Unpave a Parking Lot and Put Up a Paradise: Using Green Infrastructure and Ecosystem Services to Achieve Cost-Effective Compliance

By: Robert B. McKinstry, Jr., H. David Prior, Jennifer E. Drust, Ana C. Montalbán, and Kimberly D. Magrini

Robert B. McKinstry Jr. is a Partner in Ballard Spahr's Philadelphia Office and is the Practice Leader for its Climate Change and Sustainability Initiative. H. David Prior is a Partner in Ballard's Public Finance Department and has represented the Philadelphia Water Department as bond counsel for over twenty-five years. Jennifer E. Drust is an Associate in the firm's Environmental and Natural Resources Group and Ana C. Montalbán and Kimberly D. Magrini are Associates in the Public Finance Department.

Abstract: Philadelphia has agreed to implement a long-term plan to employ ecosystem services provided by green stormwater control infrastructure to reduce combined sewer overflows (CSO) and achieve compliance with the CSO requirements of the Clean Water Act. The $2.5 billion Green City, Clean Waters Program, to be implemented over 25 years as a part of the City's larger "Greenworks" sustainability initiative, will save the City approximately $8 billion over traditional grey infrastructure. Green infrastructure projects in developed landscapes require the involvement of private property owners. This presents unique issues and opportunities for public-private partnerships, tax-exempt finance, mechanisms to leverage tax benefits, and to generate co-benefits in energy and recreation. This article examines the applicable requirements of the Clean Water Act, the City's efforts to implement and finance the program, other similar programs and the possibility of replicating the program in other jurisdictions.

> *Don't it always seem to go*
> *That you don't know what you've got 'til it's gone*
> *They paved paradise and put up a parking lot . . .*
> Joni Mitchell[1]
>
> *"We should be the #1 Green City in America."*
> Mayor Michael A. Nutter, Philadelphia, Pennsylvania[2]

Environmental regulators and academics have long struggled with the question of how to incorporate consideration of ecosystem services—the services that nature provides to society free of charge—in both environmental regulatory programs and associated cost-benefit analyses.[3]

---

[1]JONI MITCHELL, *Big Yellow Taxi*, *on* LADIES OF THE CANYON (A&M Studios 1970).
[2]Michael A. Nutter, Mayor, Philadelphia, Pennsylvania, 2008 Inaugural Address (transcript available at http://media.philly.com/documents/NutterInauguralSpeechFinal.pdf).
[3]"Ecosystem services" have been variably defined as "the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life," "the benefits human populations derive, directly or indirectly, from ecosystem functions," "the benefits people obtain from ecosystems," or quite simply, as "the aspects of ecosystems utilized (actively or passively) to produce human well-being." *See* Brendan

(continued...)

This article has been accepted for publication in The Environmental Law Reporter News & Analysis.

The regulated community has applied the somewhat abstract concept of ecosystem services to concrete environmental problems by using "green infrastructure" to meet its compliance obligations under environmental laws.[4] Green infrastructure solutions are often much more cost-effective than traditional pipes, bricks, and cement solutions and produce or maintain many of the other benefits of natural systems.

The city of Philadelphia, the U.S. Environmental Protection Agency (EPA), and the Pennsylvania Department of Environmental Protection (PADEP) recently announced consent agreements allowing Philadelphia to implement a groundbreaking program to utilize green infrastructure to reduce uncontrolled overflows from Philadelphia's combined sanitary and stormwater sewer system.[5] This initiative, known as "Green City, Clean Waters" ("Green City" or "Program") is part of Philadelphia Mayor Michael A. Nutter's larger sustainability initiative and vision, known as Greenworks.[6] As part of Green City, Philadelphia's Water Department has committed to spending approximately $2.5 billion over the next 25 years to use largely green technologies to reduce uncontrolled overflows from its combined water and sewer system. The Philadelphia Water Department (PWD) estimates that the use of green infrastructure in lieu of the traditional approach that uses pipes, bricks, and mortar to manage overflows will save the city approximately $8.0 billion over the life of the Program.[7] Green City, developed under the leadership of Mayor Nutter and Philadelphia Water Commissioner Howard E. Neukrug, can serve as a national model for the hundreds of cities that have combined water and sewer systems. While its implementation presents a number of unique legal issues, the strategies that Philadelphia has developed are widely applicable across the United States.

The use of ecosystem services is not new to Philadelphia. In the 19th century, the city acquired what is now the 9,200 acre Fairmount Park to protect its municipal water supply using ecosystem services.[8] Mobilizing ecosystem services as a means to comply with environmental laws is also not new.[9] The first and most widely cited use of ecosystem services to meet compliance obligations under environmental laws was implemented by New York City pursuant to a 1997 Memorandum of Agreement that allowed New York City to protect the watershed upstream through conservation easements and promotion of sustainable agriculture and forestry, saving billions of dollars that would have been required to build a traditional water filtration

---

(...continued)
Fisher et al., *Defining and Classifying Ecosystem Services for Decision Making*, ECOLOGICAL ECON. 68, 643, 645 (2009), *available at* http://www.uvm.edu/giee/publications/BFisher_DefiningClassifying_EcosystemSvcs_2009.pdf. Each of these definitions captures the idea that humans benefit from the functioning of natural processes.

[4] "Green infrastructure" generally refers to features that use or rely on the natural landscape instead of engineered structures. In the case of stormwater management discussed here, green infrastructure generally refers to features like pervious pavement, green roofs, vegetated permeable swales, rain gardens and other stormwater retention technologies that mimic natural infiltration processes.

[5] *See* Sandy Bauers, *Phila. Embarks on Green Stormwater Management*, (Apr. 11, 2012), *available at* http://articles.philly.com/2012-04-11/news/31325352_1_storm-water-untreated-water-overflows.

[6] *See* Mayor's Office of Sustainability, *Welcome to Greenworks Philadelphia*, *available at* http://www.phila.gov/green/greenworks/.

[7] *See* City of Philadelphia, Pennsylvania, *Official Statement Relating to $184,855,000 of Its Water and Wastewater Revenue Bonds*, at 41 (Nov. 9, 2011), *available at* http://emma.msrb.org/ER530059-ER409573-ER811441.pdf.

[8] *See* Philadelphia Parks and Recreation, *Welcome to Fairmount Park: Philadelphia's Park System, Park Origins*, http://fairmountpark.org/HistoryPart1.asp (last visited June 24, 2012).

[9] *See generally*, Margaret E. Peloso & Matthew Dobbins, *Moving Beyond Compliance: Using Ecosystem Services to Meet Legal Obligations*, A.B.A., SEC. OF ENV'T, ENERGY & RES., 41ST ANN. CONF. ON ENVTL. LAW 2012 (on file with authors).

treatment system.[10] New Jersey has also employed ecosystem services by using "phytoremediation," i.e., planting trees, to address soil and groundwater contamination at the Bridgeport Rental & Oil Services Superfund site.[11]

Philadelphia's Green City, Clean Waters Program presents, perhaps, the largest-scale opportunity to put Mother Nature to work to reduce pollution and thereby achieve compliance with the requirements of the Clean Water Act (CWA).[12] The Program will use green infrastructure to reduce the amount of water flowing into Philadelphia's combined sanitary and stormwater sewer system, thereby both preventing overflows in which raw sewage is released into nearby rivers and mobilizing natural green processes to reduce the pollution in the stormwater that reaches rivers. Compared to so-called "grey infrastructure"—the typical pipes and tunnels that are the major components of most urban sewer systems—green infrastructure offers additional advantages: it is more cost-effective and results in additional environmental benefits.[13]

Philadelphia will use tax-exempt revenue bonds to finance a large portion of the costs of the development and maintenance of green infrastructure, a portion of which may be installed on private land when eligible public-private partnerships are more cost-effective than building the infrastructure on public property. Philadelphia's creative financing strategy is highly replicable and could prove to be particularly instructive for municipalities struggling to obtain financing for capital projects. This Article examines how Philadelphia's Program works, how it meets applicable federal and state law requirements, how it is being financed, and explains how the green infrastructure model might be replicated in other cities in the United States.

I. Philadelphia's Green City, Clean Waters Program

A. Combined Sewer Overflows: Defining the Problem

A combined water and sewer system is a system that collects rainwater runoff, domestic sewage, and industrial wastewater in one pipe. An estimated 772 cities in the United States operate combined water and sewer systems, which transport the combined stormwater and wastewater flows to a sewage treatment facility.[14] Most of the time, combined water and sewer systems treat all of the combined flows in a treatment facility, and discharge treated water to a surface water body. However, during periods of heavy rainfall or snowmelt, the wastewater volume in a

---

[10] *See generally* New York State Environmental Facilities Corporation, *New York City Watershed Memorandum of Agreement* (MOA) (Jan. 21, 1997), http://www.nysefc.org/Default.aspx?TabID=76&fid=389 The city obtained a series of filtration avoidance determinations from the U.S. Environmental Protection Agency (EPA) pursuant to the Safe Drinking Water Act, 42 U.S.C. §§300f to 300j-26, ELR STAT. SDWA §§1401-1465, for implementing the MOA. *See generally* U.S. EPA, *Region 2 Water: New York City Watershed, Filtration Avoidance* (last visited July 5, 2012), http://www.epa.gov/region2/water/nycshed/filtad.htm.

[11] *See* U.S. EPA, *EPA Superfund Record of Decision, Bridgeport Rental & Oil Services Superfund Site, Logan Township, New Jersey* (Sept. 2006) at 52, *available at* http://www.epa.gov/superfund/sites/rods/fulltext/r2006020001431.pdf.

[12] 33 U.S.C. §§1251-1387, ELR STAT. FWPCA §§101-607.

[13] *See infra* Part I.

[14] *See* U.S. EPA, *Combined Sewer Overflows*, http://cfpub.epa.gov/npdes/home.cfm?program_id=5 (last visited June 25, 2012).

combined water and sewer system can exceed the capacity of the combined system or the treatment plant. For this reason, combined water and sewer systems are designed to overflow occasionally and discharge excess, untreated sewage, industrial wastewater, and stormwater directly to nearby streams, rivers, or other waterways. These combined sewer overflow (CSO) events contain stormwater as well as untreated human and industrial waste, toxic materials, debris, and other pollutants. As cities have grown and the acreage of impervious surfaces has increased, the volume of stormwater has increased, further exacerbating the problem of CSOs.

Addressing this problem using traditional grey infrastructure requires significant capital expenditures to modify or expand existing sewage collection and treatment facilities. Traditional grey methods include expansion of treatment plants or construction of huge holding tanks and underground tunnels to hold a large volume of stormwater and wastewater and gradually release it to the sewage treatment plant. In its long-term control plan, Philadelphia has developed a far more cost-effective approach, focusing on green infrastructure that will divert or "treat" stormwater runoff, cost less, and provide numerous co-benefits. Although many cities facing significant penalties arising from CSO events have already signed consent decrees requiring substantial investments to retrofit and upgrade traditional grey infrastructure, they can amend a consent decree to allow for the use of greener and more cost-effective measures.[15]

1. Overview: The CWA

The CWA establishes the legal framework governing the obligation to deal with combined sewer overflows. Consistent with its national goal of eliminating the discharge of pollutants into navigable waters of the United States, the Act prohibits the discharge of pollutants—except as may be authorized by a permit.[16] The Act authorizes EPA to issue National Pollution Discharge Elimination System (NPDES) permits (Discharge Permits) and provides authority to delegate the NPDES permitting program to states with counterpart permitting programs that meet specific minimum criteria.[17]

Every Discharge Permit must include terms limiting the discharge of pollutants. These limitations are based on both what can be achieved using available technology and what is necessary to meet the water quality requirements of the Act.[18] Pursuant to the CWA, EPA developed technology-based effluent limitations for "point source" discharges, i.e., those from discernible, confined, and discrete conveyances from which pollutants are discharged, such as pipes, channels, and conduits.[19] These effluent limitations are then incorporated into a point source's Discharge Permit and limit the amount of specified pollutants that can be discharged.[20] Under §1311(b), publicly owned treatment works that existed prior to July 1, 1977, were required to meet effluent limitations based on secondary treatment.[21] To meet secondary treatment effluent limitation standards, publically owned treatment works must generally treat their effluent so that it does not exceed regulatory limits for pH, total suspended solids, and a

[15] For example, the District of Columbia is in the process of negotiating a possible amendment to its consent decree. *See infra* Part III.A.
[16] *Id*. §§1311(a), 1342(a).
[17] *See generally id*. §1342(b).
[18] *See generally id*. §§1342(a)(1), 1311(b), 1312.
[19] *Id*. §§1311(b), 1314(b), 1362(14).
[20] Protection of Environment, 40 C.F.R. §§122.44(a), 125.3(a) (2011).
[21] 33 U.S.C. §1311(b)(1)(B); *see also* 40 C.F.R. Part 133 (establishing secondary treatment standards).

five-day measure of carbonaceous biochemical oxygen demand.[22] The secondary treatment process generally involves some type of biological treatment and filtration, and is preceded by primary treatment.

Water-quality based standards may impose other limitations on the amounts and types of pollutants that can be lawfully discharged into navigable waters. Authorized by CWA §1312, water-quality based effluent limitations are designed to protect a water body's designated use, by imposing criteria to protect those uses.[23] Permitting authorities also must implement antidegradation policies to protect existing uses of surface water bodies.[24]

Rainstorms can wash pollution from fields, streets, parking lots, and industrial activities into streams and rivers and thereby degrade water quality. The CWA initially did not directly regulate this "nonpoint source pollution" but sought to use ecosystem services to prevent this by encouraging voluntary use of "best management practices." As point source pollution was controlled and nonpoint source pollution grew with increased urbanization, the Act mandated that stormwater systems obtain permits and control all stormwater discharges through the use of best management practices.[25] However, the combined sanitary and sewer systems that were built in many towns and cities before the CWA's 1972 enactment, like Philadelphia's, present a different problem. The stormwater in these systems mixes with sanitary waste and the combined flows are directed to a sewage treatment plant. During wet weather events, the stormwater can exceed the capacity of the sewage treatment plant and cause untreated or inadequately treated sewage to flow into the river with the sanitary waste.

This problem requires actions either to increase the treatment and holding capacity of the sewage treatment plant or slow the rainwater volume entering the combined system (i.e., to reduce "wet weather" flows). There are a variety of tools that can be used to deal with this problem, including traditional steel and cement infrastructure, best management practices, green infrastructure, or some combination of the three. For example, a traditional and more costly approach might involve both lining sewers to prevent infiltration of groundwater, building holding tanks to hold stormwater and gradually release it, and increasing the capacity of the treatment plant. A green infrastructure project would still prevent infiltration, but would use best management practices or green infrastructure in lieu of holding tanks or the expansion of treatment plant capacity.

2. CWA Regulation of Combined Sewer Overflow Events

Under the CWA, combined sanitary and stormwater sewers are required to obtain Discharge Permits.[26] Section 402(q) of the Act[27] requires that every permit, order or decree for discharge from a municipal combined storm and sanitary sewer issued after December 14, 2000, conform to the Combined Sewer Overflow Control Policy ("federal CSO Policy")[28] issued by EPA in 1994. The federal CSO Policy establishes the following objectives:

---

[22] 40 C.F.R. §133.102; *see also* 40 C.F.R. §125.3(b)(2).
[23] *See* 33 U.S.C. §1312; 40 C.F.R. §§131.10(a)-(b), 131.11(a).
[24] *See* 40 C.F.R. §131.12(a)(1).
[25] 33 U.S.C. §§1342(p)(2)(C)–(D); 1342(p)(3)(B)(iii); 1342(p)(4).
[26] *See* 40 C.F.R. §122.26(a)(7).
[27] 33 U.S.C. §1342(q).
[28] U.S. EPA, Combined Sewer Overflow (CSO) Control Policy; Notice, 59 Fed. Reg. 18,688, 18,688 (Apr. 19, 1994).

1. To ensure that if CSOs occur, they are only as a result of wet weather;
2. To bring all wet weather (combined sewer overflow) discharge points into compliance with the technology-based and water quality-based requirements of the CWA; and
3. To minimize water quality, aquatic biota, and human health effects from CSOs.[29]

To accomplish these ends, the Federal CSO Policy requires permittees of combined water and sewer systems that have produced CSO events to "immediately undertake a process to accurately characterize their sewer systems, to demonstrate implementation of…nine minimum controls, and to develop a long-term CSO control plan."[30]

The federal CSO Policy outlines the major components of a CSO long-term control plan. These include the adoption of an approach to complying with the CWA's water quality standards. Permittees can adopt either a "presumption" or "demonstration" approach to compliance.[31] Under the presumption approach, a program that meets specific criteria will be presumed "to provide an adequate level of control to meet the water quality-based requirements of the CWA."[32] Alternatively, permittees can pursue the "demonstration" approach. If this compliance method is selected, the permittee must be able to show that its program: (a) is adequate to meet water quality standards and protect designated uses (unless precluded due to natural conditions or other sources of pollution); (b) CSO events occurring after implementation will not interfere with meeting water-quality standards or impair the receiving waters' designated uses; (c) the program will provide "the maximum pollution reduction benefits reasonably attainable"; and (d) the program design allows for cost-effective expansion or retrofitting, if needed to meet water-quality standards or protect designated uses.[33]

Since at least 2007, EPA authorized permitting authorities to "structure their permits, as well as guidance or criteria for stormwater plans and CSO long-term control plans, to encourage permittees to utilize green infrastructure approaches."[34] EPA recognized that green infrastructure can be effective not only in reducing the volume of runoff by capturing flow and preventing it from entering and potentially overwhelming the combined water and sewer system, but it also provides other benefits.[35] These benefits include cleaner water and air, enhanced water supplies, reduced urban temperatures, increased energy efficiency, and increased property values. Green infrastructure also can help provide recreational space or habitat, and save capital expenses

[29] *Id*. at 18, 689.
[30] *Id*. at 18, 691.
[31] *Id*. at 18, 692–93.
[32] *Id*. at 18, 692.
[33] U.S. EPA, Combined Sewer Overflow (CSO) Control Policy; Notice, 59 Fed. Reg. at 18, 693.
[34] Memorandum from Linda Boornazian, Director, Water Permits Division, U.S. Environmental Protection Agency, and Mark Pollins, Director, Water Enforcement Division, U.S. EPA to U.S. EPA Water Division Directors, Regions 1-10, *Use of Green Infrastructure in NPDES Permits and Enforcement* (Aug. 16, 2007) at 2, *available at* http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_memo_enforce.pdf.
[35] *See* Memorandum from Benjamin H. Grumbles, Assistant Administrator, U.S. Environmental Protection Agency, to U.S. EPA Regional Administrators, *Using Green Infrastructure to Protect Water Quality in Stormwater, CSO, Nonpoint Source, and other Water Programs* (Mar. 5, 2007), *available at* http://www.epa.gov/reg3wapd/npdes/pdf/dcms4_guidance.pdf.

associated with developing and operating traditional grey infrastructure.[36] When EPA issued a memorandum dated April 20, 2011, reiterating its encouragement and support for the use of green infrastructure, it committed to working with state and local partners to incorporate green infrastructure into Discharge Permits and listed multiple instances where green infrastructure had been embraced as either a permitting requirement or implemented in response to an enforcement action.[37] Most recently, EPA released a planning framework to help municipalities meet CWA objectives "by identifying efficiencies in implementing requirements that arise from distinct wastewater and stormwater programs, including how to best prioritize capital investments."[38]

B. How Did the City of Brotherly Love Deal With CSO Events?

Philadelphia's efforts to eliminate CSOs began in the early 1990s. Philadelphia's obligations initially were incorporated into its Discharge Permits, and in 1995, in response to these requirements, the city submitted to the PADEP [39] documentation of mechanisms to implement the nine minimum controls called for under the federal CSO Policy.[40] Since the time for implementing these nine minimum controls would extend beyond the statutory five-year term for Discharge Permits, PADEP and the city then entered into a consent decree in 2008, which established a longer schedule for developing and implementing CSO controls. [41] Pursuant to this consent decree the city evaluated alternatives for eliminating CSOs, including traditional grey approaches and green infrastructure, and the city and PWD determined that use of green infrastructure could reduce the city's capital needs by 75-80%, while promoting a number of

---

[36] *Id.*

[37] *See* Memorandum from Nancy Stoner, Acting Assistant Administrator, Office of Water, U.S. EPA, and Cynthia Giles, Assistant Administrator, Office of Enforcement and Compliance Assurance, U.S. EPA, to EPA Regional Administrators, et al., *Protecting Water Quality with Green Infrastructure in EPA Water Permitting and Enforcement Programs* (Apr. 20, 2011), *available at* http://www.epa.gov/npdes/pubs/gi_memo_protectingwaterquality.pdf.

[38]Memorandum from Nancy Stoner, Acting Assistant Administrator, U.S. EPA, and Cynthia Giles, Assistant Administrator, Office of Enforcement and Compliance Assurance, U.S. EPA to EPA Regional Administrators, Regional Permit and Enforcement Division Directors, *Integrated Municipal Stormwater and Wastewater Planning Approach Framework* (June 5, 2012), *available at* http://www.epa.gov/npdes/pubs/integrated_planning_framework.pdf.

[39] EPA has delegated PADEP the authority to administer the federal NPDES permitting program under the Pennsylvania Clean Streams Law and its accompanying regulations. *See generally* 35 PA. STAT. ANN. §§691.1 *et seq*. (2012); *see also* U.S. EPA, *NPDES Permit Program Results for Pennsylvania, available at* http://cfpub.epa.gov/npdes/stateinfo.cfm?view=state&state=PA&state_id=39. PADEP has adopted its own policies for CSO discharges, as required to maintain equivalency with the federal program. *See* Pennsylvania Department of Environmental Protection Bureau of Water Standards and Facility Regulation, *Pennsylvania Combined Sewer Overflow(CSO) Policy*, Doc. No. 385-2000-011 (effective Sept. 6, 2008), *available at* http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-78187/385-2000-011.pdf (discussing the policy behind 25 PA. CODE §92a.27, National Pollutant Discharge Elimination System, Permitting, Monitoring and Compliance).

[40]City of Philadelphia, *Combined Sewer Management Program Annual Report: NPDES Permit Nos. PA0026689, PA0026662, PA0026671, PA0054712* (FY 2010 Combined Sewer and Stormwater Annual Reports) at 13–14 (on file with authors); Consent Order and Agreement, ¶¶ O, P (June 1, 2011), *available at* http://phillywatersheds.org/doc/LTCP_COA_2011_Complete.pdf; *see also* U.S. EPA, Combined Sewer Overflow (CSO) Control Policy; Notice, 59 Fed. Reg. at 18691.

[41]33 U.S.C. §1342(b)(1)(B) (permits are for fixed terms not exceeding five years); *see also* Consent Order and Agreement, ¶ T (June 1, 2011), *available at* http://phillywatersheds.org/doc/LTCP_COA_2011_Complete.pdf [hereinafter Philadelphia Consent Order and Agreement].

other goals that would make the city "greener" and more livable. This evaluation resulted in the city's submission of an updated and revised Long-Term Control Plan (LTCPU) in September 2009, which committed the city to the use of green infrastructure in lieu of grey infrastructure.[42]

The LTCPU, know as the Green City, Clean Waters Program, calls for a long-term, landscape-level approach to CSOs, involving both large and small projects on public and private land that will be implemented over a 25-year term. The city and PADEP negotiated a second Consent Order and Agreement that was executed on June 1, 2011 ("Philadelphia Consent Order and Agreement") and incorporated therein the requirements necessary to enforce the implementation of Green City.[43] On April 10, 2012, EPA announced that it, too, would endorse the city's Program, and signed a partnership agreement pursuant to which EPA will provide technical support and other assistance.[44] A consent order between Philadelphia and EPA is anticipated to be finalized later this year.

The Philadelphia Consent Order and Agreement with PADEP outlines substantive elements of the Program and establishes an enforceable schedule for its implementation. Consistent with the federal CSO Policy's "presumption approach" to satisfying water-quality standards, under the approved Program, Philadelphia will "eliminate or remove no less than the mass of pollutants . . . that otherwise would be removed by the capture of 85% by volume of the combined sewage collected in the [combined water and sewer system] during precipitation events on a system-wide annual average basis."[45] The Philadelphia Consent Order and Agreement requires that the city "design and construct facilities sufficient to capture and treat" combined sewer flows for at least 20 years after full implementation of the required measures. These "facilities" will consist of thousands of green infrastructure projects like green roofs, rain gardens, infiltration basins and acres of hard surfaces re-paved with pervious pavement. The Philadelphia Consent Order and Agreement therefore imposes interim water-quality milestones to be met at years 5, 10, 15, and 20, using appropriate "green" metrics. For each of the interim milestones, Philadelphia must achieve specific numbers in three categories: (1) Total Greened Acres; (2) Overflow Reduction Volume; and (3) Miles of Interceptor Lined. Philadelphia has committed to developing 9,564 "greened acres" at the end of the 25-year implementation period, where a "greened acre" represents "an acre of impervious cover within the combined sewer service area that has at least the first inch of runoff managed by stormwater infrastructure."[46]

PWD has identified opportunities to develop green infrastructure on publicly owned land, which represents 45% of the impervious land area of the city.[47] PWD plans to work with the Pennsylvania Department of Transportation, the Philadelphia Streets Department, and the Philadelphia Department of Parks and Recreation to tackle the largest category of impervious surface cover in the combined water and sewer system service area: namely, streets and

---

[42] Philadelphia Consent Order and Agreement, *supra* note 41, at ¶¶ Q, R.
[43] *See generally* Philadelphia Consent Order and Agreement, *supra* note 41.
[44] U.S. EPA, *EPA Administrator Jackson and Philadelphia Mayor Nutter Sign Landmark Green City, Clean Waters Partnership Agreement*, (Apr. 10, 2012) *available at* http://yosemite.epa.gov/opa/admpress.nsf/0/F0930C1DCFB711F8852579DC006657A4.
[45] Philadelphia Consent Order and Agreement, *supra* note 41, at ¶ 7.
[46] Philadelphia Water Department, *Amended Green City, Clean Waters: The City of Philadelphia's Program for Combined Sewer Overflow Control Program Summary* at 5 (June 1, 2011) , *available at* http://www.phillywatersheds.org/doc/GCCW_AmendedJune2011_LOWRES-web.pdf [hereinafter Program Summary]; Philadelphia Consent Order and Agreement, *supra* note 41, at Appendix I at 3, Table 1.
[47] *See* Program Summary, *supra* note 46, at 21.

sidewalks.[48] Examples of green projects that can be employed include construction of pervious green swales with trees and grass dividing bike lanes or sidewalks, tree planters coupled with large infiltration pits, infiltration basins beneath impervious surfaces,[49] and replacement of impervious surfaces with a variety of pervious surfaces.[50]

The Program represents an opportunity for collaboration among interconnected governmental entities. It also recognizes the educational opportunities green infrastructure provides and contains a "green schools" component. A few schools in Philadelphia have already received grants to build green infrastructure on school property.[51] For example, these grants have been used to finance a rain garden, porous play surfaces and stormwater planters at the Nebinger School in Philadelphia. This green infrastructure will manage stormwater runoff from the school and its adjacent streets.[52] The Department of Parks and Recreation, PWD, the Trust for Public Land and the Mural Arts Program part of another collaborative effort to "green" acres of concrete pavement at the Dick School and the neighboring Hank Gathers Recreation Center in North Philadelphia by replacing it with pervious pavement.[53]

PWD will not be able to green a sufficient number of acres on publicly owned lands alone. PWD has, therefore, undertaken initiatives to incentivize private property owners to manage stormwater on their property to the standard required by the various CSO consent orders or to pay PWD to do so. First, in 2006, Philadelphia adopted regulations that required new construction or redevelopment projects that disturb at least 15,000 square feet to infiltrate, retain or treat the first inch of stormwater.[54] In 2008, Philadelphia began assessing stormwater fees for existing non-residential properties based on a ratio of impervious surface area to gross property area. Under the Program, the city also will provide credits for property owners that employ green infrastructure, thereby providing a carrot to landowners to construct green infrastructure and requiring payments from those that do not pay their fair share of the costs of the Program.[55]

In many cases, however, the carrot of reduced fees is insufficient to encourage the

---

[48] *Id*. at 25.

[49] EPA has asserted authority under the Safe Drinking Water Act to review designs for infiltration basins, including stormwater tree trenches largely to assure that stormwater from industrial areas will not contaminate ground water. Interview with Scott Schwartz, Senior Attorney, City of Philadelphia Law Department, in Philadelphia, Pa. (June 18, 2012). Depending on the design, infiltration basins can be Class V injection wells (if they are deeper than they are long or if they use perforated pipe).

[50]The city has already built or designed a number of projects incorporating these and other green stormwater infrastructure. *See* http://phillywatersheds.orgbiggreenmap. *See* also Pa. Envt'l Council, *Greater Regional Philadelphia Regional Trail Network*, http://www.pecpa.org/southeast-pa-regional-trail-network (last visited June 24, 2012).

[51] Program Summary, *supra* note 46, at 26; *see also* David Stenberg, *EPA Grants Funding for Greening Philadelphia*, (Apr. 26, 2012), *available at* http://yosemite.epa.gov/opa/admpress.nsf/0/9244A9431DB1399A852579EC006DECA4 [hereinafter EPA Press Release].

[52]*See* EPA Press Release, *supra* note 51.

[53]*See* Sandy Bauers, *Plan to Green School Yards and Rec Centers Announced* (May 10, 2012), *available at* http://www.philly.com/philly/blogs/greenliving/Plan-to-green-school-yards-and-rec-centers-announced.html.

[54] Philadelphia Water Department Regulations §§600.2(a), 600.5, *available at* http://www.phila.gov/water/pdfs/PWD_Regulations.pdf.

[55] *See* City of Philadelphia, *Greenworks Philadelphia* at 38, *available at* http://www.phila.gov/green/greenworks/PDFs/GreenworksPlan002.pdf [hereinafter *Greenworks*]; Philadelphia Water Department, *Policy and Regulations*, *available at* http://www.phillywatersheds.org/what_were_doing/policy_regulations (last visited July 5, 2012).

undertaking of some of the largest most cost-effective projects on privately owned lands. For example, large parking lots or warehouses can employ green roofs, infiltration structures or pervious pavement that can treat stormwater volumes exceeding those generated by the properties. Because some of these projects on private land will be more cost-effective than others on public land, the city has also established a program for grants and low-interest loans to finance green infrastructure projects[56] where the city's cost per greened acre, considering both the city's cost for the loan or the grant and including the water and stormwater fee abatement, is less than or equal to the cost per greened acre that the city would have to spend to accomplish the same results on publicly owned land.

Because the city retains responsibility to comply with its Discharge Permits and the Philadelphia Consent Order and Agreement and must assure the integrity of its sewage treatment system, it is critical that the city retain a property interest in the green infrastructure developed on private property. The city's retention of a property interest in the infrastructure will allow the city to inspect the infrastructure to assure that it is adequately maintained and replaced, as necessary, and to take over maintenance and replacement of the infrastructure if the private owner defaults on its obligations. The city, therefore, requires that landowners enter into a deed restriction allowing the city to enter the property, inspect the green infrastructure and to repair or replace the infrastructure if the owner fails to meet certain maintenance obligations.[57]

C. How Green City, Clean Waters Fits In With Philadelphia's "Greenworks" Program

Green City is integrated into a larger program that the city developed for a "greener" Philadelphia. In 2008, Mayor Michael A. Nutter declared in his inaugural address his goal of making Philadelphia the greenest city in America.[58] To that end, the Nutter Administration launched Greenworks Philadelphia ("Greenworks"), a comprehensive sustainability program focused on guiding Philadelphia and its citizens through a seven-year process to reinvent the city.[59] Greenworks was built on the 2007 Local Action Plan for Climate Change developed by the Sustainability Working Group and incorporates GreenPlan, which is Philadelphia's open space plan.[60] Greenworks focuses on five major topics: energy, environment, equity, economy, and engagement. Greenworks defines an overarching goal for each major topic and establishes measurable targets, accompanied by specific initiatives to meet those targets.[61]

Greenworks seeks to provide Philadelphia residents with more equitable access to healthy neighborhoods and open space.[62] The first target to accomplish this broad goal is to meet federal standards for stormwater management using green infrastructure.[63] "*Greenworks Philadelphia* recommends that the natural links between land and water be reconnected and that green infrastructure—trees, vegetation and soil—become [Philadelphia's] preferred stormwater

---

[56] *See generally* Philadelphia Water Department, *Stormwater Management Incentives Program Grant Manual* at 6, *available at* http://www.phillywatersheds.org/doc/SMIPGrantManual.pdf.
[57] *Id* at 5; *see also infra* Section II.D.
[58] *See* Mayor's Office of Sustainability, *Welcome to Greenworks Philadelphia, available at* http://www.phila.gov/green/greenworks/.
[59] *See Greenworks*, *supra* note 55, at 5.
[60] *Id*. at 5.
[61] *Id*.
[62] *Id*. at 7.
[63] *Id*.

management system."[64] According to the Greenworks 2012 Progress Report, there are currently 13.9 new greened acres in the city, with 450 new greened acres targeted for completion in 2015.[65]

Consistent with its goal to increase the amount of open public space in the city, Greenworks established an objective to provide park and recreation resources within ten minutes for 75% of the city's residents.[66] According to a study by PennPraxis, 200,000 Philadelphia residents do not live within a half mile of a park or green space. To put this in perspective, imagine Salt Lake City, Utah without a park or patch of green.[67] PWD is partnering with the Philadelphia Parks and Recreation Department to try to add 500 acres of greened public space to the city.[68] This collaboration will create more green space for residents of the city and complement PWD's efforts to manage stormwater. De-paving, greening, and overseeing these new green spaces will result in healthier and safer sites in Philadelphia while fostering community values. Projects such as the ones being conducted at the Nebinger and Dick Schools also serve as an example for greening the city's high inventory of vacant lots.[69]

As is the case with most sustainability programs, the city's sustainability goals complement each other. For example, a proposal to link the major greenways running along the Schuylkill and Delaware Rivers could convert Spring Garden Street, a major east-west thoroughfare, into a bike-friendly corridor while greening the highway by providing subsurface infiltration and permeable swales with grass and trees to separate bikers from cars.[70] Projects such as these will simultaneously enhance recreation, reduce automobile traffic and its emissions of greenhouse gases and conventional pollutants, reduce the urban heat island effect, and implement green infrastructure to control stormwater. Likewise, horizontal geothermal units could be combined with infiltration basins beneath parking lots, streets, and playing fields to promote energy efficiency, while managing stormwater with natural infiltration processes.

Implementing complementary measures will allow the city to draw on diverse funding sources to construct features that serve multiple goals. For example, the city can build new trails and, during reconstruction of its streets, incorporate many green infrastructure features at a lower marginal cost than building these features alone. A portion of the costs of projects such as these will be eligible for transportation funding.[71] Another example is the construction of infiltration basins as part of horizontal geothermal heat transfer systems. The city can create a public-private partnership in which at least a portion of the costs of excavation and backfill for such projects can be financed with federal energy tax credits and capital costs can be borne by private

---

[64] *Greenworks*, *supra* note 55, at 7.
[65]The City of Philadelphia, *Greenworks Philadelphia Update + 2012 Progress Report* 1, 29 (2012), *available at* http://www.phila.gov/green/PDFs/GW2012Report.pdf.
[66] *See Greenworks*, *supra* note 55, at 7.
[67]*See* Sandy Bauer, *Plan to Green School Yards and Rec Centers Announced* (May 10, 2012), *available at* http://www.philly.com/philly/blogs/greenliving/Plan-to-green-school-yards-and-rec-centers-announced.html.
[68]*Id*.
[69]*See Id.*
[70] *See Center City Greenway Feasibility Study* at 9 (Summer 2009), *available at* http://www.drexel.edu/westphal/undergraduate/ARCH/Curriculum/Stewardson_Competition_2012/~/media/Files/westphal/dept/arch/stewardson_2012/CenterCity_Greenway_Feasibility_Study_Final_lo_res_0.ashx.
[71]The City is sharing in a Transportation Investment Generating Economic Recovery (TIGER) grant from the U.S. Department of Transportation to build a regional trail system that will promote health, reduce traffic congestion and emissions and incorporate green stormwater infrastructure. *See* Pa. Envt'l Council, *Greater Regional Philadelphia Regional Trail Network*, *supra* note 50.

parties.[72]

II. Financing Philadelphia's Green Infrastructure Project

As part of the Program, the city will achieve greater savings using green infrastructure because the Program enables the city to leverage complementary sustainability programs and achieve economies of scale. In its study of alternatives, PWD has estimated that use of green infrastructure will save the city approximately $8.0 billion over the life of the Program.[73] Even with these savings, implementation of the Program and other capital needs will require that the city spend $2.5 billion over the next 25 years. Philadelphia will fund these expenditures with water and sewer revenues and tax-exempt revenue bonds, whose interest and principal will be paid from water and sewer revenues.

Many of the opportunities for cost savings raise unique issues because a public entity will be using public funds and tax-exempt financing to install thousands of green infrastructure projects on both private and public property. This will require the participation of private entities whose properties contribute stormwater runoff to the combined water and sewer system, either by building green infrastructure themselves or making land available for use as green infrastructure.

To fund a multi-billion dollar project based on water and stormwater charges derived only from property owners that discharge into the sanitary sewer system would create clear inequities since stormwater runoff can also be generated by landowners whose properties contain acres of impervious surfaces yet do not discharge directly into the sanitary sewer system. Therefore, a fee structure must fairly charge owners of properties with impervious surfaces for the stormwater runoff they contribute to the water and sewer system as well as users that discharge directly into the system. The rate structure must create incentives for private landowners to install green infrastructure themselves or to allow their properties to be used for green infrastructure.[74] Philadelphia's creation of a fee based on a property's impervious surfaces in addition to the more common charges for water and sewer usage eliminates this inequity and creates an incentive to implement green infrastructure projects. The city must retain sufficient control over any green infrastructure installed on private land in order for such improvements to become part of the city's water and sewer system, as discussed more fully below.

Many of the most cost-effective projects may be located on privately owned land where stormwater charges on impervious surfaces will not create a sufficient incentive for the private landowner to build green infrastructure. Funding these projects using public funds and tax-exempt revenue bonds creates additional challenges. Because the city, like other municipalities, is a creature of state law and can only exercise the powers that it is given by the state, it must assure that its Program and financing will satisfy the requirements of state and local law, including, in the case of Philadelphia, the requirements of the First Class City Revenue Bond Act (the "Philadelphia Bond Act"),[75] the General Water and Wastewater Revenue Bond Ordinance of

[72] *See* I.R.C. §48(a)(3)(A)(vii) (2012).
[73] *See* City of Philadelphia, Pennsylvania, *Official Statement Relating to $184,855,000 of Its Water and Wastewater Revenue Bonds* at 41 (Nov. 9, 2011), *available at* http://emma.msrb.org/ER530059-ER409573-ER811441.pdf.
[74] *See generally* Philadelphia Water Department Regulations, *supra* note 54, §304.0.
[75] 53 PA. STAT. ANN. §15901 *et seq.* (2012).

1989, as amended and supplemented (the "Philadelphia Bond Ordinance"),[76] and state constitutional restrictions limiting the expenditure of public funds for private purposes.[77] Finally, if the city uses tax-exempt financing, it must comply with the requirements of the Internal Revenue Code[78] and the regulations of the Internal Revenue Service.[79] Each of these issues must be addressed by any public entity seeking to implement a green infrastructure program similar to Philadelphia's.

A. Creative Rate Charges to Pay Debt Service and Incentivize Green Use

Like any city dealing with combined sewer overflows, Philadelphia had to reconsider and revise its water and sewer rate structure. Like most public entities operating water and sewer systems, the city traditionally based its water and sewer charges on water usage alone, reasoning that the volume of water used would equal or at least be proportional to the volume of sewage discharged. However, this is not the case with stormwater. A warehouse or parking lot with impervious pavement that uses no water actually does contribute substantial stormwater runoff to the combined water and sewer system. Thus, the city revised its water and stormwater charges to create incentives for individuals to build green infrastructure on private property or to allow the city to build it for them.

As part of the Program, PWD has implemented a water and sewer rate structure that aims to encourage users of the water and sewer system to choose green alternatives over traditional grey ones, while enabling PWD to generate sufficient water and sewer charges to make principal and interest payments on its revenue bonds. Currently, water and stormwater rates and charges in Philadelphia for non-residential properties are based on both usage of water and a property's amount of impervious surface.[80] Under this rate structure, a non-residential property with a parking lot made of porous asphalt would receive a credit on its water bill for use of green methods, whereas non-residential property owners who do not utilize green infrastructure would not receive a credit. This refined water and sewer rate structure is intended to incentivize Philadelphia non-residential property owners and residents to choose green.

To incentivize private non-residential landowners to develop green infrastructure on their property, Philadelphia instituted the Stormwater Management Incentives Program, which offers financial assistance in the form of grants or loans for eligible green infrastructure projects on private property.[81] In order to be eligible for a grant or loan, an applicant must show that the proposed project is more cost-effectively built and maintained by the applicant than by PWD.[82] In making grants or loans to private property owners for the construction of green infrastructure

---

[76] Philadelphia, Pa., The General Water and Wastewater Revenue Bond Ordinance of 1989 (May 18, 1989), as supplemented and amended, and as further supplemented by an ordinance approved January 23, 2007; *available at* http://www.phila.gov/pdfs/Ordinance.pdf (hereinafter *the Philadelphia Bond Ordinance of 1989*).
[77] *See, e.g.* PA. CONST., art. IX, §9.
[78] *See infra* Section II.E.
[79] *See* 26 C.F.R. §1 *et seq*.
[80] *See* Philadelphia Water Department Regulations, *supra* note 54, §§302.0, 304.0. A flat stormwater fee is assessed against residential properties.
[81] *See generally* Philadelphia Water Department, *Stormwater Management Incentives Program, available at* http://www.phillywatersheds.org/what_were_doing/SMIP_Grant (last visited June 24, 2012).
[82] *See* Stormwater Management Incentives Program Grant Manual, *supra* note 56, at 6. Grant recipients are also required to file a deed restriction in the form of an Access, Operations, and Maintenance Agreement. *Id.* at 5.

projects, the city must assure both that the green infrastructure (i) does not impair PWD's ability to generate sufficient revenues to operate the water and wastewater system and repay the principal and interest due on its revenue bonds, and (ii) does not provide a windfall to any private landowner. Therefore, in determining whether to make a grant or loan to a private landowner for a green infrastructure project, the city will consider both the cost of the grant or loan and the "cost" of the credit the landowner will receive to abate its charges based on the decreased amount of impervious surfaces on its property.[83] The city will not make a grant or loan unless the cost per greened acre for the private property owner is less than or equal to the city's estimated cost per greened acre. For example, if a $250,000 grant to build an infiltration basin under Mr. Green's parking lot would result in $150,000 in fee abatement for Mr. Green over the life of the infrastructure, and allow the city to avoid spending $500,000 in other projects that would achieve the same amount of greened acres, the making of such a grant would save the city $100,000, and it would be cost-effective to make the full $250,000 grant to Mr. Green. If however, the city could build projects that would produce the same amount of greened acres on city-owned property for $300,000, the maximum grant that might be awarded to Mr. Green would be $150,000. Thus, the grant and loan programs allow the city to "purchase" interests in private land that can be used for the most cost-effective green infrastructure projects.

The city has made and will continue to make grant and low-interest loans available to private landowners, where the installation of green infrastructure on private land will be most cost-effective, even taking into account the fee abatement that will result. To assure that the city retains control over the green infrastructure feature on private land, and to assure "public ownership" of the asset such that it becomes part of the city's water and sewer system, the city requires that the landowner agree to a deed restriction or easement in order to qualify for a grant or loan and for a water and stormwater fee abatement.[84]

B. State Constitutional Restrictions on the Use of Public Funds on Private Property

The Pennsylvania Constitution, like many other state constitutions, generally prohibits the use of public funds, such as the proceeds of governmental tax-exempt revenue bonds, for private purposes.[85] At first blush, the city's use of governmental revenue bonds to finance a grant to Mr. Green would seem to be prohibited. However, by managing "x" amount of stormwater, thereby alleviating stresses on the water and sewer system's capacity, the proceeds of the bonds would serve a substantial public purpose. This substantial public purpose outweighs any private benefit the Program would provide, thereby rendering constitutional the use of bond proceeds to finance an infiltration basin on Mr. Green's private property.

Moreover, as long as the city maintains a property interest (e.g., an easement or right of way granting the city access to the infiltration basin for maintenance) in the infiltration basin on Mr. Green's private property, the financing of the infiltration basin will qualify as a "project" under the Philadelphia Bond Act, the cost of which can be financed with revenue bonds. Because the city would retain a property interest in the infiltration basin, which would help the city with the important public goal of managing stormwater runoff, the green infrastructure would become part of the city's water and sewer system. Green infrastructure projects and facilities financed

[83] See Philadelphia Water Department Regulations, §304.5(c)(1).
[84] *See Stormwater Management Incentives*, *supra* note 81.
[85] *See* PA. CONST., Art. IX, §9.

under the Program meet the Philadelphia Bond Act definitions of "project" and "system" even where located on land owned by private parties, so long as the city obtains and maintains a property interest in the green infrastructure to be financed.[86]

C. Using Tax-Exempt Revenue Bonds to Pay for Green Infrastructure Projects on Private and Publicly Owned Land

Philadelphia, like any municipality, may only exercise the powers that have been granted to it by the state, and can only do so in accordance with the ordinances adopted by the municipality's governing body. Accordingly, in order to issue tax-exempt revenue bonds to finance Green City, the city had to assure that the Program comported with the requirements of the state law, the Philadelphia Bond Act,[87] and the Philadelphia Bond Ordinance.[88]

The Philadelphia Bond Ordinance permits revenue bonds to be issued pursuant to the Philadelphia Bond Act to finance various projects in furtherance of the city's water and wastewater system ("System"). In order to use bond proceeds to pay for the development and maintenance of green infrastructure on both private and publicly owned land, the green infrastructure projects must meet the definition of "project" under the Philadelphia Bond Act and must become part of the System. The definition of "project" in the Philadelphia Bond Act includes "rights or lease hold estates in land…which the city is authorized to own, construct, acquire, improve, lease as lessor or as lessee, operate, maintain or support."[89] 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 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.[90]

The city and the PWD are authorized and entitled under the Philadelphia Bond Ordinance to fund projects or improvements to the System which are part of the System or which become part of the System.

Since the city owns the rights of way and public land, such as parks, the Philadelphia

---

[86] *See infra* Section II.C.
[87] 53 PA. STAT. ANN. §15901 *et seq*. (2012).
[88] *Id.*
[89] 32 PA. STAT. ANN. §§5051 *et seq*. (2012). The Pennsylvania Uniform Environmental Covenants Act, 27 PA. CONST. STAT. ANN. §§6501 *et seq*. (West 2012) (based on the Uniform Environmental Covenants Act; *see* Uniform Law Commission, The National Conference of Commissioners on Uniform State Laws, Environmental Covenants Act, *available at* http://www.uniformlaws.org/Act.aspx?title=Environmental%20Covenants%20Act (so focused on requirements applicable to environmental remediation projects that it is inappropriate for use on a stormwater project).
[90] The General Water and Wastewater Revenue Bond Ordinance of 1989, *supra* note 76, at §2.01.

Bond Act clearly authorizes the financing of green infrastructure improvements on such public property. For instance, the city's use of stormwater planters in a city-owned park would qualify as a "project" under the Philadelphia Bond Act used in connection with the System. The city would retain a leasehold or other property interest in the stormwater planters located on land owned by the city, and the stormwater planters would alleviate stresses on the System by absorbing run-off from the park and nearby streets, thereby becoming part of the System.

Analyzing the use of tax-exempt revenue bonds to finance green infrastructure on privately owned land is somewhat more complex. Nonetheless, the Philadelphia Bond Act is broad enough to allow bond proceeds to be used for grants and loans to incentivize private property owners to build and maintain green infrastructure on private property. The deed restriction necessary to assure long-term maintenance of the green infrastructure and to allow the city to enter onto private property to inspect and to repair or replace malfunctioning systems, constitutes a conservation easement under the Conservation and Preservation Easements Act.[91] An easement or deed restriction is a property interest that is cognizable at law and an "intangible asset" characterized as a capital asset for purposes of governmental accounting standards.[92] The green infrastructure on private property will be used by the System for the benefit of the System, thus becoming part of the System.

D. Compliance With the Requirements of the Internal Revenue Code

In order to issue tax-exempt revenue bonds, the city must comply with and examine all of the provisions of the Internal Revenue Code necessary for the bonds to be issued on a tax-exempt basis,[93] including issues of private use.[94]

The city, like other jurisdictions, frequently and historically issues tax-exempt "governmental bonds" to finance water and sewer projects. In order for bonds to qualify as tax-exempt "governmental bonds," the city must reasonably expect at the time of issuance that:

1. The bond issue will not fail *both* the private business use test and the private security or payment test, meaning that no more than 10% (5% in certain situations) of the proceeds of

[91] 32 PA. STAT. ANN. §§5051 *et seq*. (2012). Pennsylvania adopted the model Act, whose requirements should be considered in drafting easements and deed restictions. The Pennsylvania Uniform Environmental Covenants Act, 27 PA. CONST. STAT. ANN. §§6501 *et seq*. (West 2012) (based on the Uniform Environmental Covenants Act); *see* Uniform Law Commission, The National Conference of Commissioners on Uniform State Laws, Environmental Covenants Act, *available at* http://www.uniformlaws.org/Act.aspx?title=Environmental%20Covenants%20Act.

[92] In re Condemnation Proceeding, 940 A.2d 624, 628 (Pa. Commw. Ct. 2008); *See* Forest Glen Condo. Ass'n v. Forest Green Commons L.P., 900 A.2d 859, 863-64 (Pa. Super. Ct. 2006); Assalita v. Chestnut Ridge Homeowners Ass'n, 866 A.2d 1214, 1220 (Pa. Commw. Ct. 2005); *see also* Government Accounting Standards Board of the Financial Accounting Foundation, *GASB Issues Accounting and Financial Reporting Guidance for Intangible Assets* at 1 (July 2007) (commenting on GASB Statement No. 51 defining an easement as an intangible asset), *available at* http://www.gasb.org/cs/ContentServer?c-Development_C&pagename=GASB%2FDocument_C%FGASBDocumentPage&cid=1175804844345.

[93] Interest received by holders of governmental bonds can be excluded from gross income for federal income tax purposes. *See* I.R.C. §103(a).

[94] These provisions include regulations relating to private activity tests, private use, and private payments and continued monitoring for confirmation of compliance. For more detailed information regarding the tax requirements relating to private use, see I.R.C. §§103, 141–47.

the issue can be used in private business use ("Private Use") and no more than 10% of the debt service on the bonds can be paid or secured by private security or payments (this limit is capped at $15,000,000 for issues in excess of $300,000,000) ("Private Payments or Security"); and

2. The bond issue will not fail the private loan financing test, meaning that no more than the lesser of 5% of the proceeds or $5,000,000 of the bonds can be used to finance private loans ("Private Loans").[95]

There is no question that tax-exempt revenue bonds can be issued to finance green infrastructure on public property and public streets. The requirements of the Internal Revenue Code will create some restrictions on a city's ability to use tax-exempt bonds to finance grants and loans to private property owners. While grants to private property owners like Mr. Green might constitute Private Use, the source of payment for the bonds would not constitute Private Payments or Security. The particular infrastructure being financed under the Program, to the extent it qualifies as Private Use, will decrease fees paid to the city by Program grantees resulting from the water and sewer rate structure that rewards green users (only) with stormwater credits for stormwater abatement. Further, the city will retain a property interest in the green infrastructure. Therefore, there will be no Private Payments or Security associated with the grantee's green infrastructure as long as the infrastructure is financed with a grant, rather than a loan. Thus, under (1) above, the bond issue would not fail *both* the Private Use test and the Private Payments or Security test, and so long as the city uses the proceeds of tax-exempt revenue bonds to finance only grants to private individuals (not loans), the bond issue will not fail the Private Loan test in (2). Thus, the revenue bonds used to finance grants to private property owners would retain their tax-exempt status. Although the Internal Revenue Code will restrict a municipality's ability to use the proceeds of tax-exempt bonds to finance loans rather than grants, cities like Philadelphia will be able to install green infrastructure in the areas where it is the most cost-effective method to manage CSOs, whether the land is city-owned or privately owned, using a mix of loans funded with operating revenues and grants funded with tax-exempt bonds.

If the bonds are issued on a tax-exempt basis, the city and PWD will have to comply with certain of the requirements of the Internal Revenue Code. First, the use of bond proceeds must further the city's governmental purposes. Second, the weighted average maturity of the bonds cannot be unreasonably long in relation to the useful life of the green infrastructure it finances. Third, the program must meet various spend down requirements, such as the requirement that at least 85% of the bond proceeds be spent within three years. For a program to be implemented over 25 years, a municipality would have to issue multiple bond issues. Fourth, the municipality must comply with various arbitrage and rebate requirements of the Internal Revenue Code.

III. Philadelphia's Use of Green Infrastructure: Is it Replicable?

Green City is currently the most ambitious green infrastructure program being implemented to

[95] *See* I.R.C. §141.

comply with federal and state water protection laws governing CSOs. However, several other large urban areas, including New York City and Washington, D.C., are also taking measures to incorporate green infrastructure as a tool to meet environmental compliance obligations. Kansas City, St. Louis, and Louisville have also committed to develop green infrastructure projects under consent decrees or orders.[96]

Philadelphia, which is a consolidated city and county with a Home Rule Charter,[97] has broad authority to implement its green infrastructure Program using creative rate charges based partly on the amount of impervious surface of a property and public-private ventures funded in whole or in part with revenues from rate charges and the proceeds of tax-exempt revenue bonds. Although the entities with CSO problems vary widely in their institutional structures, and the state laws that have created them, most states provide municipalities or other governmental bodies with the requisite power to implement and finance green infrastructure projects similar to Philadelphia's.

A. Where Else is Green Infrastructure Being Implemented?

While Philadelphia's Program is regarded as the nation's most expansive program launched to-date, other cities are also planning or implementing green infrastructure programs. As part of its Green Infrastructure Plan, in 2007 New York City committed to incentivize and build more green infrastructure, including green parking lots and green roofs, and to form an inter-agency task force to develop best management practices.[98] New York City's current Green Infrastructure Plan builds on its Sustainable Stormwater Management Plan developed in 2008.[99] To improve water quality, the Green Infrastructure Plan sets the goal of capturing the first inch of rainfall on 10% of the impervious areas in the CSO watersheds.[100] Over the course of 20 years, New York City plans to meet these goals by achieving 1.5% capture by 2015, an additional 2.5% by 2020, an additional 3% by 2025 and the remaining 3% by 2030.[101] New York City reviewed land uses, impervious surfaces, development trends, planned road construction projects, and other projects around the city to determine what opportunities existed for green infrastructure. The NYC Department of Environmental Protection (NYC DEP) committed to developing demonstration projects, allocating $5.7 million for the city's efforts. Of these funds, $2.6 million have been allocated for grants to nonprofit and academic organizations to develop green infrastructure projects in the Gowanus and Flushing Bay watersheds.[102] While New York City intends to undertake another study to plan for the implementation of green infrastructure, it is prepared to

---

[96] *See* United States v. The Metro. St. Louis Sewer Dist., No. 4:07-CV-1120 (CEJ) (E.D.Mo. consent decree filed Aug. 4, 2011), *available at* http://www.epa.gov/region7/enforcement_compliance/msd_consent_decree.pdf; United States v. The City of Kansas City, Mo., No. 4:10-CV-0497-GAF (W.D.Mo. consent decree filed May 18, 2010), *available at* http://www.epa.gov/region7/enforcement_compliance/KCMO_OCP_CD.pdf. Kentucky v. The Louisville and Jefferson County Metro. Sewer Dist., No. 3:05-CV-236-S (W.D. Ky. consent decree filed Apr. 25, 2005), *available at* http://www.epa.gov/compliance/resources/decrees/civil/cwa/louisville-cd.pdf.

[97] *See* Philadelphia Home Rule Charter *available at* http://www.seventy.org/Files/Philadelphia_Home_Rule_Charter.pdf.

[98] Michael R. Bloomberg, Mayor, *NYC Green Infrastructure Plan: A Sustainable Strategy for Clean Waterways*, at 2, *available at* http://www.nyc.gov/html/dep/pdf/green_infrastructure/NYCGreenInfrastructurePlan_LowRes.pdf.

[99] *Id.*

[100] *Id*. at 46.

[101] *Id.*

[102] *Id*. at 48.

spend up to $1.5 billion over the next 20 years.[103] The mayor of New York City also announced a 10-year capital plan that included $735 million for green infrastructure.[104]

In June 2011, New York City announced grant recipients of $3.8 million.[105] The grant recipients' projects ranged from green roofs, rain gardens, and an intelligent distributed cistern system.[106] New York City has recently announced a 2012 grant program. To be eligible for a grant, the proposed project must be within the bounds of New York City and the applicant must be a private property owner, a business, or a §501(c)(3) organization; projects on public property are not grant eligible.[107] Projects must manage at least one inch of rainfall and provide the city with access for maintenance over 20 years if they are located on private property.[108] New York City also developed funding agreements and restrictive covenants and advises project applicants to be prepared to sign its form agreements "as is."[109]

In March, 2012, NYC DEP and the New York Department of Environment and Conservation amended New York City's CSO consent order to include the use of green infrastructure as a compliance mechanism.[110] Pursuant to the order, New York City committed to spend $187 million to meet its goal of controlling the first inch of stormwater from 1.5% of impervious surfaces in city-wide combined areas by December 31, 2015.[111] Subsequent provisions of the agreement implement the additional percentage reduction controls articulated in the Green Infrastructure Plan.[112]

In Washington, D.C., D.C. Water (formerly known as the Water and Sewer Authority or WASA) is subject to a long-term control plan incorporated in a consent decree from 2005.[113] D.C. Water faces significant challenges to pay for the long-term control plan in the consent decree, which calls for the construction of three tunnels to store rain overflows until the water can be treated at a cost of $2.6 billion over 20 years.[114] Revenue from D.C. Water's Impervious Area Charge is predicted to be insufficient to cover the debt service on the bonds for the needed projects.[115] In 2011, D.C. Water asked for EPA's support to extend deadlines under the consent decree to accommodate the evaluation of green infrastructure plans and designs for the Potomac

---

[103] Michael R. Bloomberg, Mayor, *NYC Green Infrastructure Plan: A Sustainable Strategy For Clean Waterways*, *supra* note 96, at 49.
[104] Michael R. Bloomberg, Mayor, *NYC Green Infrastructure Plan: 2011 Update*, at 2, *available at* http://www.nyc.gov/html/dep/pdf/green_infrastructure/gi_annual_report_2012.pdf.
[105] *Id.*
[106] *See id*. at 17.
[107] NYC Environmental Protection, *Green Infrastructure Grant Program: 2012 Grant Workshop*, at 4, *available at* http://www.nyc.gov/html/dep/pdf/green_infrastructure/2012_gi_grant_workshop_presentation.pdf.
[108] *Id*. at 5.
[109] *Id*. at 9.
[110] *NYC Green Infrastructure Plan: 2011 Update*, *supra* note 102, at 2. *See also* State of New York Department of Environmental Protection, *Order on Consent, DEC Case No. CO2-20110512-25*, ¶¶ 16, 21 (Mar. 8, 2012), *available at* http://www.dec.ny.gov/docs/water_pdf/csomod2012.pdf.
[111] *Id*. at Section III.A.1.
[112] *See id*. at Section III.B.2.
[113] *See* D.C. Water and Sewer Authority, *Long-Term Control Plan Consent Decree Status Report: Quarter No. 1 – 2012*, *available at* http://www.dcwater.com/news/publications/2012-Q1%20LTCP%20CD%20Quarterly%20Rpt-final.pdf.
[114] Carol O'Cleireacain, *Cleaner Rivers for the National Capital Region: Sharing the Cost*, METROPOLITAN POLICY PROGRAM AT BROOKINGS, May 2012, at 3-4, *available at* http://www.brookings.edu/research/papers/2012/05/23-washington-dc-clean-water-ocleireacain.
[115] *Id*. at 4.

and Rock Creek tunnels required by the 2005 consent decree.[116]

When Washington, D.C.'s sewer system permit was renewed in October, 2011 by EPA Region III, the permit called for the development, implementation and enforcement of a program that "integrates stormwater management practices at the site, neighborhood and watershed levels that shall be designed to mimic pre-development site hydrology through the use of on-site stormwater retention measures (e.g., harvest and use, infiltration and evapotranspiration), through policies, regulations, ordinances, and incentive programs."[117] The permit also requires the installation of a minimum of 350,000 square feet of green roofs on publicly owned buildings during the term of the permit, development of a tree planting strategy with a goal of creating 40% tree canopy coverage by 2035, and developing a green landscaping incentives program.[118]

B. Necessary Authority to Create and Finance Green Infrastructure Programs

Philadelphia and New York City are consolidated city-counties with control over the "watershed" of their CSO systems and broad grants of power that enable them readily to implement each of the elements necessary to finance and to install green infrastructure: (1) imposition of charges on those who are contributing stormwater flows that create CSOs in order to finance the green infrastructure and to create incentives for private entities to create the infrastructure; (2) authority to issue tax-exempt revenue bonds to finance green infrastructure; and (3) authority to enter into partnerships with private entities to implement these projects on private property with grants, loans, and other contracts, and to take advantage of the full range of incentives and funding opportunities that can arise from the co-benefits created by green infrastructure projects (e.g., transportation, recreation, and energy savings).

Other publicly owned treatment systems are not so fortunate. The watersheds of many combined systems cross many municipal boundaries and municipal cooperation will be necessary to impose the necessary rate charges, issue the bonds and enter into the public-private arrangements required to implement these programs. Most states give their local governments the authority to accomplish each of these goals, although different mechanisms may be required. Political differences may pose impediments for the many systems whose CSO watersheds cross municipal boundaries, although the cost savings available should create a powerful incentive to generate the necessary cooperation.

1. Rate Structures

Creating a charge for untreated stormwater that flows into a combined water and sewer system is one of the central elements to generate the revenues necessary to finance any green program without unfairly imposing charges on those generating only wastewater or using water supplied

---

[116] Letter from George S. Hawkins, General Manager, D.C. Water to the Honorable Lisa P. Jackson, Administrator, U.S. Environmental Protection Agency, *Re: Incorporating Green Infrastructure Into DC Water's Clean Rivers Project* (Aug. 1, 2011), *available at* http://www.dcwater.com/education/pdfs/LID_Letter_EPA_AdministratorAug2011.pdf.

[117] *See* Government of the District of Columbia, *Authorization to Discharge Under the National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permit, NPDES Permit No. DC0000221* (effective Oct. 7, 2011), at §4.1, *available at* http://www.epa.gov/reg3wapd/pdf/pdf_npdes/Wastewater/DC/DCMS4permit2011.pdf.

[118] *Id*. at §§4.1.4, 4.1.6.2, 4.1.7.2.

by a local government, either for activities that generate wastewater or those, such as irrigation, that do not. Regardless of the form of rate structure utilized, the entity engaged in bond financing will have to assure that its water system generates sufficient rate charges to pay debt service, or principal and interest payments on the bonds as they become due.

Philadelphia uses a combined water and sewer rate structure that charges users both water and stormwater fees in one bill. Cities across the country vary in their approaches--some assess combined fees like Philadelphia while others assess stormwater and water charges separately. Portland, Oregon, for example, does not charge combined water and sewer rates in one fee, although it has a combined water and sewer system. Regardless of the particular rate structure employed, the salient issue regarding rates and charges is that the water and sewer system produce revenues sufficient to finance its debt.

Across the country, rate requirements are established pursuant to various types of legislation, some by ordinances or regulations. For example, the Pennsylvania Municipality Authorities Act ("PA Authorities Act") [119] enables authorities, which are created by municipalities, to "fix, alter, charge and collect rates and other charges in the area served by its facilities."[120] This provides authority to impose charges for stormwater management based on the amount of impervious surface area of a property. The Philadelphia Bond Ordinance establishes a rate covenant, which requires sufficient debt service coverage and operating costs and the establishment of specified reserves to provide financial stability. Under the Philadelphia Bond Ordinance, bond proceeds and project revenues collected by the city or PWD in the form of rates become part of the water fund and must be used by PWD for the System.

Imposing impervious surface charges may present a challenge for publicly owned treatment works serving multiple jurisdictions. However, most intermunicipal agreements and state statutes authorizing the creation of municipal authorities include broad authority to impose necessary rates, as discussed further below.

2. Authorization Necessary to Finance a Green Infrastructure Program

A second element needed to establish a green infrastructure program is the ability to issue tax-exempt revenue bonds to fund the requisite capital programs. Most cities have enabling legislation that authorizes the city, a political subdivision of the city, or a state or locally organized authority to issue governmental bonds to finance initiatives that serve legitimate public purposes such as the ones served by Philadelphia's Program.

However, as discussed above, cities cannot loan governmental bond proceeds to private landowners without jeopardizing the tax-exempt status of the bonds under the Internal Revenue Code. Assuming a proper governmental purpose and compliance with other state and federal regulations, municipalities can retain ownership interests in the stormwater features and utilize grants to encourage the development of projects on private property. In addition, cities can fund green infrastructure programs and private grants and loans using self-generated capital derived from rates and charges. While the vehicles for financing such important programs as Philadelphia's are varied, the Philadelphia model provides an invaluable guide to all cities with combined water and sewer systems.

Other cities may finance green infrastructure programs similar to Philadelphia's using

[119] *See generally* 53 PA. CONS. STAT. ANN. §§5601–5623.
[120] 53 PA. CONS. STAT. ANN. §5607(d)(9).

bonds under the following scenarios:

- The proceeds of the bonds are used to fund facilities located on publicly owned land.
- The proceeds of the bonds are used to fund a grant program to finance the development of facilities on privately owned land and the following two conditions below also are satisfied.
- The city must maintain an ownership interest in or control over the stormwater infrastructure on privately owned land through an easement or right of way.
- The grant program must be determined by the city to further the governmental purposes of improving water quality, mitigating stormwater runoff and pollution and complying with environmental regulations or any applicable consent orders.
- If the bonds are issued on a tax-exempt basis, the city must comply with the requirements of the Internal Revenue Code.

3. *Authorization to Enter Into Necessary Contracts*

The third power necessary to finance and to implement a green infrastructure program is the power to enter into the necessary contracts. These include the contracts (1) among the municipalities served by the system to use the combined water and sewer system, to impose or to pay the combined water and sewer system rates and to repay the bonds, (2) the contracts necessary for bond financing, and (3) the grant, loan, conservation easement and other agreements with private entities necessary to implement public-private partnerships. Most jurisdictions provide broad authorization for intergovernmental agreements[121] and publicly owned treatment works serving multiple jurisdictions necessarily will have entered into agreements or other arrangements that provide the authority to impose rates, to build necessary infrastructure, and to issue bonds. This existing authority will, however, need to be examined to determine if it includes the necessary authority to impose impervious surface charges and to enter into the public-private arrangements necessary for a successful green infrastructure program. Some examples of state authority that can be used to implement green infrastructure projects in combined water and sewer systems crossing state boundaries are provided below.

C. Examples of Laws Providing the Necessary Authority to Implement Green Infrastructure Projects

1. The Pennsylvania Municipality Authorities Act

The Pennsylvania Municipality Authorities Act, referred to as the PA Authorities Act, [122] is an

[121] *See, e.g.* Pennsylvania Intergovernmental Cooperation Authority Act for Cities of the First Class, 53 PA. STAT. ANN. §12720.101 *et seq.*; *see also* First Class City Home Rule Act, 53 PA. STAT. ANN. §13101 *et seq.*

[122] *See generally* 53 PA. CONS. STAT. ANN. §§5601–5623. Although Philadelphia's Program relies on the authority provided by the Philadelphia Bond Ordinance and the Philadelphia Bond Act as one vehicle for bond financing,

(continued...)

example of a state law providing authority both for financing and implementing green infrastructure projects across municipal jurisdictional boundaries. This law is particularly significant for managing CSOs across municipal boundaries. Pennsylvania has 53 CSO systems,[123] and with 2,566 municipalities with varying powers,[124] most of these systems cross municipal boundaries. Indeed, the ALCOSAN system, serving Pittsburgh and other municipalities within Allegheny County, serves 83 municipalities.[125]

The PA Authorities Act permits an organizing municipality to engage in a variety of sustainability projects. Authorities, which have no inherent powers, can only carry out a limited list of projects and municipal services. However, authorities have broad powers in respect of those approved projects and services, including the power to enter into long-term contracts, to issue debt, to charge rates and impose assessments to defray the costs of certain services, and the power of eminent domain.[126] Its enabling legislation gives an authority its powers, either expressly or by necessary implication. Unless the organizing municipalities specify the project an authority will undertake, "the authority shall be deemed to have all the powers granted by" the PA Authorities Act.[127]

The PA Authorities Act provides broad powers to enter into all of the types of public-private partnerships that are critical to the implementation of a green infrastructure program. Authorities are also permitted under the PA Authorities Act "to make business improvements or provide administrative services in districts…zoned commercial or used for general commercial purposes or in contiguous areas if the inclusion of a contiguous area is directly related to the improvements and services proposed by the authority."[128]

In fact, an authority may have greater flexibility than Philadelphia or other municipalities to enter into many useful forms of public-private partnerships for a green infrastructure program. Most notably, although an authority must use competitive bidding for construction projects, it is generally not required to use fixed procurement procedures for services and the purchase of patented and manufactured products are exempt from the competitive procurement requirements for municipal authorities, permitting an authority to undertake demonstration projects with advanced technology.[129] While Philadelphia, like other cities, is limited by the Home Rule

---

(...continued)
Philadelphia could also finance the Program by issuing bonds through a conduit issuer or municipal authority pursuant to the Pennsylvania Municipality Authorities Act. Most cities have either or both the direct power to issue governmental bonds pursuant to a city ordinance or the power to issue bonds through a conduit authority in order to finance programs like Philadelphia's.

[123] U.S. EPA, *Report to Congress: Impacts and Control of CSOs and SSOs, Appx. D* (August 26, 2004), *available at* http://cfpub.epa.gov/npdes/cso/cpolicy_report2004.cfm.

[124] These municipalities include a first class city (Philadelphia), a second class city (Pittsburgh), a second class A city (Scranton, Pa.), third class cities (*e.g.* Harrisburg, Pa.), boroughs, incorporated towns, first class townships, and second class townships. 53 PA. STAT. ANN. §§101 (cities), 45101 *et seq.* (boroughs), 53101 *et seq.* (incorporated towns), 55101 *et seq.* (first class townships), 65101 *et seq.* (second class townships).

[125] *See* ALCOSAN Allegheny County Sanitary Authority, *About Us*, http://www.alcosan.org/AboutUs/tabid/54/Default.aspx (last visited June 25, 2012).

[126] 53 PA. CONS. STAT. ANN. §§5607(a), 5615(a)(1) ("[T]he authority shall have the power to acquire by purchase or eminent domain proceedings either the fee or the rights, title, interest or easement in such lands, water and water rights as the authority deems necessary…").

[127] *Id.* §5607(c).

[128] *Id.* §5607(g).

[129] *Id.* §5614(a)(1) (noting that authorities must bid "all construction, reconstruction, repair or work of any nature made by an authority" over $10,000). *See also* 53 PA. CONS. STAT. ANN. §5614(b). *See Niebauer v. Centre County*
(continued...)

Charter to contracts of four years duration,[130] the contracts of a municipal authority have no statutory limit.[131]

In addition, any municipal authority may make loans or leases to finance projects and may fund its financing activities through grants from federal agencies or the Commonwealth of Pennsylvania ("Commonwealth") or by issuing municipal bonds.[132] The PA Authorities Act exempts a municipal authority acting within the scope of its authority from taxation and payments in lieu of taxes within the Commonwealth.[133] An entity that satisfies the requirements necessary to be treated as a political subdivision also will be treated as any other governmental unit by the Internal Revenue Service, allowing interest on bonds issued by the entity to be excluded from the bondholder's gross income and allowing the authority to receive charitable contributions.[134] A political subdivision is an entity delegated the right to exercise part of the unfettered sovereign powers of the governmental unit, including the power of eminent domain, the power to tax, or police power.[135] The PA Authorities Act gives a municipal authority the same right of eminent domain exercised by municipalities of the same class as the municipality that organized it and in which it is to be exercised and so would qualify as a political subdivision for purposes of federal tax exemption.[136]

(...continued)
Solid Waste Auth., 429 A.2d 1210 (Pa. Commw. Ct. 1981) (stating that "the acquisition by contract of the right to deposit municipal waste on the land of another is not within Section 10 because the contract is not one for the 'construction, reconstruction, repairs or work.…'").

[130]Philadelphia Home Rule Charter Section 8-200(3) ("Contracts may be made for…services to be rendered over a period of more than one year only when permitted by ordinance. Otherwise no contract shall be binding upon the City unless there is an appropriation available for its payment. When the term of a contract exceeds four years, there shall be inserted a clause reserving to the City the right to terminate it[.]"), *available at* http://www.seventy.org/Files/Philadelphia_Home_Rule_Charter.pdf.

[131] The city and other municipalities can have no limit upon their power to enter into long-term contracts with an authority. *Id*. (stating that contracts can be for a term no longer than one year with three one year renewals without City Council approval, but that "[t]he limitations of this paragraph shall not apply to any contract entered into between the City and any authority.").

[132] 53 PA. CONS. STAT. ANN. §§5607(d)(6), (14) (permitting authorities to borrow money and accept grants from a federal agency, the Commonwealth, a municipality, a school district, a corporation or another authority); *id*. §5607(d)(12) (permitting an authority "to borrow money, make and issue negotiable notes, bonds, refunding bonds and other evidences of indebtedness or obligations, hereinafter called bonds, of the authority.").

[133] *Id*. §5620.

[134] *See* I.R.C. §103(a); 26 C.F.R. §1.103-1(b) ("The term 'political subdivision,' for purposes of this section denotes any division of any State or local governmental unit which is a municipal corporation or which has been delegated the right to exercise part of the sovereign power of the unit. As thus defined, a political subdivision of any State or local governmental unit may or may not, for purposes of this section, include special assessment districts so created, such as road, water, sewer, gas, light, reclamation, drainage, irrigation, levee, school, harbor, port improvement, and similar districts and divisions of any such unit."); *see also* I.R.C. §170(c)(1).

[135]The enumerated powers of an authority include: the power of eminent domain (53 PA. CONS. STAT. ANN. §5607(d)(15)), the power "[t]o pledge, hypothecate or otherwise encumber all or any of the revenues or receipts of the authority as security for all or any of the obligations of the authority," (§5607(d) (16)), the power "[t]o appoint police officers who shall have the same rights as other peace officers in this Commonwealth with respect to the property of the authority," (§5607(d) (26)), and the power, "[i]n the case of an authority created to provide business improvements and administrative services, to impose an assessment on each benefited property," (§5607 (d)(27)). *See Comm'r of Internal Revenue v. Shamberg's Estate*, 144 F.2d 998 (2d Cir. 1944*) cert. denied*, 323 U.S. 792 (1945).

[136] 53 PA. CONS. STAT. ANN. §5615; *but see id*. §5607(e)(1) ("An authority may not pledge the credit or taxing power of the Commonwealth or its political subdivision.").

2. Necessary Authority to Finance Similar Programs in Other States

Statutory authorization similar to the PA Authorities Act and the Philadelphia Bond Act to issue bonds to finance green infrastructure projects exists in most jurisdictions. For example, in Maryland, municipal corporations are authorized to incur debt through the issuance of bonds for any proper public purpose,[137] including the design, construction, extension, alteration, purchase, and/or condemnation of all or part of a system.[138] Georgia presents another example. Georgia law authorizes the formation of certain authorities through general enabling acts, local laws, or constitutional amendments. Eleven types of authorities can be created through enabling acts: Development, Downtown Development, Hospital, Housing, Joint Development, Recreation, Regional Jail, Regional Solid Waste Management, Residential Care Facilities for the Elderly, Resource Recovery Development, and Urban Residential Finance (for municipalities with populations over 350,000). Additionally, Georgia state statutes provide certain statutorily created authorities, including a development authority and an environmental finance authority, with the power to issue bonds. The Georgia Constitution requires the State Financing and Investment Commission to approve the issuance of all public debt.[139]

As previously discussed, in order to replicate a program like the city of Philadelphia's Green City, Clean Waters Program, municipalities need three major elements: (1) the authority to impose and adjust rates and charges on individuals contributing to CSOs, which revenues in turn serve to finance the costs of green infrastructure improvements, (2) the authority to issue debt to finance such improvements, and (3) the authority to contract with private entities to erect and maintain green infrastructure on privately-owned property. The cities of Atlanta and Baltimore are examples of municipalities that enjoy these three critical elements and will be discussed below.

The city of Baltimore is a particularly good example to illustrate how other cities can implement programs like Philadelphia's because of its strong similarities to Philadelphia. The Mayor of Baltimore approved a consent decree with EPA in 2002, which sets forth a capital improvement program to eliminate CSOs and sanitary sewer overflows.[140] Like Philadelphia, Baltimore has issued bonds to finance the costs of capital improvements for its Bureau of Water and Wastewater.[141] Baltimore's water utility and its wastewater utility (collectively, "Baltimore Utilities") are separate utilities within the Bureau of Water and Wastewater.[142] Each of the Baltimore Utilities charges separate water and wastewater rates and charges. These rates and charges and other operating revenues of the Baltimore Utilities secure Baltimore's debt service on outstanding debt, providing funds sufficient to make payments of principal and interest on the

[137] MD. ANN. CODE art. 23A, §31 (2012).
[138] *See* MD. CODE ANN., ENVIR. §9-711(a) (LexisNexis 2012).
[139] GA. CONST. art. VII, §IV, ¶ VII.
[140] *See* City of Baltimore, Maryland, *Official Statement relating to 156,925,000 of its Project Revenue Bonds (Water Projects)* (June 8, 2011) at 70, *available at* http://emma.msrb.org/ER477080-ER370883-ER768550.pdf.
[141] *See id.* at 49, 65.
[142] *See* Charter of Baltimore City art. II §§4, 15 and art. VI, §18 (2012), *available at* http://www.baltimorecity.gov/Portals/0/Charter%20and%20Codes/ChrtrPLL/01%20-%20Charter.pdf [hereinafter Baltimore Charter]; *see also* See Baltimore Code of Public Local Laws, §25 (2012), *available at* http://www.baltimorecity.gov/Portals/0/Charter%20and%20Codes/ChrtrPLL/02%20-%20PLL.pdf [hereinafter the Baltimore Code].

bonds as they become due.[143] The rates and charges of each of the Baltimore Utilities can be adjusted from time to time pursuant to the terms of the Baltimore Code to enable the Baltimore Utilities to charge sufficient rates and charges to meet debt service requirements on their outstanding debt obligations.[144] Similarly to Philadelphia, the issuance of revenue bonds is authorized pursuant to ordinances and resolutions of the city of Baltimore, specifically (1) Ordinance No. 495 of the city of Baltimore adopted in May 24, 1990, as amended (the "Baltimore Bond Ordinance") and (2) the city of Baltimore's Amended and Restated Water Projects Bond Resolution adopted by its board of finance on April 15, 2002, as amended and supplemented (the "Baltimore Bond Resolution"). In terms of the third element needed to establish a program like Philadelphia's, the city of Baltimore enjoys ample authority to enter into private contracts for the benefit of its residents under the Baltimore Charter and the Baltimore Code.[145]

Like the city of Baltimore, the city of Atlanta has requisite power to implement and finance a program like Philadelphia's and has in fact established a Stormwater Management Program. Atlanta is under two consent orders with EPA, dated December 9, 1997, and March 25, 2003, respectively, which require Atlanta to complete certain capital improvements for its water and wastewater system.[146] Atlanta, like Baltimore and Philadelphia, has issued bonds to finance the capital costs of such improvements.[147] Also like Philadelphia, Atlanta's water system imposes one combined fee for its water and sewer services and makes assessments based on a property's impervious surface area.[148] The rates and charges paid by users of the system and other operating revenues provide security for debt service payments on outstanding debt.[149] The rates and charges set forth pursuant to the Code of Ordinances of Atlanta[150] can be and are adjusted frequently in order to enable the water and sewer system to charge sufficient rates and charges to make principal and interest payments on the system's bonds as required. Similar to Philadelphia and Baltimore, the issuance of such bonds is authorized pursuant to (1) the Master Bond Ordinance,[151] (2) the Revenue Bond Law,[152] and (3) the Code of Ordinances.[153] In terms of the third element necessary to develop a program like Philadelphia's, Atlanta enjoys ample authority to contract with public and private parties for the benefit of its residents under its Code of Ordinances.[154]

---

[143] *See* City of Baltimore, Amended and Restated Water Projects Bond Resolution (effective May 7, 2002); *see also* Baltimore City Code art. 24, §3-1 [hereinafter Baltimore City Code].
[144] *See supra* 142, Baltimore Code §25 (2012).
[145] *See* Baltimore Charter, *supra* note 142, at art. II, §§4, 15 and art. III §11.
[146] *See* City of Atlanta, Georgia, *Official Statement Relating to 448,965,000 of Its Water and Wastewater Revenue Bonds, Series 2009B* (Oct. 14, 2009) at 58, *available at* http://emma.msrb.org/EP334238-EP38768-EP660796.pdf.
[147] *See generally id.*
[148] *See* City of Atlanta, Georgia, *Official Statement Relating to 448,965,000 of Its Water and Wastewater Revenue Bonds, Series 2009B* (Oct. 14, 2009), Appendix B "Engineer's Financial Feasibility Study" at 2-3, *available at* http://emma.msrb.org/EP334238-EP38768-EP660796.pdf.
[149] Master Bond Ordinance adopted on March 31, 1999, as supplemented and amended, §4.2.2.
[150] *See* Atlanta, Georgia Code of Ordinances, Part II, Chapter 154, art. §3, div. 3, *available at* http://library.municode.com/index.aspx?clientId=10376 [hereinafter Code of Ordinances].
[151] Master Bond Ordinance adopted on March 31, 1999, as supplemented and amended.
[152] Title 36, Chapter 82, art. §3 of the Official Code of Georgia Annotated, as amended [hereinafter the Revenue Bond Law].
[153] *See* Atlanta, Georgia Code of Ordinances, *supra* note 150, at Part I, Subpart A, art. §6.
[154] *Id.* at Part I, Chapter 1, §3-104.

IV. Implementation Challenges

Replication of Philadelphia's or New York's successful programs will not depend solely upon the law, but will require political will to champion a green infrastructure program within the jurisdiction, to negotiate an amendment to existing permits and consent orders, to impose rate increases (where needed) to support payments due on tax-exempt revenue bonds and to devise requirements for grants and loans necessary to implement the Program. This will require a champion who can both explain the benefits of green infrastructure and overcome resistance to change within municipal governments, financing institutions, state environmental regulators and EPA's regional offices. Although EPA headquarters' policy favors green infrastructure, those implementing the policy at the lower levels are frequently more comfortable with business as usual, even if it is more expensive and less effective. Philadelphia Water Commissioner Howard Neukrug was such a champion. After finding his own champion in Mayor Nutter, he first convinced PWD officials, then PADEP and EPA officials. Randy Hayman, General Counsel of D.C. Water, is similarly spearheading the effort to modify Washington D.C.'s consent order.

A champion must do his or her homework to create the case for green infrastructure and to inspire the constituency to support a green infrastructure program. The program must be described clearly and its economic and environmental benefits quantified. Integrating the green infrastructure program into a larger sustainability program is often helpful as it allows cities to achieve economies of scale from implementing various levels of sustainable features within the same project. Both the financing of green infrastructure and the environmental benefits it affords must be quantified to engage what may be a skeptical public. The champion also must demonstrate that the program can be accomplished within existing authority, or with minimal changes to that authority.

V. Conclusion

The use of ecosystem services is not a new concept, but the ways that ecosystem services can be implemented effectively as environmental compliance tools continues to evolve. The use of green infrastructure, such as porous pavement, rain gardens or tree pits to absorb stormwater runoff in urban areas is a cost-effective approach that delivers social as well as environmental benefits. Philadelphia is pursuing an environmental compliance strategy that depends on green infrastructure to lessen the volume of water entering the combined water and sewer system and ultimately reduce the level of pollutants that such volumes ordinarily are expected to contribute. Other large cities, including New York City, Washington, D.C., St. Louis, Louisville, and Kansas City are engaging in similar green infrastructure efforts.

While Philadelphia's Program is both groundbreaking and exceptional in scope, it is a model that is replicable in other urban areas in Pennsylvania as well as in other states. Under existing law, most cities and regions can issue tax-exempt revenue bonds to fund green infrastructure projects like Philadelphia has been successful in doing.

As a practical matter, the implementation of a Program like Philadelphia's requires political will, leadership, and vision. It is always helpful to have a champion for green infrastructure who can understand and communicate its benefits and demonstrate that the use of green infrastructure is actually much more cost-effective than traditional and more expensive grey methods.