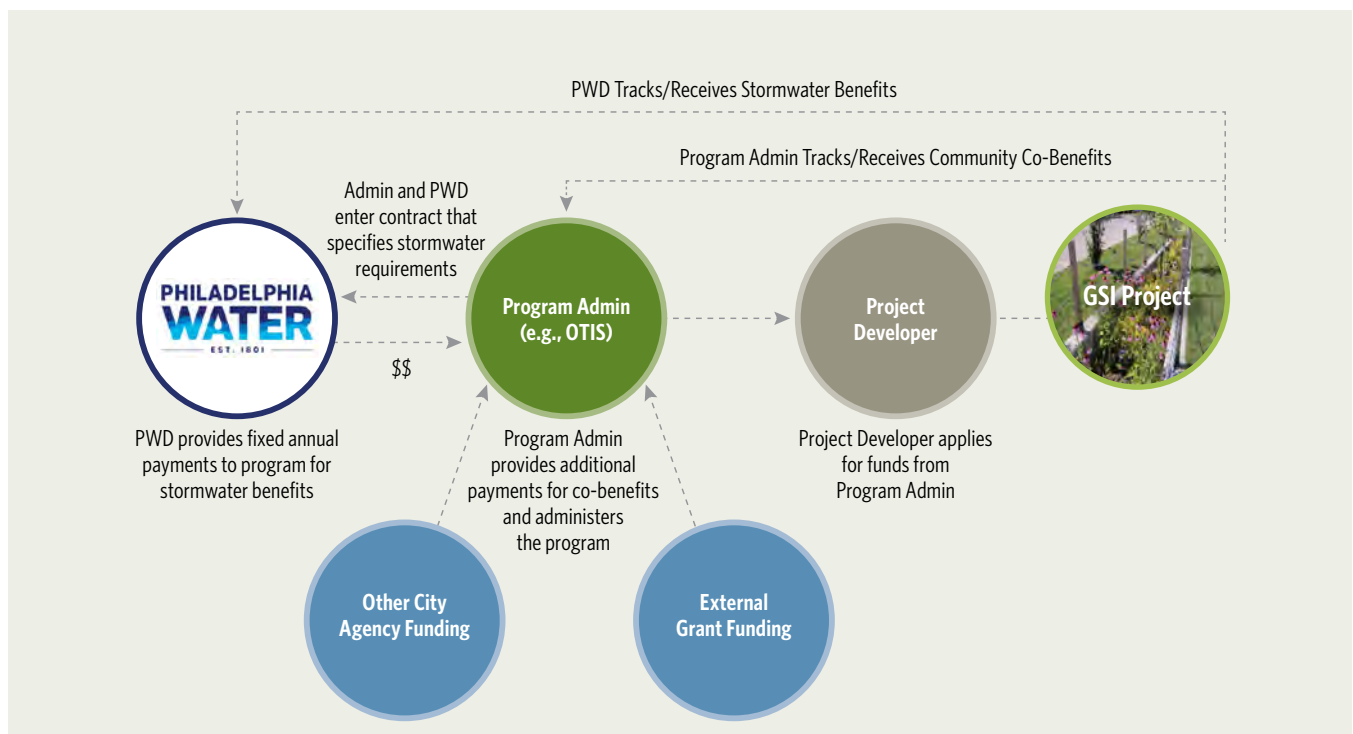
One way to maximize the impact from the City-wide collaboration outlined in Recommendation 1 and the co-benefits identified and prioritized in [Recommendation 3](#) would be to direct at least some of the resources from the existing GSI stormwater grants program to a new, City-wide community greening grants program. This program would establish a mechanism to facilitate partnerships within City government agencies, and potentially other non-City entities, with the goal of achieving multiple community and environmental benefits and facilitating co-financing of projects. The program could target non-City public landowners and quasi-public entities, particularly those that pay stormwater fees. It could also facilitate implementation of water quality projects in the parts of the City subject to the City's MS4 permit.

This kind of program would reduce compartmentalization and improve public outreach and education for all participating City entities. A more centralized community greening grants program that seeks to support a broader

set of City-wide benefits could help attract private foundation and corporate support. The program could also become a centralized portal for private non-residential landowners seeking information about multiple City initiatives— sustainability, hazard mitigation, economic development, community greening—and grant funding available to them to achieve multiple City goals. Finally, a Community Greening Grants Program could provide more partnership opportunities with existing community organizations, a critical element for improving racial equity in co-benefit distribution.

Below is a simple graphic of how this program could function, followed by a description of each circle. This concept takes PWD’s existing collaboration model one step further to acknowledge and embrace the benefits that a broader set of City entities and non-City landowners are seeking.

**FIGURE 1: Community Greening Grants Program**



**PWD Circle:** The Community Greening Grants Program concept recognizes that PWD’s interest in green infrastructure is directly tied to stormwater management. Any resources provided by PWD to such a program would be valued according to the stormwater storage and infiltration capacity of projects as has been done through the existing PWD grants program.

**Other City Agency Funding Circle:** Other City agencies and departments such as the Office of Sustainability have interests in greening projects and can contribute to support the program. How they value their contributions to such a program would be directly related to the benefits they seek from greening projects—and it could be quite different from how PWD values certain elements of a project. For example, planting a tree may have a certain value for stormwater management but a different value for increasing property values and neighborhood improvement. Engaging with other agencies and departments around valuing these different benefits will result in more accurate valuations of a full suite of benefits. PWD’s existing work with the School District of Philadelphia (SDP) serves as an example of the kind of mutual collaboration that can be expanded. The partnership has allowed SDP, PWD, home

and school associations, and community groups to work together towards designing and implementing green schoolyards throughout the City.

**External Grant Funding Circle:** These funds could come from private foundations or private corporations in the form of grants or contributions. Having a more centralized program for community greening will help private entities understand where and how they can support the City's efforts to incentivize investments on non-public properties. It also helps communicate the various benefits of greening projects to help broaden the potential audience of private contributors.

**Program Administration Circle:** Program administration could be located in a City department, in a public partner entity or in a non-profit third-party organization. In terms of non-City entities, it could be managed by PIDC or a non-profit with expertise in greening projects.

- The City agency or department options could include the City Manager's office, the Office of Transportation, Infrastructure and Sustainability, the Office of Sustainability, the Department of Planning and Development, the Department of Public Health, the Division of Housing and Community Development, the Innovation Management Team, and the Office of Community Empowerment and Opportunity. This is a not a comprehensive list, but any of these agencies or departments might have an interest in the co-benefits derived from GSI projects and could provide insight and expertise on how to achieve those co-benefits within a specific project. They may also have insight on or access to land that is not private, but falls outside the definition of publicly-owned land for the purposes of PWD's GSI funding.
- Having a non-City agency such as a non-profit manage the program may have the added benefit of making it easier to bring in private funding from corporations or foundations to match City investments in GSI.

**Project Developer Circle:** This could also be described as the grant manager. This entity could be the property owner, it could be a private contractor experienced with designing and implementing greening projects, or it could be a non-profit or community organization that will be responsible for the relationship between the landowner and the project implementer. For example, the project manager could be the Community Development Corporation or a Neighborhood Improvement District Management Association.

Another approach to this kind of program would be to target specific landowners, specific activities and/or specific kinds of organizations. For example, the program could target affordable housing developers and incentivize GSI implementation in their developments. Based on our interviews, they would greatly benefit from this kind of City-wide program centralization. PWD could use this kind of grant program to increase capacity in neighborhoods to implement GSI through Community Development Corporations. The City recently implemented an ordinance to address failing retaining walls through Neighborhood Improvement Development Management Authorities. Both of these organizations could be important partners for implementation and maintenance of GSI. Other City agencies might have financial resources that could support these initiatives to achieve community development and employment goals.

Several cities around the country are piloting these kinds of City-wide collaborative funding strategies. Most of them involve public projects, so they may be most informative in terms of engaging non-City public landowners in Philadelphia. Some examples are informal initiatives to build climate resilience; others are more formal collaborations with specified City-agency partners.

## CASE STUDY

The Metropolitan Water Reclamation District of Greater Chicago (MWRD) established the Green Infrastructure Partnership Opportunity Program that partners with municipalities, townships, school districts, park districts, and other governmental organizations in the implementation of GSI practices.

See [Appendix A](#) for more information.

## RECOMMENDATION 6

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### Add Flexibility to Incentives Programming with Pay-for-Performance to Expand the Market for Private Projects

Pay-for-Performance (PfP)—also known as Pay for Success—agreements are designed to tie payments to the delivery of measurable and verifiable outcomes that are assessed through specific project performance metrics. PfPs can be set up to achieve different social or environmental goals; i.e., PWD could choose to prioritize maximizing stormwater volume capture through such a program.

Adding this tool to PWD’s toolbox could provide the following benefits:

- Shifts financial and delivery risk to the private sector, whereby PWD can set a fixed price per GA delivered and the developer can determine the best pathway to finance, design, and build the projects.
- Accelerates the number of projects and the speed of delivery when and where needed. Provides PWD with flexibility to incentivize specific geographies and/or interventions, and to adaptively manage programs on some regular interval.
- Provides greater certainty and transparency to the aggregator community and the finance institutions that would support project development.
- Reduces administrative burden and cost to PWD.
- Aids PWD’s project procurement.

The diagram below sets out the basic structure for a PfP agreement. Stormwater project developers would enter a contract with PWD to implement stormwater projects on non-residential private or non-City public properties in the CSO area. The contract would specify at a minimum the desired number of GA, the certification process to indicate whether the outcome has been achieved and a payment schedule with the contract value being paid on delivery of the GA. If needed, the project developer can use the contract to secure private financing through traditional means (i.e., construction loan, business loan, project or company-level equity). As represented on the right side of the diagram, the activities between the “Project Developer” and “Investors” are at the discretion of the project developer.

**FIGURE 2: Pay-for-Performance Contracting**



Alternatively, if PWD cannot enter into an agreement as described above, PWD could simply allocate capital into a PfP program that is capitalized annually through a guaranteed minimum amount per year. PWD would transparently report on the capital left in that program as projects are delivered and paid for. If needed, payments for projects could simply be rolled over to the next fiscal year cycle. The project developer, at their discretion, would then determine the risk premium for delivering the project. While this arrangement is similar to the current grant program, there is a key distinction that project developers have indicated is important: the technical criteria for payment is laid out in advance, and therefore there is more certainty around payment/project acceptance. This might result in a more proactive project development pipeline.

Project developers with whom the research team spoke have shown support for the idea that a PfP contract with a fixed value for stormwater capture would provide transparency and certainty to the process of implementing stormwater practices on private properties.

Regardless of program configuration, a PfP agreement should be structured on a per-acre delivered basis so that PWD and the aggregator have flexibility. For example, if an aggregator cannot deliver the total amount of acres agreed upon in the contract or design, the contract will not be voided, but rather prorated to the acres actually delivered. If a PfP contract will only prioritize stormwater volume capture then it must be implemented along with other programs that are specifically addressing stormwater TBL benefits, such as the Community Greening Grants Program described under [Recommendation 5](#).

Elements required in a PfP contract:

- Value per GA
- Planned number of GA
- Certification process
- Payment schedule

Elements that could be part of a PfP contract:

- Project type
- Project location, e.g., specific areas of the City, or non-City public land, or multiple parcels owned by one entity
- Additional performance metrics such as those that capture TBL benefits (e.g., vegetation, community impacts, etc.)
- Provision of operations and maintenance (O&M) for a set number of years

A PfP contract can reduce PWD’s administrative costs as compared to a grant program, depending on how engaged PWD wants to be in the specific activities required under the contract. A PfP structure requires PWD staff engagement up front, either by using a standard template contract with every aggregator to simplify the process or by negotiating individual contracts. It also requires PWD engagement after the project is completed, to verify and certify outcomes. However, a PfP contract does not require staff engagement throughout the project implementation process. This is in contrast to the current stormwater grants program, which requires staff engagement before, during and after project implementation. One project developer commented that if PWD wants to exert more control on the type of projects or the location of projects, it can actively do outreach to landowners and identify location and/or project types that it wants to prioritize and publish a list of potential projects for developers to consider. While this would provide PWD with a stronger say in the types of projects implemented through contract agreements, such a process would increase the administrative costs of a PfP strategy.

The main challenge to PWD in using a PfP contract is not the contract itself or its design—it is the access to flexible funding. If PfP contracts for projects on private land can only be supported with operating funds, PWD must expend those funds in one calendar year with the potential to extend that contract for several more years. These challenges might be resolved through an arrangement like that with PIDC for the existing grants program, such that funds are expended and off PWD’s books in a given year, but the contract would be administered by PIDC—or another third-party non-profit—allowing more flexibility in timeline for expenditure.

PWD’s operating revenues have been variable over the last 10 years, presenting challenges to funding these kinds of contracts over time. Adopting a policy to dedicate a specified amount of capital revenues for PfP contracts would resolve the challenge created by variable operating revenues. For more information on how this could be done, see [Appendix D](#).

One of the main challenges of a competitive bid market with limited annual market size (\$11.5–33 million) as the grants program is currently structured (see [Table 2](#)) is that market participants have little incentive to invest the necessary resources in a staffing model that can appropriately/adequately qualify projects at scale. Further, the relatively small size of this market and the procurement uncertainty of the current grant program create challenges for businesses to attract financing at the scale of PWD’s needs. Most financing firms want to see a pathway to a minimum \$10 million investment in one to three years. Currently, no single aggregator in the PWD market would be able to support that level of investment and so no single aggregator is making investments in its internal operations to work at scale. A PfP program could address these challenges, attract larger businesses into the program that can take more financial risk, and help create a more viable market.

## Pros and Cons of PfP Contract Model

Pros	Cons
<ol style="list-style-type: none"> <li>1. Enables private sector to access private financing; no cash outlay for public sector until project is completed and verified</li> <li>2. Creates efficiency through economies of scale</li> <li>3. Allows for flexibility &amp; creativity of project approach, new technology adoption, co-benefits, and contracting structure</li> <li>4. Draws on private sector expertise</li> <li>5. Program can include contracts with more than one project developer</li> <li>6. Partnerships can be with not-for-profit entities</li> <li>7. Can allow for consideration of a project's full lifecycle, potentially bundling O&amp;M costs into the contract</li> <li>8. Risk is shared with or passed entirely to private entity</li> </ol>	<ol style="list-style-type: none"> <li>1. A local and stable revenue source is needed that can reliably fund the contract payments</li> <li>2. May be structured using capital or operating revenues, but creating new processes around contracting using either revenue source will be challenging</li> <li>3. The public agency has to be willing to hand over some control of projects to the developers</li> </ol>

### CASE STUDIES

*Washington, D.C.'s Department of Energy & Environment (DOEE) Stormwater Retention Credit (SRC) Price Lock Program guarantees purchasing SRCs at fixed prices from implementers of voluntary green infrastructure on public or private property across the City.*

*See [Appendix A](#) for more information.*

### RECOMMENDATION 7

## Create a Pre-development Fund for Any Grants Programming

Since the inception of GCCW, PWD has had enough applicants to spend down the funding allocated to the stormwater grants program. It is likely that the most obvious opportunities were addressed in the first several years of the program, so the pool of available properties will become smaller going forward. PWD should implement a pre-development fund to support activities that are critical to identifying and bringing forward more and better projects to the stormwater grants program. A pre-development fund would help ensure a supply of implementable projects independent of the amount of funding set aside for project construction.

In soliciting perspectives on the GSI program from the Philadelphia project aggregator/development community, the research team heard consistently that applying to the stormwater grants program is financially viewed as high risk because of the uncertainty of project funding and whether reimbursement for prior costs would be received. Project design and planning requires investing significant sums of money with no guarantee that projects will get funded. Even when projects are funded, developers—especially the smaller ones—cannot always bridge the financial gap until reimbursement. Further, most aggregators are not willing to take on debt-financing to develop projects for a grant program with no guarantee of an award. Removing barriers to pursuing and accessing incentive funding will also help bring new project developers into the scene who were not able to apply for grants before due to these risks and financial gaps.

Apart from supporting concept design and planning of projects, a pre-development fund could also be used to pay for other pre-development services such as building the aggregator community's capacity or conducting general outreach to landowners with an emphasis on co-benefits-oriented projects. Supporting project development could increase accessibility of the stormwater grants program to a wider aggregator/project development community, especially if careful consideration is made to developing an application process that is as simple as possible and equitable across the aggregator community.

Ideally the fund should be structured as a recoverable grant so that if a project gets funded, a portion of the grant goes back into the pre-development fund or gets deducted from the overall grant award. However, a portion of the fund would likely become grant money, which could be structured to come from philanthropic rather than public funds. The fund should also ideally work in tandem with a program like the Community Greening Grants Program, described above, so that pre-development funds are separate from the funds assigned to construction of projects.

A pre-development fund could take on two different structures:

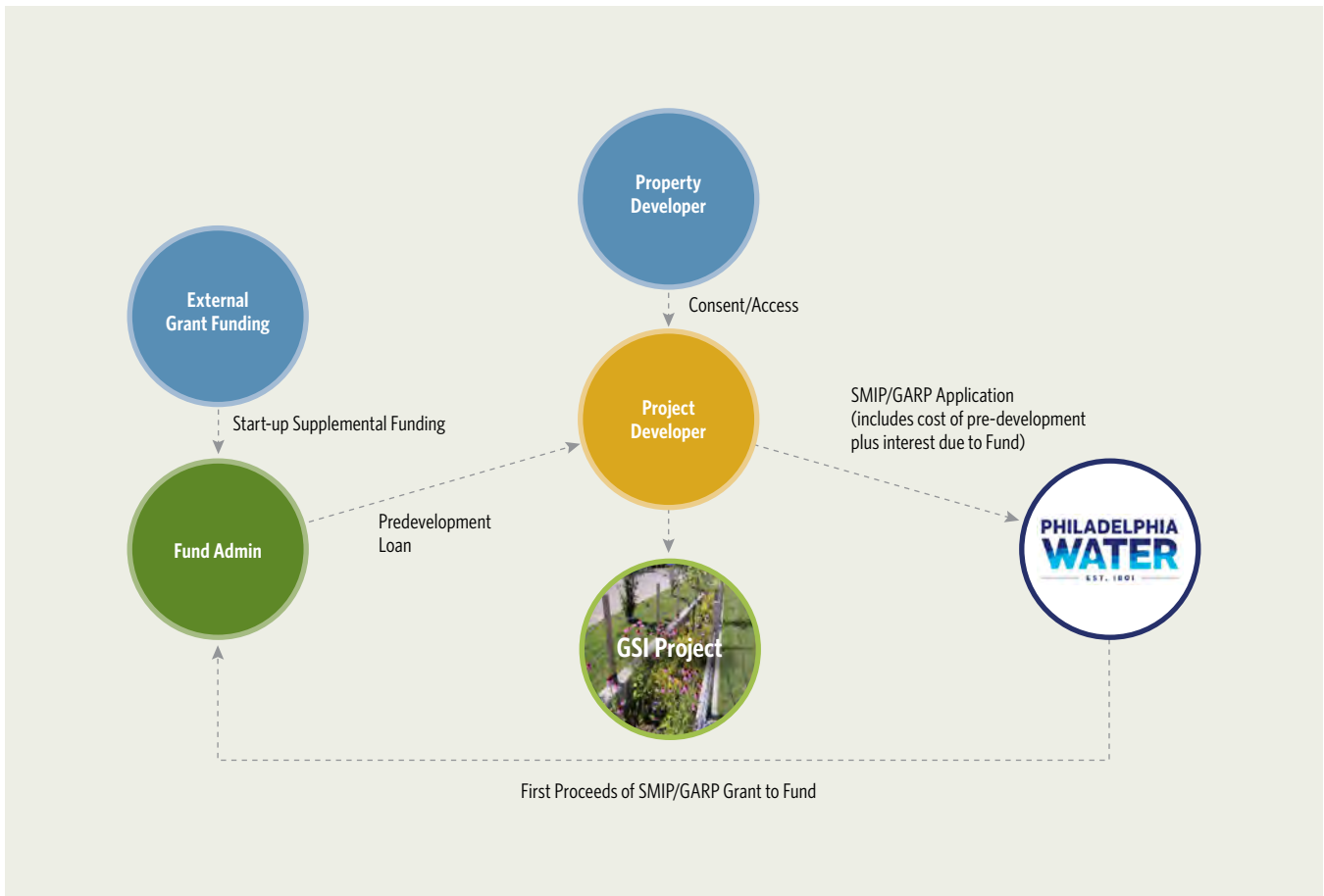
- A business startup program run by PWD or another City agency. The program would award a fixed amount of funds to be used for project design, planning and legal support before applying for a stormwater grant. *Example:* Washington, D.C.'s Department of Energy & Environment (DOEE) has an Aggregator Startup Grant Program. The program awards \$75,000 per aggregator per site for startup activities, like concept design, geotechnical investigation, survey, and landowner negotiations (including legal fees).
- A third-party fund that can raise money from private sources and possibly City funds, which then creates a program to distribute money equitably across the City, in close contact with PWD to ensure costs are qualified for reimbursement under the Office of Economic Opportunity (OEO) requirements. Depending on how the third party is capitalized, it might also be able to make grants that are both OEO and non-OEO qualified.

Third-party structure:

- Grants would be structured as recoverable, not debt.
- The third-party fund would need to create a formal arrangement with PWD to receive reimbursement for OEO-qualified funds it dispersed to aggregators with successful applications. These reimbursements would go directly to the third party, not through the aggregator. This formal arrangement would also help with fundraising.
- The third party would handle all paperwork and grant tracking with close input from PWD on legal issues, technical documents, and other specified needs.
- The third party would recycle any funds it receives in reimbursement from PWD into more grants, until the pool is exhausted or PWD takes over the program.



**FIGURE 3. Pre-development Fund Program**



A pre-development fund would work most efficiently if a guaranteed minimum amount of support were available on a yearly basis to fund those activities. Supporting this fund must be factored into the necessary investments to create a stable annual budget for the stormwater grants program.

### CASE STUDY

*Washington, D.C.’s Department of Energy & Environment (DOEE) SRC Aggregator Startup Grants support technical and outreach work of businesses as they evaluate sites for the feasibility of green infrastructure retrofits.*

*See [Appendix A](#) for more information.*

### RECOMMENDATION 8

## Amend the Stormwater Ordinance to Drive More Greened Acres

If PWD does not want to commit more financial resources to GA on private land, it can generate more of them through stormwater ordinance compliance on new development and redevelopment projects. The current ordinance states that all projects on sites that disturb 15,000 square feet (SF) or more of land must meet PWD’s Stormwater Regulations for Post-construction Stormwater Management Requirements. This applies to six of the seven watersheds in the City; in the

Darby and Cobbs Creek Watershed, the threshold is 5,000 SF.<sup>32</sup> The current water management requirement for Philadelphia is infiltration of the first 1.5 inches of runoff from all DCIA within the limits of earth disturbance.

The research team recommends that the City lower the land disturbance threshold and/or increase the amount of runoff required to be managed. Some examples of other cities that have accomplished this are listed in Table 5.

**TABLE 5: Other U.S. cities and their post-construction stormwater standards<sup>33</sup>**

City	Land Disturbance Threshold	Impervious Cover Threshold	Volume to Control: post-construction Water Quality Volume (WQv) & other requirements
Arlington, Virginia	2,500 SF		<b>Redevelopment:</b> Reduce 10–20% below pre-development loads <b>New Development:</b> Limit phosphorus to 0.41 Lbs/year
Washington, D.C.	5,000 SF		<b>Redevelopment:</b> On-site retention of 0.8 inches of stormwater from a 24-hour storm (if the building’s post-construction assessed value is 50% or greater than its pre-construction assessment) <b>New Development (major land disturbing activity)<sup>34</sup>:</b> On-site retention of 1.2 inches of stormwater from a 24-hour storm
Baltimore, Maryland	5,000 SF		<b>Redevelopment:</b> Treatment of 0.5 inch, 50% removal of impervious surface area, or combination of both <b>New Development:</b> Treatment of 1.0 inch
Seattle, Washington	7,000 SF	1,500 SF	<b>Complex:</b> Infiltrate, disperse, and retain onsite to Maximum Extent Practicable (MEP)
San Francisco, California		5,000 SF or more of impervious surface in combined sewer areas or 2,500 SF or more in separate sewer areas.	<b>Large Projects under SFPUC jurisdiction</b> must be designed to infiltrate, evapotranspire, bioretain, and/or biotreat the stormwater volume generated by the 90th percentile, 24-hour storm. This storm translates to a rainfall depth of approximately 0.75 inches and a rainfall intensity of approximately 0.24 inches per hour. <b>Large Projects under Port jurisdiction</b> must be designed to infiltrate, evapotranspire, bioretain, and/or biotreat the stormwater volume for the 85th percentile, 24-hour storm. This storm translates to a rainfall depth of approximately 0.63 inches and a rainfall intensity of approximately 0.2 inches per hour.
Portland, Oregon	500 SF		Removal of 70% of total suspended solids (TSS) from runoff generated by a design storm up to and including 0.83 inches of rainfall over a 24-hour period.

Both Washington, D.C., and Baltimore use 5,000 SF as the amount of disturbance that requires stormwater management. If moving to a 5,000 SF threshold would be an unreasonably dramatic change, the City could transition to a lower threshold in phases and reduce the disturbance area by, for example, 2,500 SF every three years until it reaches an appropriate bottom limit as determined by the City. Due to the fact that this would change the land use regulations, this threshold adjustment would have to be approved by the City planning department.

Likewise, the City could consider changing the ordinance to require treatment and management of the first 2.0 or more inches of runoff from all DCIA. Given the fact that the City is experiencing increased rain and extreme storms,<sup>35</sup> increasing the amount of runoff that has to be managed on site would more accurately reflect this reality.

The City could also adopt a tiered approach in which PWD and the planning department are tasked with deciding appropriate levels of runoff managed for each SF tier. For example, development projects that disturb between 10,000–14,999 SF might be required to manage 1 inch of runoff from all DCIA and development projects between 5,000–9,999 SF might be required to manage 0.75 inches of runoff from all DCIA. A tiered approach would help avoid having private developers plan projects that fall just below the current threshold in order to avoid triggering the regulation and shift more of the stormwater management responsibilities for impervious surfaces onto these developers.

Eventually lowering the land disturbance threshold to 5,000 SF could unlock opportunities for PWD to work with other City departments on projects that emphasize co-benefits. For smaller projects, other City entities may be more willing to take on or share the cost of implementing SMPs—particularly those that provide co-benefits for the community.

Any of these changes would result in an increase in administrative costs to the City to review stormwater management documentation for more development projects. Given that the City values each GA at approximately \$200,000 in its grants program, the additional administrative costs could be compared to the value of the potential new GA that could be achieved with a lower disturbance threshold.

## CASE STUDY

*Baltimore, Maryland, requires a rigorous permit review process for developers disturbing 5,000 SF or more of land that includes seven sequential steps to determine the minimum design requirements to adequately manage stormwater on each site.*

See [Appendix A](#) for more information.

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32 We reviewed the current regulation found in Chapter Six-PWD of the [Stormwater Manual](#).

33 [https://www.epa.gov/sites/default/files/2016-08/documents/swstdsummary\\_7-13-16\\_508.pdf](https://www.epa.gov/sites/default/files/2016-08/documents/swstdsummary_7-13-16_508.pdf).

34 [https://doee.dc.gov/sites/default/files/dc/sites/d DOE/page\\_content/attachments/0%20Full%202021%20DCMR%20Chapter%205%20with%20Changes%20Accepted%20-%202020%20Amendments.pdf](https://doee.dc.gov/sites/default/files/dc/sites/d DOE/page_content/attachments/0%20Full%202021%20DCMR%20Chapter%205%20with%20Changes%20Accepted%20-%202020%20Amendments.pdf).

35 <https://water.phila.gov/sustainability/climate-change/>.

## APPENDIX A

# Case Studies

The summaries on the following pages provide additional information about programs in other cities that are relevant to the recommendations presented in this report and mentioned throughout the document.





# CITY OF HAMPTON, VIRGINIA

## RELEVANCE

- Issuing a bond to pay for GSI
- Establishing a system to share costs of co-benefits across departments

After almost two years in the making, in December 2020, the City of Hampton, VA, closed on the state’s first Environmental Impact Bond (EIB). The bond will help finance \$12 million in nature-based solutions to address localized flooding. Projects’ success will be measured in gallons of water managed.

To generate the buying power to secure this and other water-related bonds, the City Council agreed to raise stormwater fees by \$5 over a period of five years (\$1/year); the final fee increase will bring the City’s fee to be similar to those of surrounding municipalities.

This effort is part of Resilient Hampton, a City-wide initiative to improve flood resilience in the City since 2019 when it hired its first Resiliency Officer. The initiative is addressing the funding and maintenance of stormwater projects and other resiliency efforts planned by the City and is expected to cost more than \$60 million to implement. (D. Imburgia, pers comm, 2.24.21).

The use of stormwater fees to pay for resiliency projects in the City has its limitations. Based on Virginia’s utility code, some of the resiliency components of the green infrastructure projects that will be implemented cannot be paid by stormwater fees (i.e., trails, boardwalks and other amenities in stormwater parks). Additionally, the use of the fees for the resiliency projects is competing with the need to pay for other legally mandated stormwater projects in the City that are addressing MS4 and Chesapeake Bay Total Maximum Daily Loads compliance.

A cross-departmental Resilient Hampton team has been meeting every other week to address these issues. The team includes members from across the City representing the following City entities: Public Works; Community Development; Planning & Zoning; Housing & Neighborhood Services; Parks, Recreation & Leisure; as well as a federal facilities liaison. The intention of this decentralized approach is to allow for inter-departmental collaboration in order to integrate resiliency across the City and creatively combine the challenges of addressing stormwater, flooding and water quality. The Resilient Hampton projects are currently dually housed between Community Development and Public Works departments. The system has had the support of the City council as well as the City manager. (C. Heaps, pers comm, 10.19.21).

Apart from funding coming from the EIB, the team was also looking in 2021 to secure funding to pay for the maintenance of the new stormwater parks and other project components. For example, one of the projects, the Big Bethel Blueway, will be retrofitting a drainage ditch and creating a walking/biking path. The stormwater component of the project will be financed by the stormwater fees; once in place, the blueway will be maintained by Parks, Recreation & Leisure; and funding for the walking/biking path still has to be secured. (C. Heaps, pers comm, 10.19.21).

The City is looking to complement funding with external sources such as the Virginia Community Flood Preparedness Fund grants and FEMA Flood Mitigation Assistance grants. The stormwater fee funds are being used as a match for these funding sources.

## ADDITIONAL INFORMATION

- [Resilient Hampton initiative](#)
- [Hampton fights flooding with Virginia’s first environmental impact bond](#)



## SAN FRANCISCO, CALIFORNIA

### RELEVANCE

- Innovative financing and coordinating authority - Joint Benefits Authority
- Getting multiple City agencies to pay for co-benefits of GSI/resiliency projects

The World Resources Institute, the City of San Francisco's Public Utilities Commission (SFPUC) and Encourage Capital are working together towards the implementation of a **Joint Benefits Authority (JBA)**, an innovative tool that will enable financing and delivery of integrated public infrastructure across multiple City agencies. The effort will unite multiple municipal departments behind one green infrastructure (GI) project and allow for each department to pay for the specific co-benefits that the GI project will deliver to that department. The JBA will help overcome a water utility's bias against funding 100% of a green infrastructure project that provides multiple benefits to a community, but are not 100% attributable to their water user fees.

During 2021, the JBA team focused on the identification of a pilot to test this JBA approach in the City. The pilot selection criteria included the involvement of three or more City agencies, a location within an environmental justice area, and delivery of multiple benefits. The JBA team is collaborating with an interdepartmental team, including SFPUC, the Port of San Francisco (PORT), San Francisco Municipal Transportation Agency (SFMTA), and San Francisco Planning Department, to pilot the JBA in advancing the recently completed Islais Creek Southeast Mobility Adaptation Study (ICSMAS). This adaptation planning effort in the Islais Creek Channel, an environmental justice area in southeast San Francisco, analyzed and identified strategies to ensure resilience to future climate impacts using nature-based solutions. The goals include: (1) flood protection and resilience for critical waterfront and transportation infrastructure threatened by flooding from sea level rise, stormwater-driven flooding, and storm surges; (2) improvements to the multi-modal transportation network; and (3) community priorities to ensure healthy neighborhoods with new open space, green infrastructure, creek restoration, and improved ecological habitat. Because these challenges are complex and interrelated, and the project goals are multi-benefit and interdisciplinary, the City team aims to test the JBA to implement a suite of projects inspired by the planning effort.

Once the pilot is set, next steps will include looking into the necessary legislation to allow for the implementation of the JBA and evaluating financing mechanisms, which may include joint bonding or finance pooling. The implementation of a JBA will not necessarily require a new revenue source, as the overall objective is to make more efficient use of current public funds across multiple agencies and to tap into other funding sources (i.e., insurance or healthcare funds). (L. Beyer, pers. comm., 2.11.21)

### ADDITIONAL INFORMATION

- [JBA 2 pager](#)



## AUSTIN, TEXAS

### RELEVANCE

- The program was designed to involve other City agencies around co-benefits and co-financing.
- Three departments are co-financing: Austin Water, Development Services—Urban Forestry and Watershed Protection Department.

The Austin Rain Catcher Pilot Project (RCPP) is being piloted by Austin's Watershed Protection Department. The RCPP is being piloted in the Upper Waller Watershed to test the hypothesis that greater financial incentives and technical guidance to community members will result in greater adoption of large volume cisterns and rain gardens. The department identified the benefits of rainwater capture (cisterns and rain gardens) in Austin, quantified several project benefits, and examined how these benefits could be used to develop partnerships with additional City departments and encourage residents to install the systems. The primary financial contributors to the program are three City departments: Austin Water, Development Services—Urban Forestry & the Watershed Protection Department (Jessica Wilson, pers. comm. 10.7.21).

### ADDITIONAL INFORMATION

- [Rain Catcher Pilot Program](#)
- [Scaling Green Stormwater Infrastructure Through Multiple Benefits in Austin, Texas](#)
- [Watershed Protection Department](#)



# MILWAUKEE, WISCONSIN

## RELEVANCE

- Large-scale GSI Implementation
- Example of using debt financing on non-utility properties

The Milwaukee Metropolitan Sewerage District (MMSD) issued in 2020 the first-ever Certified Climate Bond for a combined wastewater and stormwater program in the United States. Funds from the bond will be used to finance capital projects ranging from water reclamation facilities and pipelines to green infrastructure, including investing \$20 million between 2020-2023 in community-based GSI facilities located on private property. These projects are expected to capture an additional 8.45 million gallons per storm, about \$2.37 per gallon captured.

In Milwaukee, one inch of rainfall amounts to 7.1 billion gallons of water. To control this influx of stormwater, the local utility, Milwaukee Metropolitan Sewerage District (MMSD), receives flows from two sewer systems—a combined system constructed over 130 years ago and a separate system built following World War II. Historically, MMSD faced 50 to 60 sewer overflows per year. MMSD is supplementing grey infrastructure investments made in the 1980s and 1990s with green infrastructure—including bioswales, permeable pavement, stormwater trees, rain gardens, and more—to help further reduce overflows. MMSD’s investment in green infrastructure could reduce the utility’s future infrastructure costs. In particular, an investment of \$178 million for green infrastructure in the agency’s combined sewer service area would result in stormwater capture equivalent to \$222 million investment in grey infrastructure.

Through the mid-1990s, MMSD invested \$3 billion in gray infrastructure and in 2010, another \$1 billion in an overflow reduction plan that expanded the deep tunnel system to 28.5 miles and allowed it to store up to 521 million gallons of stormwater. Despite these massive investments and time-intensive infrastructure upgrades, the Milwaukee community continued to voice concerns about sewer overflows.

In response, MMSD decided to prioritize ratepayer involvement in a solution. MMSD recognized that because localized infrastructure can be installed right on a home or business owner’s property, it is more likely to gain public support since it is easily visible and accessible to the community. In 2002, MMSD began deploying localized strategies including bioswales, permeable pavement, stormwater trees, rain gardens, and more to help capture stormwater where it falls, reduce the strain on centralized infrastructure, minimize pollution caused by overflows, and improve water quality. As of 2013, MMSD’s goal is to “achieve zero sewer overflows, zero basement backups, and improved water quality by the year 2035” by capturing the first 0.5 inch of rainfall from impervious surfaces with localized infrastructure. As of May 2021, MMSD had installed GSI on private property that captures 43 million gallons of stormwater per storm.

## ADDITIONAL INFORMATION

- [Milwaukee Certified Climate Bond](#)
- [Tap into Resilience: Milwaukee Metropolitan Sewerage District](#)





## SEATTLE PUBLIC UTILITIES COMMISSION, WASHINGTON

### RELEVANCE

- Use of GSI to manage stormwater
- Use of capital to finance GSI on non-utility properties

SPU and King County are working to manage urban storm water runoff into Puget Sound and overflows from areas of Seattle with combined sewer systems. Storm water runoff and combined sewer overflows are a significant source of surface water pollution. RainWise is a rebate program that helps eligible property owners manage stormwater by installing rain gardens and/or cisterns on private property and disconnecting their roof downspouts from the sewer system if necessary. About 50,000 properties in targets basins in Seattle are eligible to participate.

If a property owner lives in a targeted basin, they first learn about appropriate green infrastructure strategies—either a rain garden, a cistern, or a combination of both—for their property at the RainWise website, which uses data maintained by SPU to accurately reflect the specifics of that parcel. Next, the potential participant is given information about available reimbursements and contractors that are qualified to evaluate and install the recommended technologies. As part of this process, SPU conducts both pre- and post-inspections of the installed projects and then provides rebates for properly installed systems. Rebates can be up to \$4.00 per square foot of rooftop runoff controlled by the rain garden and/or cistern, and have averaged \$4,800 per property covering 90% of the project. Following installation, RainWise participants are responsible for maintaining their project for five years and enter into a maintenance agreement with SPU. This helps provide SPU with certainty that the localized storm water infrastructure will be in place as the utility works to address storm water management.

In addition, SPU and its partner King County strive to make RainWise equitable and inclusive. To this end, SPU has created several alternative funding and grant programs for income-qualified households and contractors such as the RainWise Access Grant and the RainWise Pilot Access Loan. Further, RainWise funds outreach efforts to multicultural residents that include providing additional customer service and coaching of clients that need extra help navigating the installation and rebate process of the program.

Seattle Public Utilities and King County finance the RainWise program with municipal bond proceeds using the GASB 62 regulated operations accounting approach. By investing in these programs at scale, as of September 2020, Seattle has been able to finance GI projects that manage 410 million gallons of stormwater per year, bringing the City closer to meeting its goal of managing 700 million gallons of runoff per year with GI by 2025.

### ADDITIONAL INFORMATION

- [Seattle Public Utilities, Water Now case study](#)
- [Tap into Resilience: Pathways for Localized Water Infrastructure](#)



## BUFFALO, NEW YORK

### RELEVANCE

- First EIB used to finance a green infrastructure incentives program on private property.
- Use of Green Infrastructure Equity Index (GI Equity Index)
- Uncertainties: how much demand will there be and what types of projects are going to be proposed.

This \$49 million EIB, the largest EIB so far in the U.S., was issued by the Buffalo Sewer Authority in June 2021. It will provide upfront capital on a large scale to fund projects on private properties by providing reimbursements for the implementation of GSI through its Rain Check 2.0 Grant Program. The bond's measurable outcomes will be acres of impervious surface managed through the grant program and will be disclosed to investors on an annual basis.

The bond will also report on several equity and community impact metrics. Buffalo Sewer developed a Green Infrastructure Equity Index (GI Equity Index) that incorporates elements of existing green infrastructure indexes and racial equity analysis tools to conduct a preliminary analysis of various equity considerations that will be used in Rain Check 2.0.

To address its combined sewer overflow problems, the City has already implemented larger projects on public properties, mainly on streets, parking lots and green roofs through its Rain Check 1.0 program. In order to reach its stormwater targets, the City needed to expand its efforts to private properties. Rain Check 2.0 will work on new developments and targeted properties that may include partnering with large and small property owners, local colleges and schools, religious institutions, non-profits, housing authorities and individual residents.

The issuance of this EIB will provide a pool of upfront capital for the program so that Buffalo Sewer can offer these incentives on a larger scale throughout the City. The novel structure of this EIB incentivizes Buffalo Sewer to manage more acres of impervious surface through the grant program, as the coupon rate on the bond will step down if Buffalo Sewer achieves its goal for acres managed through the incentive program. Arcadis N.V. is the independent third-party validator and will be responsible for inspecting each green infrastructure project site and performing measurements to determine whether the stated outcomes have been achieved. Additionally, the funds will also be used to cover some design and construction costs of projects on public properties.

The City has worked to identify and provide an analysis of priority CSO basins to work in and within each one it has identified opportunity sites. This will be used to begin the conversation between Buffalo Sewer, the City, the property owners, and the community.

### ADDITIONAL INFORMATION

- [EIB press release](#)
- [Rain Check 2.0 Opportunity Report](#)
- [Water Finance & Management article](#)
- [Buffalo Sewer Authority Issues Largest-Ever U.S. Environmental Impact Bond](#)
- [The Bond Buyer article](#)
- [An Equitable Water Future, Buffalo](#)



## COOK COUNTY, ILLINOIS (CHICAGO AND GREATER CHICAGO)

### RELEVANCE

- Partnership program across government agencies to fund GI projects – cost share funding of GI practices (between MWRD and government agencies)
- Examples of templates for intragovernmental agreement and for partnership application forms

The Metropolitan Water Reclamation District of Greater Chicago (MWRD) is a special-purpose district responsible for treating wastewater and providing stormwater management for residents and businesses in Chicago and 128 suburban communities. MWRD established the **Green Infrastructure Partnership Opportunity Program** to increase the acceptance and funding of GI throughout Cook County. Since 2017 the program has partnered with municipalities, townships, school districts, park districts, and other governmental organizations within its jurisdiction in the implementation of GI practices to alleviate flooding. MWRD funding for selected projects is in the form of reimbursement of construction related costs only. The amount of funding the MWRD provides to selected projects is based on the effectiveness of the proposed GI, the needs of the community, and availability of funding.

**Space to Grow: Greening Chicago Schoolyards** is a unique collaboration among MWRD, Chicago Department of Water Management, Chicago Public Schools and two non-profit partners (Openlands and Healthy Schools Campaign). The program partners spent 18 months building a shared vision and goals for Space to Grow while they piloted four schoolyard transformations that included GSI. As of 2019, Space to Grow had built 34 green schoolyards.

### ADDITIONAL INFORMATION

- [Green Infrastructure Partnership Opportunity Program](#)
- [Templates: Intragovernmental agency agreement template and GI Partnership Application Form](#)
- Greening Chicago Schoolyards:
  - [Space to Grow Program](#)
  - [Implementing Green Stormwater Infrastructure on Schoolyards](#)
  - [Green Schoolyards for Healthy Communities](#)



## WASHINGTON, D.C.

### RELEVANCE

- Pay for Performance/Stormwater Retention Credits Price Lock Program
- Aggregator start up grants

Washington D.C.'s Department of Energy & Environment (DOEE) implemented a Stormwater Retention Credit (SRC) Purchase Agreement Program. Through this program, DOEE guarantees purchasing SRCs at fixed prices from stormwater retention credit generators. SRC generators can lock in an SRC sale price by selling credits to DOEE through the SRC Price Lock Program. SRC generators are developers that implement voluntary green infrastructure projects across the City. They then have the option of selling the stormwater credits they generate through their projects to DOEE, through the SRC Purchase Agreement and Price Lock Program; or to other developers who need to purchase stormwater credits.

SRC generators can seek out the most cost-effective opportunities for installing green infrastructure projects on private and public land throughout the District of Columbia.

DOEE has also offered in the past SRC Aggregator Startup Grants to support SRC-generating businesses as they evaluate sites for the feasibility of green infrastructure retrofits. Grant funds are used to support technical and outreach work to identify and aggregate a pool of projects that are considered to be good candidates to generate SRCs.

### ADDITIONAL INFORMATION

- [Stormwater Retention Credit Eligibility and Certification Process](#)
- [SRC Price Lock Program](#)
- [SRC Program Resources](#)
- [SRC Aggregator Startup Grants](#)



## BALTIMORE, MARYLAND

### RELEVANCE

- Stormwater ordinance language
- Land disturbance threshold at 5,000 SF
- Low disturbance incentives

In 2009, Maryland Department of Environment (MDE) updated their regulation to require land disturbance activities that disturb 5,000 SF or more to have their phased stormwater management plans approved by the Department of Public Works and comply with the 2000 Maryland Stormwater Design Manual. Baltimore developed their ordinance in accordance with this new threshold provided by the state. A developer must follow seven sequential steps to determine the minimum design requirements to adequately manage stormwater on their site. In short, Baltimore requires a rigorous permit review process for developers disturbing 5,000 SF or more of land (soil).<sup>36</sup>

MDE identified 14 specific performance standards that are divided into four main categories to in part justify the need for their land disturbance threshold. In some counties, a Stormwater Management Plan is required for any project that disturbs over 1,000 SF. The four main categories include:

1. Recharge the water table
2. Flood Protection
3. Stream Channel Erosion Protection
4. Water Quality Improvement

In accordance with these four main categories of performance standards, four storage volumes must be calculated to determine the size of the necessary stormwater management intervention.<sup>37</sup>

In efforts to incentivize low-impact development, MDE developed a low impact development credit, the natural area conservation credit, and the environmentally sensitive development credit. Descriptions of each credit are as follows:

**Low Impact Development Credit:** All disconnected impervious surface runoff directed towards BMPs like grass channels or vegetated areas is subtracted from the site's overall impervious surface area. For example, the plan for a new development includes a total impervious surface area of 10,000 square feet. The developer decides to divert the runoff from a 1,000 square-foot roof away from a stormwater pond and towards a vegetated area. Now, the impervious surface area for determining the size of the stormwater pond is 9,000 square feet.

**Natural Area Conservation Credit:** Natural areas permanently conserved in a land trust or conservation easement are subtracted from the total site area when calculating the size of large stormwater structures.

**Environmentally Sensitive Development Credit:** If a new development meets all the following criteria, no large stormwater structures need to be constructed. 1) Less than 15% of the site is impervious. 2) Rooftop runoff is disconnected and directed to a vegetated area. 3) Grass channels are used instead of curb and gutter systems. 4) At least 25% of the site is permanently conserved. 5) Lots are larger than two acres or, preferably, lots are clustered and at least one-half acre in size. 6) Any remaining impervious surfaces, like roads or driveways, must satisfy all four storage volume criteria by using Low Impact Development techniques.<sup>17</sup>

### ADDITIONAL INFORMATION

- [Maryland Stormwater Program](#)
- [Maryland Stormwater Design Manual](#)
- [Stormwater Management Guidelines for State and Federal Projects \(April 2010\)](#)

<sup>36</sup> <https://publicworks.baltimorecity.gov/sites/default/files/SWM-Min%20req.pdf>.

<sup>37</sup> <https://www.towson.edu/public-safety/environmental-health-safety/documents/a-citizens-guide-to-stormwater-management-in-maryland-1.pdf>.

APPENDIX B

# The City of Philadelphia's Ability to Debt Finance Green Stormwater Infrastructure



## MEMO

To: WaterNow Alliance  
From: Orrick, Herrington & Sutcliffe LLP  
Date: March 24, 2021  
Re: The City of Philadelphia's Ability to Debt Finance Green Stormwater Infrastructure

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As requested, this memorandum addresses whether the City of Philadelphia (the "City") has the requisite legal authority to issue bonds and/or other debt instruments secured by water/wastewater system revenues for the purpose of financing green stormwater infrastructure ("GSI") benefiting the system and located on private property. As discussed below, the City may use revenue bond proceeds to finance GSI located on private property if the City acquires sufficient rights with respect to the operation and maintenance of the GSI sufficient to be considered a part of the City's utility system.

### I. RELEVANT LEGAL AUTHORITY

The City's ability to debt finance its water and wastewater systems is primarily derived from, and constrained by, the First Class City Revenue Bond Act (the "Bond Act") and the General Water and Wastewater Revenue Bond Ordinance of 1989, as amended and supplemented (the "Ordinance"), and state constitutional restrictions limiting the expenditure of public funds for private purposes.

#### Bond Act

Pursuant to Section 4 of the Bond Act, the City has authority to: *"issue revenue bonds for the purpose of financing or refunding the cost of a project or of two or more projects combined to be secured by and payable solely from project revenues in accordance with and subject to the provisions and limitations of this act."*<sup>1</sup>

The Bond Act defines "project" as follows:

*"any buildings, structures, facilities or improvements of a public nature, the related land, rights or leasehold estates in land, and the related furnishings, machinery, apparatus or equipment of a capital nature, which the city is authorized to own, construct, acquire, improve, lease as lessor or as lessee, operate, maintain or support; any item of construction, acquisition or extraordinary maintenance or repair thereof; the city's share of the cost of any of the foregoing or any combination thereof undertaken jointly with others; and any combination of any or all of the foregoing or any undivided portion of the cost of any of the foregoing or of any such combination as may be designated as a project by the city for financing purposes and in respect of which the city may reasonably be expected to receive project revenues."*

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<sup>1</sup> First Class City Revenue Bond Act, The Act of Oct. 18, 1972, P.L. 955, No. 234.

## Ordinance

Bonds issued under the Ordinance “shall be issued for the purpose (i) of paying the costs of Projects (as such term is defined in the Act) relating to the System...” The Ordinance authorizes the City to fund projects or improvements to the System which are or become part of the System.

As defined in the Philadelphia Bond Ordinance, “System” includes:

*“the entire combined water system and wastewater system of the City, now existing and hereafter acquired by lease, direct control, purchase or otherwise or constructed by the City, including any interest or participation of the City in any facilities in connection with said System, together with all additions, betterments, extensions and improvements to said System or any part thereof hereafter constructed or acquired and together with all lands, easements, licenses and rights of way of the City and all other works, property or structures of the City and contract rights and other tangible and intangible assets of the City now or hereafter owned or used in connection with or related to said System.”*

## Gift of Public Funds Prohibition

Article IX, Section 9 of the Pennsylvania Constitution provides as follows:

“The General Assembly shall not authorize any municipality or incorporated district to become a stockholder in any company, association or corporation, or to obtain or appropriate money for, or to loan its credit to, any corporation, association, institution or individual.”

The Pennsylvania Supreme Court has explained that so long as a program is reasonably designed to combat a problem and the public will benefit from a program, then the program is sufficiently public in nature to withstand constitutional challenges.<sup>2</sup>

## II. ANALYSIS

The key question with respect to the use of bond proceeds to finance GSI assets located on privately owned land is whether the financing of the GSI constitutes the financing of a project that is part of the “System” as defined by the Ordinance. More specifically, can the City acquire with respect to GSI located on private property an interest sufficient for the financing to be considered a financing of a project that is a part of the System?

The City’s interests could include an easement, a deed restriction, a license and/or a contractual commitment.

An *Easement* is “An interest in land owned by another person, consisting in the right to use or control the land, or an area above or below it, for a specific limited purpose.”<sup>3</sup>

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<sup>2</sup> *Tosto v. Pennsylvania Nursing Home Loan Agency*, 460 Pa. 1 (1975). *Tosto* concerned nursing homes. Pennsylvania courts have also found exceptions for situations involving industrial development, disaster relief and the reduction of unemployment.

<sup>3</sup> EASEMENT, *Black’s Law Dictionary* (11th ed. 2019).



A *Deed Restriction* is “A limitation or restriction on property use.”<sup>4</sup>

A *License* is “An authority to do a particular act, or series of acts, upon another’s land, without possessing any estate therein.”<sup>5</sup> A license generally permits the licensee to use the licensor’s land for a specific purpose but confers only a personal privilege that cannot be assigned, is terminable at will and does not create an interest in land.<sup>6</sup>

A *Contractual Commitment* would take the form of a contract between the City and the property owner pursuant to which the property agrees to continue to use the GSI as contemplated. A contractual commitment by itself would not convey to the City an interest in the property and would be personal to the property owner, although the property owner could agree to not transfer the property except to a transferee who assumed the property owner’s obligations under the contract.

## Easement Approach

The most compelling way to for the financing of GSI located on private property to fall within the Bond Act’s definition of project and within the Ordinance’s definition of System would be for the City to obtain an easement on the property. An easement could take the form of a formal easement or, as noted in an analysis prepared by attorneys at Ballard Spahr LLP<sup>7</sup>, a deed restriction accompanied by a right of the City to enter the property for the purpose of maintenance, repair or replacement can create an easement under Pennsylvania law. Easements, moreover, are for GASB purposes characterized as a capital asset.<sup>8</sup> By acquiring an easement on the property on which the GSI is located the City would be acquiring an interest in land for purposes of the Bond Act and the Ordinance.

## Contractual Approach

An argument can be made that the City’s rights with respect to the maintenance of the GSI pursuant to a contract between the City and the property owner can be sufficient for the financing of GSI on private property to constitute a part of the System. Specifically, that the GSI benefits the system and the contract rights of the City themselves constitute an asset of the System. The argument would be strengthened, moreover if the City receives a license allowing the City to enter the property for the purpose of maintenance, repair or replacement and/or the property owner agrees to not transfer the property unless the transferee assumes the property owner’s contractual obligations and grants a license.

## Gift Prohibition

The primary question in determining whether an appropriation of public funds violates a constitutional provision prohibiting gifts of public money is whether the funds are to be used for a public or private purpose. Although

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4 Black’s Law Dictionary Free Online Legal Dictionary 2nd Ed. Available at <https://thelawdictionary.org/deed-restrictions/>.

5 LICENSE, Black’s Law Dictionary (11th ed. 2019).

6 Id.

7 McKinstry, Robert B. and Prior, H. David and Drust, Jennifer, Montalbán, Ana and Magrini, Kimberly, Unpave a Parking Lot and Put up a Paradise: Using Green Infrastructure and Ecosystem Services to Achieve Cost-Effective Compliance (August 1, 2012). Available at SSRN: <https://ssrn.com/abstract=1824530> or <http://dx.doi.org/10.2139/ssrn.1824530>.

8 Statement No. 51 of the Governmental Accounting Standards Board. Available at file:///C:/Users/80J/Downloads/259\_925\_GASBS-51.pdf.



the GSI would be placed on private property and benefit private entities, financing the GSI would constitute a program reasonably designed to combat a public problem (stormwater runoff) and the public will benefit from the benefit to the City's the water or wastewater system. Thus, the financing will serve a public purpose sufficient to address gift prohibition concerns.

### **III. CONCLUSION**

The Bond Act and the Ordinance provide sufficient legal authority for the City to bond finance GSI located on private property if the City acquires rights with respect to the operation and maintenance of the GSI sufficient to be considered a part of the System. An easement would provide sufficient rights and an argument can be made that the City can acquire sufficient rights by contract without an easement.

The GSI will provide sufficient public benefit to obviate any gift of public funds concerns.



**APPENDIX C**

# Equity and Co-benefits Background, Considerations, and Tools



# Equity and co-benefits background, considerations, and tools

## I. INTRODUCTION

This appendix is a response to one of the original research questions for this project: “Question 3. Are there policy changes needed to better realize community benefits and ensure racial equity in the implementation of the program?” The answers to this question are relevant for multiple recommendations as indicated in Table 4, Alignment of Conclusions with Recommendations, in the main report, *Sustainable Funding for Philadelphia’s Green City, Clean Waters Plan: Advancing Implementation on Private and Non-City Public Lands*. This appendix contains information with the most direct relevance for Recommendations 3: Clarify the City’s Triple Bottom Line/Co-Benefit Priorities, and 4: Ensure Racial Equity in GSI Implementation, in the report. This appendix covers the cross-cutting steps that will help improve the overall yields of community benefits associated with green stormwater infrastructure (GSI) projects implemented via the Philadelphia Water Department (PWD)’s Green City, Clean Waters (GCCW) program, but most importantly, ways to better deliver these benefits to community members and neighborhoods that are subjected to racial inequities and other environmental injustices, while avoiding negative unintended consequences.

The appendix begins with important intersectional information on the larger effects of GSI, to assist PWD in framing its policies. The appendix then provides implementation information for Recommendations 3 and 4.

Green stormwater infrastructure sits at multiple points of contact between people and the city, environment, society, and civic policy. It is important for PWD and other city agencies to be aware of the larger context and possible consequences, both positive and negative, of installing GSI across the city. Racial equity is a complicated problem and this appendix does not suggest that it is within PWD’s scope or ability to solve disparities. However, through informed and proactive advance planning, PWD can work to minimize negative unintended consequences while improving racial equity and increasing community benefit production.

## II. CRITICAL CONTEXT AND BACKGROUND INFORMATION; REPORT ASSUMPTIONS AND LIMITATIONS

The recommendations contained within this report work off several assumptions, and are also subject to certain inherent limitations. This section addresses these issues and surveys key background material and contextual understanding.

Without proactive planning, the GSI that PWD installs risks contributing to unintended, negative gentrification and displacement outcomes to disadvantaged or marginalized communities. PWD emphasizes in its own materials that adding green features to stormwater management is desirable because of the triple bottom line (TBL) co-benefits they provide, specifically including environmental benefits, human health benefits, and the fostering of social equity that results from increased green space.<sup>1</sup> Thus, PWD has already identified and

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<sup>1</sup> LTCP Update GCCW at 1-2: [http://archive.phillywatersheds.org/ltcp/LTCPU\\_Section01\\_Introduction.pdf](http://archive.phillywatersheds.org/ltcp/LTCPU_Section01_Introduction.pdf).

prioritized some triple bottom line co-benefits for city residents. To ensure that these co-benefits of GSI are distributed and enjoyed equally by Philadelphia residents, PWD should also create policies and plans to minimize gentrification and displacement.

## A. Critical Background: Green Gentrification and Displacement

Green stormwater infrastructure sits at the intersection between people and the city, environment, society, and civic policy. As cities across the country have turned to GSI solutions when reinvesting in their stormwater systems, or to reinvest in other urban green space, there has been a corresponding rise in concern about possible unintended side effects on the residents in areas where GSI and other forms of greening are installed. This section provides a brief summary of the critical issues of gentrification and green gentrification, recognizing that the body of literature on these subjects is a vast and unsettled subject of its own.

The term “gentrification” was originally coined in the 1960s by Ruth Glass to describe the transformation of working-class London neighborhoods into middle and upper-class neighborhoods.<sup>2</sup> Colloquially, gentrification has come to mean “a process in which a neighborhood gains wealth and sees its population become more affluent, whiter, and younger.”<sup>3</sup> “Green gentrification,” also sometimes called “environmental gentrification,” is a term that colloquially refers to the gentrification process that happens when new green or environmentally sustainable amenities are installed—such as parks, street trees, or clean-up of previously abandoned land—that attract and serve new eco-conscious, affluent in-movers.<sup>4</sup>

Gentrification is a highly contested social and political issue, in part because of its visibility and immediate effect in cities across the nation. Gentrification has the power to displace low-income families or, more often, prevent low-income families from moving into previously affordable neighborhoods.<sup>5</sup> It has the power to completely transform the cultural landscape of a neighborhood—changing everything from a neighborhood’s colloquial name, to the use of public space, to the small businesses that can locate there.

Debates about gentrification tend to follow two lines of argument. On one side, people argue that gentrification is good for cities because it brings a higher tax base, revitalizes previously derelict neighborhoods, improves public safety, and attracts newcomers to boost the economy. On the other, some argue that gentrification is bad, a modern perpetuation of decades of exploitation of poor communities and the disenfranchisement of communities of color. Critics of gentrification point to displacement as the primary threat to low-income communities. Displacement is the process by which a neighborhood becomes too expensive for its long-term residents to live so that, over time, lower-income residents get priced out due to rising rents, property taxes, or general cost of living.

Generally, although not universally, critics of gentrification are more concerned about displacement of residents than with gentrification itself. In fact, long-term residents’ views on gentrification can be quite

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2 LTCP Update GCCW at 1-2: [http://archive.phillywatersheds.org/ltcpu/LTCPU\\_Section01\\_Introduction.pdf](http://archive.phillywatersheds.org/ltcpu/LTCPU_Section01_Introduction.pdf).

3 Richard Florida, *The New Urban Crisis: How Our Cities Are Increasing Inequality, Deepening Segregation, and Failing the Middle Class—and What We Can Do About It* 59 (New York: Basic Books, 2017).

4 Tania Schusler & Amy Krings, *Addressing Environmental Gentrification: Improving Environmental Health for Children and Youth without Displacement* 3 (Center for the Human Rights of Children Publications; Loyola eCommons, November 2018).

5 Lance Freeman, *Displacement or Succession? Residential Mobility in Gentrifying Neighborhoods*, 40 *Urban Affairs Review* 4 (2005).

ambivalent, as pointed out by Lance Freeman in a 2006 book on the issue.<sup>6</sup> Many long-term residents Freeman interviewed welcomed the improved access to services and amenities that come with investment, as long as that investment did not lead to displacement. When “environmental gentrification” is discussed, it often explicitly or implicitly includes displacement.<sup>7</sup>

Displacement as a result of environmental gentrification is a particularly concerning outcome to advocates, because working class, working poor, and communities of color will have suffered the environmental harms while deriving none of the new benefits. Many advocates are also wary of environmental gentrification as a result of living with the negative consequences—intentional and unintentional—of various “urban renewal” initiatives over the years.<sup>8</sup>

## B. Implications for planning for PWD

Critically for PWD, displacement is not always the inevitable result of gentrification, but instead is a gradual process that can be mitigated by anticipating the impacts that gentrification can have on housing affordability and then planning for them accordingly.<sup>9</sup> In fact, multiple studies have suggested that direct displacement of long-term, low-income residents by wealthy in-movers happens relatively seldomly. Instead, displacement tends to happen via the exclusion of low-income in-movers in gentrifying neighborhoods rather than via the direct displacement of low-income individuals already residing there.<sup>10</sup> Thus, it is within PWD’s power to implement environmental justice principles through implementation of its GCCW program and ensure an equitable distribution of GSI projects and their co-benefits to residents of Philadelphia.

Although there is no single best practice for accomplishing a more equitable distribution of GSI co-benefits, there are strategies that PWD can choose to implement. First, one of the most important parts of equitable GSI installation is the planning aspect itself, including racial justice and equity principles and community participation as part of the process.<sup>11</sup> Second, deliberate identification and prioritization of goals that include environmental justice aspects as part of the planning process shapes the types of GSI that should be installed, and make it easier to identify and plan for potential unintended consequences that may not align with PWD’s goals.<sup>12</sup> Third, coordination with other city agencies and quasi-public agencies, such as with parks systems or housing and land organizations, during the planning and implementation stages of park and green space development has proven to be a successful strategy.<sup>13</sup> PWD can take action independently by incentivizing and prioritizing development grants that include anti-displacement strategies.<sup>14</sup>

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6 See Lance Freeman, *There Goes the ‘Hood: Views of Gentrification from the Ground Up* (2006).

7 Schusler, *supra*, at 3 (citing Curran & Hamilton, 2012, p. 1027); Checker (2011, p. 210).

8 See, e.g., Sterling Johnson & Kimberley Thomas, *Green Gentrification in South Philly*, *Edge Effects* (November 4, 2021), <https://edgeeffects.net/green-gentrification>.

9 Freeman, *supra*, *Displacement or Succession* at 488; Rigolon & Christensen, *Greening without Gentrification*, at 1, 3.

10 E.g., Lance Freeman, *supra*, *Displacement or Succession* at 463-491; see also Kacie Dragan, Ingrid Ellen & Sherry A. Glied, National Bureau Of Economic Research, *Does Gentrification Displace Poor Children? New Evidence From New York City Medicaid Data*, Working Paper 25809 (May 2019), <http://www.nber.org/papers/w25809>.

11 Rigolon & Christensen at 4; Taguchi et al. at 3, 4.

12 See Taguchi at 4-5.

13 Rigolon & Christensen at 4.

14 *Id.*

## C. Assumptions

This appendix works from the premise that GSI installation provides a host of co-benefits. However, it is important to note that GSI encompasses a wide variety of practice types, and that each performs best under specific conditions and when targeting specific goals.<sup>15</sup> Therefore, to achieve the best outcome, specific goals must be set.<sup>16</sup> GSI without proactive planning can lead to displacement of Black, working poor, and other disadvantaged communities.<sup>17</sup> The inequitable distribution of GSI in the context of historical and ongoing disinvestments in socially vulnerable communities have contributed to disparities in health and other measures of well-being.<sup>18</sup>

This appendix also assumes that because PWD is driven by the consent decree and GCCW targets and needs to get as many greened acres in the ground as possible, and because there are not overwhelming numbers of grant applicants or potential GSI projects, they have generally not been able to screen or weight projects based on additional factors like co-benefits or equity criteria alone. Instead they have had to select projects that have the best likelihood of achieving volume capture in a relatively cost-effective manner. This approach to GSI aligns with other cities' approaches where hydrological and logistical (mostly feasibility) siting criteria are the most frequently occurring project selection criteria in all the cities evaluated.<sup>19</sup> PWD does recognize the importance of adapting their programming to boost the proportion of GSI projects with vegetation or other features benefiting the community, however, so in 2021 they adjusted their stormwater grants program criteria to encourage projects that have more vegetated components or provide other added community benefits that go beyond simple stormwater volume capture. This adjustment appears to be having the desired effect, as more of the applications and most of the selected grant awards for FY22 included vegetated solutions that will provide greater TBL benefits.<sup>20</sup>

We further assume that dollars spent solely on cost-efficient volume capture are not accomplishing as much as they could in terms of the multiple benefits of GSI. Therefore, we must acknowledge and choose to pay more for projects that yield desirable co-benefits.

Finally, in this Appendix, we note that the equity question at issue addresses the co-benefits of individual projects and their impacts, rather than the equity benefits of reducing overall stormwater volume and combined sewer overflows (CSO) (which is a larger but less-tangible benefit for many in the city, and which is where PWD generally stops in terms of trying to achieve equity benefits of stormwater control).

## D. Limitations

As with any work, this report and its results and recommendations must be inherently limited in their scope. Here, one critical limitation is that the study of gentrification and displacement is a complex and rapidly evolving field. Moreover, the term "gentrification" itself is poorly defined, and can vary depending on the context. Here, it is important to recognize this as a limitation because it means that the recommendations

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<sup>15</sup> Taguchi et al, 2020.

<sup>16</sup> *Id.*

<sup>17</sup> Taguchi et al, 2020; Alessandro Rigolon and Jon Christensen, 2019.

<sup>18</sup> Taguchi et al, 2020.

<sup>19</sup> Hoover et al 2021.

<sup>20</sup> Personal communication, PWD staff, February 2022.



presented are specific to the problem as described. If new information or understanding about gentrification, displacement, and their causes and linkages arises in the future, that would likely affect how this report's recommendations should be understood.

Another critical limitation of this report's recommendations is that equity issues are deeply entrenched, and no single policy by any individual government or municipal agency will solve these issues. Thus, any policy of PWD will be inherently limited in its ability to address gentrification and displacement. True racial equity will require a city-wide commitment and significant work by other departments, particularly for zoning policies, which are largely beyond the scope of this study or the power of PWD. This report acknowledges this context and hopes to provide workable recommendations that are within PWD's power to enact.

Bearing all this in mind, it is still important to recognize that stormwater management and green stormwater infrastructure solutions sit at the intersection of many different interests and municipal departments' purview. We therefore recommend that PWD work with other departments on this issue.

### **III. IMPLEMENTATION**

To better realize community benefits and ensure racial equity in the implementation of the GCCW program on private non-residential land and non-city-owned public land, PWD should work to further prioritize the TBL benefits (also known as co-benefits) associated with GSI and specifically identify racial equity as a key priority.

Strategies that will help advance this objective include: clarifying and prioritizing desired co-benefits (Recommendation 3), targeting GSI investments in priority locations (Recommendation 4), and expanding collaboration with other city departments and community organizations (Recommendation 1). These strategies can also be integrated into Recommendation 5 (Community Greening Grants Program), if that approach is implemented. Further, to support these and the other recommendations, PWD should also work to expand the pool of potential projects and to remove barriers to accessing incentive funding. These recommended strategies can be applied whether PWD decides to modify existing incentive programs and policies or chooses to implement a separate Community Greening Grants Program.

#### **A. Recommendation 3: Clarify the City's Triple Bottom Line/Co-Benefit Priorities**

The Green City, Clean Waters plan is an important element of Philadelphia's vision as a vibrant and sustainable City as reflected on PWD's website. Achieving this vision extends beyond the traditional scope of the Department's work, but the desired triple bottom line (or co-benefit) priorities of GSI projects have not been defined as clearly as the program's stormwater capture goals (i.e., greened acres targets). If PWD and the City want to increase the yield of co-benefits from GSI projects, they need to define and prioritize the desired co-benefits, agree upon mechanisms for achieving them via GCCW, and adjust programs accordingly. The process of identifying and selecting which co-benefits and related equity outcomes are most important to support through the Stormwater Grant program, and then selecting metrics through which to measure progress, would best be done in partnership with other City departments and relevant cross-departmental initiatives.

PWD should partner with the Office of Sustainability to initiate and complete cross-departmental adoption of triple bottom line benefit definitions and metrics. This can be done in collaboration with colleagues that have expertise and insights into how to measure the full set of benefits—physical and mental health, flood mitigation, community development, employment, real estate improvement, business environment, sustainability - that can be elements of green infrastructure projects. Taguchi et al offers a relevant decision-making framework that relies on identifying and prioritizing goals and then strategizing about which GSI practices are best suited to accomplishing these goals in order to implement GSI projects that are effective, cost efficient, and just. Setting goals or targets for co-benefits of GSI and tracking them will improve transparency and accountability. It will also make it easier for entities outside PWD, including private funders, to understand what they could invest in (beyond stormwater volume capture) and for project developers to understand what PWD is prioritizing and cultivate those co-benefits in potential projects. PWD could also leverage these grant program elements to draw in specific landowner types—such as campuses—whose interests might align well with the co-benefits delivered to the campus community by these GSI features. Being able to quantify the added co-benefits of GSI projects can be particularly attractive to investors who are interested in measuring the social and environmental outcomes of projects (e.g., for Environmental Impact Bonds (EIBs)).

The Stormwater Grants program should be adjusted to further incentivize certain GSI features that produce the desired co-benefits. Weighting more heavily the features that deliver TBL outcomes encourages grant applicants to include them in proposed projects so they are more competitive. The existing stormwater grants program criteria, particularly the Greening and Community Impacts categories, have served as a starting point for the program. PWD has already adjusted their grant criteria (via their scoring rubric) for this purpose, but this can be strengthened based on the results of the co-benefit definition and prioritization process. Going forward, other City plans and initiatives should be taken into account. These should include any specific equity objectives and co-benefits that have been laid out in the Long Term Control Plan (LTCP) or other regulatory documents as well as newer initiatives around the City that are seeking to advance equity and environmental justice objectives. These include the: Philly Tree Plan, Urban Agriculture Plan, Environmental Justice Advisory Commission (in formation as of late 2021), Hazard Mitigation Plan, Climate Change and Health Advisory Group (past) and forthcoming Climate and Health Adaptation Plan, Philadelphia Climate Action Playbook, and climate change adaptation plan (Growing Stronger). The nascent Environmental Justice Advisory Commission would serve as a particularly appropriate venue for identifying and prioritizing racial equity objectives that can be addressed in part through GSI. Also, a regional funders' roundtable on climate change that was canceled due to the Covid-19 pandemic could be rescheduled and used to gather input on priority co-benefits that advance racial equity outcomes. The co-benefit / TBL metrics that were identified through the collaborative prioritization process should be incorporated into the stormwater grants program to evaluate applications and to track progress.

Other cities cite a variety of potential triple bottom line benefits and track associated metrics that could support Philadelphia's broader vision for a thriving city. Examples include:

- Health improvements
- Increases in life expectancy of residents
- Heat-island/heat stress reduction
- Air quality improvements

- More equitable distribution of park acreage
- Reductions in nuisance/regular flooding
- Increases in household income
- Reductions in unemployment/increased employment
- Access to healthy food
- Increases in homeownership across racial and ethnic groups
- Energy savings
- Carbon reduction benefits<sup>21</sup>

Many of these triple bottom benefits of GSI are already tracked by the City or other entities. The process by which co-benefits are identified and prioritized can also include expert and community input on how to best measure these benefits and on suggested data sources. Data is likely available from other City departments as well as state, federal, and non-governmental sources. Maps, spatial data, benefit calculators, and other decision support tools that can guide prioritization of projects and locations (detailed below) may also be useful for tracking purposes. It should be noted that some analyses and tools have used the same data inputs or have cross-referenced data from similar analyses and tools, so there is some redundancy across these resources. Potential sources of expertise and data within the City on co-benefit metrics to track include:

- Office of Sustainability
- Parks & Recreation
- Philly Tree Plan
  - Developed by a project team and led by Parks & Recreation; they produced a priority map using an Environmental Justice index based on weighting several factors: heat, traffic, air quality, asthma, mental health, cancer, income, tree canopy cover, and impervious surface area.
- Department of Public Health
- Office of Emergency Management
- Philadelphia Heat Vulnerability Index (HVI)
  - Developed by the Philadelphia Department of Public Health and the Office of Sustainability. Link: <http://bit.ly/PhillyHVI>.
  - One potential metric to use would be heat exposure (e.g. compare the current index with updated versions in the future) and/or other metrics as suggested by expert partners; the HVI also indicates the City's priority areas, which could be used for spatial targeting of vegetated GSI projects.

Other potential sources of expertise and data, including spatial tools, prioritizations, and indices that have been developed using combinations of relevant co-benefit criteria:

- Greenprint Partners
  - Recent study to determine how to assess health benefits of GSI
- GI Equity Index

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<sup>21</sup> Economic Framework and Tools for Quantifying and Monetizing the Triple Bottom Line Benefits of Green Stormwater Infrastructure, the Water Research Foundation, Project No. 4852/SIWM4T17, 2021.

- Developed by Megan Heckert and Christina Rosan (see Heckert & Rosan 2018).  
Link: <https://doi.org/10.3389/fbuil.2018.00027>.
- Academy of Natural Sciences (ANS)
  - Recent study to assess targeted implementation strategies for Green Stormwater Infrastructure (GSI) on private lands in Philadelphia, based on what could produce a meaningful impact to CSO reduction and achieve an equitable distribution of projects to socially vulnerable areas. These spatial analyses characterized “sewershed” sensitivity to rain events and mapped important socioeconomic-demographic factors such as social vulnerability, community capacity, and environmental/ecological vulnerability.
- Trust for Public Land’s Climate-Smart Cities tool for Philadelphia
  - An interactive decision-support tool that combines several criteria that are important for advancing climate resiliency. Link: [https://web.tplgis.org/philadelphia\\_csc/](https://web.tplgis.org/philadelphia_csc/). The Philadelphia Department of Public Property is adopting this tool and planning to integrate it with their Asset Management software.
- Environmental Protection Agency (EPA) EJSCREEN
  - Mapping tool that shows environmental and demographic indicators as well as combined EJ indexes. Link: <https://www.epa.gov/ejscreen>.
- Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC) Triple Bottom Line (TBL) tool
  - Framework and Excel-based tool that quantifies the co-benefits of certain GSI practices. Link: <https://www.waterrf.org/research/projects/economic-framework-and-toolsquantifying- and-monetizing-triple-bottom-line>.
  - Developed in coordination with the Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC) project. Link: <https://www.waterrf.org/CLASIC>.

To support project developers in adding features that boost TBL benefits of GSI projects, PWD can select a tool or combination of tools that developers can easily use to assess and score the co-benefits of their potential projects and assist with grant application development. There are co-benefit tools and calculators available that provide information on features that can be added to a GSI project and quantify the additional benefits provided beyond stormwater capture. Ideally, these tools will enable developers to do this assessment without having to hire consultants or have specialized knowledge of the methods of quantification. Tools that can help when planning and designing projects:

- CLASIC TBL tool (mentioned above)
- Center for Neighborhood Technology’s “The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental and Social Benefits”
- National Tree Benefit Calculator
- Tree Equity Score

There are also several mapping resources and spatial tools for identifying areas that would benefit most from investments in GSI that are currently being developed and tested by City entities and partner organizations. In addition to being useful for PWD and the City to identify priority locations for GSI projects, these mapping tools could help project developers identify opportunities that would better match PWD’s goals. PWD has participated in meetings and provided data to some of these projects, which are mentioned above and

include the Philly Tree Plan, the Trust for Public Land's Climate-Smart Cities tool, and the Academy of Natural Sciences' mapping of priority storm sewersheds and expanded environmental justice indicators.

## **B. Recommendation 4: Ensure Racial Equity in GSI Implementation**

After PWD and the City have identified TBL/co-benefit priorities and selected appropriate metrics, they should consider how to advance these priorities through GCCW in a way that helps reduce racial inequities. Existing maps and tools can be used to identify areas within the City where GSI co-benefits will make a bigger difference to residents (i.e., where there is a higher proportion of socially vulnerable residents and/or more environmental injustice indicators). These geographic priorities should then be integrated into the GCCW stormwater grants program structure and publicized to boost those communities' interest in developing local GSI projects. In addition, PWD can expand collaboration with other City departments and community-based organizations to continually integrate racial justice and equity considerations into all aspects of GCCW programming and to build the capacity of underserved communities and community-based organizations to pursue GSI projects.

### **i. Ensure that racial equity is maintained or improved by identifying specific areas within the City and setting aside funds for co-benefit focused GSI in those areas**

Most co-benefits of GSI projects are spatially constrained. In other words, the co-benefits of GSI diminish quickly as distance from the project increases. If no spatial criteria are taken into consideration when making GSI investment decisions, communities meant to benefit may not actually receive the co-benefits of the project. By strategically targeting investments to neighborhoods that lack GSI and have other socioeconomic vulnerabilities, PWD can make sure that GSI co-benefits are being delivered to communities that need them the most while also addressing historic environmental injustices. In addition, because GSI associated with redevelopment projects only happens in certain neighborhoods and is driven primarily by market forces, the stormwater grants program is an important pathway for advancing equity-related objectives, as it has more flexibility than PWD's other mechanisms for accomplishing Greened Acre (GA) targets.

While GSI projects generally need to happen across the entire CSO area, PWD should prioritize certain neighborhoods and/or project types in order to deliver co-benefits to neighborhoods that have suffered from sustained lack of investment and rank higher with regards to socioeconomic and environmental justice disparities. This spatial prioritization would ideally be linked to work under Recommendation 3 (to define and prioritize the desired co-benefits of GSI projects) and lead to the selection of areas that would be uplifted and benefit the most by installation of GSI projects with more co-benefits as opposed to projects that prioritize stormwater volume capture alone. As detailed in section A/Recommendation 3 above, projects that have produced maps and spatial tools that can be used to identify areas for increased investments in vegetated GSI practices include the Philly Tree Plan, the Trust for Public Land's Climate-Smart Cities tool, Heckert & Rosan's GI Equity Index, and the Academy of Natural Sciences' mapping of priority storm sewersheds and expanded environmental justice indicators. The Philadelphia Heat Vulnerability Index can also be used to target areas for vegetated GSI practices, especially tree canopy. If available, web links to these maps and tools have been provided in section A above. PWD can employ one of these mapping resources or spatial tools to select focus areas for stormwater grants program investments in GSI.

To be more strategic about where the co-benefits of GSI projects are delivered, the stormwater grants program can be adjusted to direct more support to vegetated GSI in priority neighborhoods. This can be achieved in several different ways:

- Adjust weighting of grant criteria/rubrics to award more points to priority neighborhoods
- Offer additional financial or other incentives for proposed vegetated projects in priority areas
- Set aside a percentage or amount of grant funding to go to priority neighborhoods
  - Example of this approach: State Revolving Funds (SRFs) are an example of the set-aside approach, in terms of federal requirements imposed on states. The Drinking Water SRF requires 6% in each state to go to disadvantaged communities (as defined by the state), although in some years' appropriations bills Congress has set a higher percentage. The Clean Water State Revolving Fund (CWSRF) requires a certain percentage for either "green" projects (incl. green stormwater infrastructure) or projects in disadvantaged communities. The CWSRF set-aside originated in the 2009 stimulus bill, and the concept has carried over to future annual appropriations.

**ii. Expand or strengthen coordination and collaboration across departments and with private partners to integrate other racial justice and equity initiatives into PWD's incentive programs**

One effective way for PWD to improve the racial equity in delivery of GSI co-benefits outcomes will be to increase inter-agency and private partner coordination. In order to successfully implement more GSI projects in places that need them the most, PWD will need to continue to engage neighborhoods and community organizations, building partnerships and collaborations. PWD has already undertaken a Public Involvement and Participation Plan (PIPP) process in partnership with the Pennsylvania Environmental Council for the MS4 areas in the City. This kind of process would also be useful in the CSO basins to identify key areas and their particularized needs, information PWD can use to set goals and recruit more vegetated GSI projects.

PWD has already collaborated in several different projects; this kind of interagency work allows PWD to most effectively use its dollars to optimize co-benefits that are priorities for other entities as well. Interagency work can include things like coordination of tree planting and other green space installations, utilizing existing programs or agency expertise to measure co-benefits, or engaging with other agencies to identify and target areas of the city where GSI would have a greater positive impact by improving co-benefits as well as stormwater control itself.

Federal funding may also provide a critical point of opportunity for interagency coordination on infrastructure projects that support GSI. Part of the project identification and goal-setting process, as discussed elsewhere in this report, can and should include identifying potential partner agencies and funders of co-benefits. For any given co-benefit goal, there are likely to be other agencies or private funders with an interest in that outcome. The Philadelphia Health Department, for instance, may be interested in tracking the public health benefits of green space or tree installation.

### iii. Racial equity implications of a Community Greening Grants Program and Pay for Performance (PfP) contracts (Recommendations 5 & 6)

The report also makes Recommendations for implementing Community Greening Grants and Pay for Performance contract programs. Implemented in tandem, these recommendations could provide an effective pathway for PWD to improve racial equity in delivery of the GCCW program over the next decade.

A City-wide Community Greening Grants program would better reflect the multiple benefits of greening projects while reducing compartmentalization of projects and increasing efficiency. Moreover, a Community Greening Grants program would allow PWD to focus more heavily on equitable distribution of the co-benefits side of greening programs by decoupling the greening element of projects from stormwater volume, which can be better addressed through the PfP structure.

A Community Greening Grants Program should ideally exist in partnership with the PfP contract structure described in Recommendation 6. A Greening Grants program will help ensure that GSI co-benefits are prioritized and delivered, and it can be set up in a way that targets priority areas of the city. Other research, such as heat maps and tree canopy analysis, has shown that neighborhoods who suffer from the worst effects of a lack of greening often are the same neighborhoods who live along lines of inequality and historic disinvestment: they are disproportionately Black or Hispanic, poor, and/or working-class.<sup>22</sup> Recent research has even shown that increased greening and maintenance of that green space can be linked to a reduction in gun violence.<sup>23</sup>

PWD's existing incentives program is designed to retrofit projects on private or non-city public properties. To date, many of the resulting GSI projects have been more focused on maximizing stormwater volume capture without necessarily including any vegetated elements. PWD staff are not the only city and public agency staff interested in stormwater management projects that include green elements. Moreover, including community groups in the planning of GSI and other kinds of greening is a critical element of avoiding the negative, unintended side effects of displacement that may be associated with greening and redevelopment projects. A Community Greening Program would help enable partnerships with existing community organizations, which is a critical element for racial equity in co-benefit distribution, because it allows for community-centered GSI design. For example, growing capacity within neighborhoods to implement GSI could happen through Community Development Corporations.

Other cities have been piloting these kinds of collaborative strategies. Some are informal initiatives to build climate resilience. Some are more formal collaborations with specified city-agency partners. One in San Francisco is building the foundation for a Joint Benefits Authority (JBA)—a formal legal structure that enables shared financing for collaborative projects.

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22 Economic Framework and Tools for Quantifying and Monetizing the Triple Bottom Line Benefits of Green Stormwater Infrastructure, the Water Research Foundation, Project No. 4852/SIWM4T17, 2021.

23 Charles C. Branas, Eugenia South, Michelle C. Kondo, Bernadette C. Hohl, Philippe Bourgois, Douglas J. Wiebe, and John M. MacDonald, *Citywide cluster randomized trial to restore blighted vacant land and its effects on violence, crime, and fear*, 115 PNAS 2946 (2018)/

#### iv. Supporting strategies and implementation considerations

As cities have turned to GSI solutions when reinvesting in their stormwater systems, there has been a rise in concern about unintended impacts—crucially, the displacement of residents who are poor, working-class, and/or people of color—in areas where GSI and other forms of greening are installed. PWD should work with other City departments to take steps to mitigate these effects through good planning and adoption of anti-gentrification policies, as detailed under Critical Context and Background Information above.

To ensure that the stormwater grants program supports GSI in places that need the associated TBL benefits the most, PWD must remove barriers to funding access for quality projects that will provide significant co-benefits in these areas. This research found that the process of obtaining project development funds constitutes a significant barrier in several ways. Developers who are small, new, or money-constrained face hurdles because they may not have the expertise or up-front funding to prepare an application. Providing reliable funding for pre-development grants and more initial technical support to community groups could help address this issue. Also, allowing higher per-GA expenses may lead to more projects being proposed that will provide TBL benefits to areas lacking GSI currently. The timeline of obtaining GSI funding is also a barrier, because a long decision process translates to delays and added expense, pushing GSI projects out of reach for affordable housing developments, for example, and making alignment with other funding sources difficult. Finally, more outreach to underserved communities and small developers is critical to bolster awareness of the availability of these funds.

Even if the co-benefits of GSI are prioritized and racial equity is explicitly sought after, projects must still be logistically feasible and capable of delivering stated benefits. Feasibility has been a limiting factor to GCCW projects in the past and will likely pose a limitation to achieving greater co-benefits through GSI investments if it is not addressed. Broadly speaking, the primary way to have a greater number of feasible projects from which to choose (thus enabling selections based on more than feasibility and cost effectiveness criteria) is to expand the pool of quality potential projects, especially in priority neighborhoods. Expanding this pool will involve a combination of efforts noted below.

- Increasing the number of people and organizations seeking to host or install GSI projects
  - Response: engage in more outreach and marketing to recruit projects and applicants in locations with greater need for GSI co-benefits.
    - E.g., if priority areas are established, PWD's outreach will need to be adjusted in order to recruit sufficient numbers of applicants and feasible projects within priority areas.
- Building the capacity of people and organizations to accomplish GSI projects, especially to deliver the greener features that yield more co-benefits.
  - Response: conduct capacity building activities for locations and communities with greater need for GSI.

Closely aligned with the recommendations to increase the supply of GSI projects is making sure that everyone who might be interested in applying to stormwater grants is aware of them and has the



capacity to develop a quality project and submit a proposal. As covered in the report's Recommendations, this will involve reducing or removing barriers to accessing incentive funding and boosting the capacity of people and organizations who represent disadvantaged or marginalized communities so that they do not face disproportionate barriers to accessing stormwater grants program support.

Removing barriers, engaging communities, planning to avoid gentrification, recruiting private landowners, and helping develop quality projects are all needed to better address racial equity and will require sustained investment from PWD in staff and resources. Accomplishing this will likely require additional targeted outreach efforts and increased grant program funding for vegetated GSI projects in neighborhoods that have been identified as priorities by PWD and/or the City.

APPENDIX D

# Potential Implementation Scenarios Using Report Recommendations



## Potential Implementation Scenarios Using Report Recommendations

As described in the main report, the research team developed a set of eight recommendations for consideration of the Philadelphia Water Department (PWD) as it moves into the next phase of implementation of the Green City, Clean Waters (GCCW) plan. Meeting the Greened Acres (GA) target set out in the plan by 2036 will require adaptation to scale up implementation and realize the vision of the plan.

This appendix presents four scenarios that describe possible implementation paths by combining different recommendations to accelerate green stormwater infrastructure (GSI) implementation and increase the number of projects being installed that provide multiple co-benefits.

The eight recommendations are:

Rec. 1	Continue and Expand Collaborations
Rec. 2	Ensure Stable Funding for Private / Non-City GSI Using All Financing Methods— Including Capital Revenues
Rec. 3	Clarify the City’s Triple Bottom Line Priorities
Rec. 4	Prioritize Racial Equity in Stormwater Grant Program Design
Rec. 5	Identify More Quality Private/Non-city GSI Projects through a Community Greening Grants Program
Rec. 6	Add Flexibility to Project Delivery with Pay for Performance Contracts
Rec. 7	Pair Any Grant Programs with a Pre-Development Fund
Rec. 8	Amend Stormwater (SW) Ordinance to Realize More Greened Acres on Private/Non-City Land

Four of these recommendations apply across any scenario that PWD might pursue and hereinafter are referred to as “General Recommendations.” They include:

- Rec. 1 - Continuing collaboration
- Rec. 3 - Clarifying triple bottom line benefits
- Rec. 4 - Prioritizing racial equity
- Rec. 8 - Lowering the stormwater ordinance threshold

These General Recommendations will allow PWD to gain efficiencies within the incentives program, leverage city revenues to the maximum extent possible to deliver more triple bottom line benefits and address racial inequities. Additionally, Recommendation 8 will drive more landowners to partner with PWD on GSI projects because of a lower parcel size threshold.

The remaining four recommendations, hereinafter referred to as “Specific Recommendations,” could be implemented to drive specific policy goals and include:

- Rec. 2 – Leverage capital revenue
- Rec. 5 – Establish a Community Greening Grants Program
- Rec. 6 – Use pay-for-performance contracts
- Rec. 7 – Pair grants with a pre-development fund

As set out in the different scenarios described below, the Specific Recommendations can be implemented in various combinations. For the purpose of this exercise, an annual budget for the stormwater grants program is set at \$30 million. However, as described in the analysis that led to the recommendations, this level of investment will only maintain the current rate of implementation on private non-residential and non-city public lands. In order to accelerate GSI implementation to meet the targets set out in the GCCW plan, this annual budget will likely need to increase. Since increasing the stormwater fee may not result in sufficient gains in realized operating revenue and may result in additional affordability challenges, scaling GSI implementation to reach the GCCW plan targets will probably require accessing capital revenue to support the stormwater grants program.

## Scenario 1

Under this scenario, all the GSI on non-residential private land would be financed using capital revenues and implemented through a pay-for-performance structure with an annual investment of \$30 million used to finance up to three contracts per year.

*Specific Recommendations applied:*

- Rec. 2 – Leverage capital revenue
- Rec. 6 – Use pay-for-performance contracts

These changes to the stormwater grants program delivery would clarify the market for private developers significantly and should result in fewer administrative costs to PWD over time. The pay-for-performance contracting model has the potential to provide more transparency for project developers and less of an administrative burden on PWD.

The contracts could be written to maximize stormwater volume capture or could be designed to also require delivery of triple bottom line benefits in ways that help address racial inequities (see [Appendix C](#)). Pay-for-performance contracts would also avoid the current expenditure limitations, which require one-year contracts because of the stormwater grants program’s dependence on operating revenues. The contracts could also potentially be used to target specific areas with specific goals—i.e., a contract for the Stadium District would have different performance

metrics than a contract for the Breeze Point Neighborhood. Using capital revenues would provide a stable funding source and flexibility in contracting.

This scenario could be modified to limit the capital revenue expenditures to less than the stormwater grants program budget (e.g., \$30 million) annually, though this could impact the usefulness of the pay-for-performance structure because any contracts funded through operating funds would be limited to one year and require phased contracts, complicating the program and increasing administrative costs to both the city and contractors.

Although adopting a pay-for-performance contracting structure may require adjustments to the current procurement process, it would provide more transparency and predictability to external partners. It would also provide project developers with a contract that guarantees payment, therefore allowing them to access financing options for the implementation of stormwater capture projects.

## Scenario 2

This scenario would require different city agencies coming together to create a Community Greening Grants Program that prioritizes the implementation of water management practices that maximize community benefits and provides upfront funding to do so.

### *Specific Recommendations applied:*

- Rec. 2 – Leverage capital revenue
- Rec. 5 – Establish a Community Greening Grants Program
- Rec. 7 – Pair grants with a pre-development fund

PWD could work with the Health Department, Philadelphia Housing Authority, Department of Parks and Recreation, Community and Economic Development, Office of Emergency Management, and other city agencies with missions that require working with private business owners and landowners to identify larger non-residential private and non-city public parcels in the City where implementing GSI projects could achieve multiple city priorities and deliver triple bottom line benefits. These priorities and benefits could include, for example, increasing tree canopy cover, mitigating flooding, increasing affordable housing, and improving neighborhoods without gentrification. The City departments and agencies would collaborate to design a Community Greening Grants Program to target these identified parcels. The program would be supported with a pre-development fund to ensure equitable access to grant resources. The Community Greening Grants Program would also provide a single point of entry for these landowners to access programming across multiple City departments and agencies, making engagement with the programs more streamlined. It would also provide a centralized point of contact for philanthropic entities and corporations who might be interested in supporting such a grant program.

The grant program and pre-development fund could be managed within an existing City department or agency, or another option would be to outsource the grant program and pre-development fund to a third-party entity to manage, with representatives from the City departments and agencies providing direction, oversight, and resources. To scale up implementation, PWD would use capital revenue to finance the program and pre-development fund at

\$30 million per year to ensure plan goals are attained across multiple City priorities and that triple bottom line benefits are realized. The scale of the capital revenue investment should reflect the opportunities identified on non-residential private land and non-city public land.

This scenario could also be modified to only target non-city public lands, or to limit the amount of capital revenue used to fund the grant program and pre-development fund on an annual basis with the remainder of the funds coming from operating revenues to reach at least \$30 million per year.

While this scenario would require additional PWD staff time as well as staff time from other city departments and agencies, it would result in the implementation of projects on non-residential and non-city public lands that would accomplish multiple City priorities.

### Scenario 3

This scenario would pair the existing stormwater grants program with a pre-development fund to improve access to grant resources and maximize community benefits.

*Specific Recommendations applied:*

- Rec. 2 – Leverage capital revenue
- Rec. 7 – Pair grants with a pre-development fund

This scenario outlines limited programmatic change while shifting more of the program resources towards achieving triple bottom line benefits. PWD could retain the existing stormwater grants program but update the community benefits elements to increase triple bottom line benefits while working with other City departments and agencies to define and achieve these goals, especially in underserved neighborhoods, as described in Recommendations 3 and 4. Capital revenue would be used to create a stable and larger budget to scale implementation at a minimum level of \$30 million per year.

This scenario could include a time-limited pre-development fund to build new capacity among project developers. It could also be modified to use capital funds for specific, targeted projects addressing racial inequity, while using operating funds to reach a \$30 million minimum annual stormwater grants program budget.

### Scenario 4

This scenario combines the above scenarios to split funding among a Community Greening Grants Program, pay-for-performance contracts, and a pre-development fund.

*Specific Recommendations applied:*

- Rec. 2 – Leverage capital revenue
- Rec. 5 – Establish a Community Greening Grants Program



- Rec. 6 – Use pay-for-performance contracts
- Rec. 7 – Pair grants with a pre-development fund

Under this scenario, PWD implements all eight recommendations. Capital revenue is mobilized to fund the stormwater grants program at \$30 million annually, as well as the city-wide Community Greening Grants Program and pay-for-performance contracts.

As stated in Scenario 2, the Community Greening Grants Program funds projects on non-residential private and non-city public parcels and is also supported with a pre-development fund.

Based on conversations and implementation experience, pay-for-performance contracts would likely need to be valued at \$10 million or more, so perhaps one or two contracts could be entered into each year with the remainder of the stormwater grants program budget going to Community Greening and the predevelopment fund.

This scenario could be modified to limit the amount of capital revenues used and to instead rely more heavily on operating funds to reach a minimum \$30 million annual stormwater grants program budget.

While representing the greatest amount of programmatic change, it increases the probability of reaching the scale needed to meet the GCCW plan targets by delivering more projects that realize triple bottom line benefits while also streamlining administration for some deliverables using the pay-for-performance contract structure. It would require buy-in within PWD and ideally the Office of Transportation, Infrastructure, and Sustainability (OTIS) because of the time commitment needed upfront to make the programmatic changes.





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