

South Philadelphia Green Stormwater Infrastructure Tour: A Manual



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Green Cities Clean Water

December 13, 2013

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GREEN CITY, CLEAN WATERS

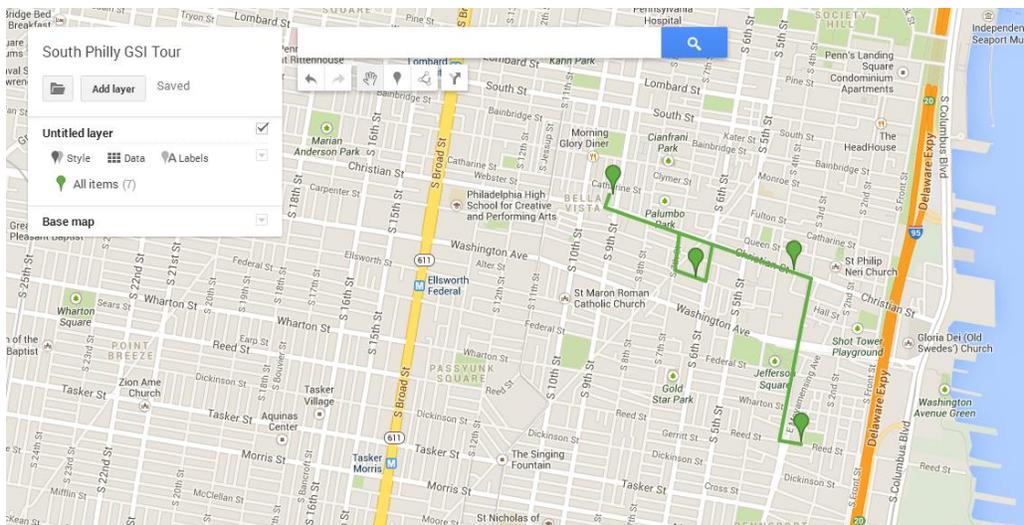
The Green City Clean Waters program is a 25 year plan through which the Philadelphia Water Department seeks to implement green stormwater management strategies on a city-wide level to protect and enhance its watersheds. Philadelphia’s combined sewer system creates an increased need to manage stormwater and prevent sewage overflow into our surrounding streams and rivers.

An essential element of the Green City, Clean Waters program is public awareness and community education. It is in this area that our South Philadelphia Green Stormwater Infrastructure Tour focuses its efforts in an attempt to bring South Philadelphia neighborhoods into the conversation.



Our goal in this project was to educate community organizations, individuals and other interested parties about the GSI projects currently in place in their neighborhoods through a tour of carefully chosen sites.

Additionally we created an interactive Google Map as a platform for spreading the information about GSI development in the neighborhood. Our map is based off of PWD’s Big Green Map of stormwater infrastructure in Philadelphia. We believe a smaller version that provides pictures, video, information and is specific to South Philadelphia will be useful in creating a sense of partnership and collaborative effort.



[South Philly GSI Tour Map](#)

Our hope is that both our tour and the corresponding map can grow as other Penn students, community members or sustainability-minded organizations get involved. This will create a network of GSI professionals and organizations that will become more conscious of similar projects happening nearby and open the door for collaboration and the emergence of knowledge about cost effective best management practices.

We ultimately hope to help bridge the gap that exists between the academics of green stormwater infrastructure at institutions like the University of Pennsylvania and the logistics of developed projects in hardscape urban neighborhoods like those in South Philadelphia.

COMMUNITY ENGAGEMENT AND METHODOLOGY

As mentioned, the sites on the map and included in our tour were carefully chosen based on our desire to present a representative variety of green stormwater infrastructure tools and locations with different types of community engagement (ie. school projects, PWD work, private development). Below is a list of the sites on our tour and relevant information about our methods of community engagement and outreach.

Herron Park Sprayground:

Meg Malloy, an Environmental Educator at Fairmount Water Works, provided an overview of the park and resources for its specs. Additionally, members of Pennsport Tree Tenders, Friends of Manton Park and Pennsport neighborhood associations were contacted. A member of Manton Street friends was especially interested in attending and potentially incorporating GSI in nearby Manton Park. Another interested South Philly resident (and member of Tree Tender) was aware of stormwater management as a teacher at Frankford Friends School, also undergoing designs for GSI.

Southwark Community Garden:

Southwark Community Garden is exclusive and difficult to enter. However, Ann Harvey, a water quality specialist from PWD's Bureau of Lab Services, reached out to TTF for help with sustainability initiatives in Queen Village this past summer. As chair of the neighborhood sustainability group, she was an important contact and appears as the site expert in our virtual tour.

The GreenTreks Network director, a resident of the Queen Village neighborhood, provided details on multimedia for Southwark Garden that could support the tour. And Nocella Roofing Company, a volunteer and donator to TTF Watershed, offered insight on the project and other green roofs in the area. Ed Bell, the point person on this project, was consulted on the costs associated with the roof and the process.

George W. Nebinger School:

Surprisingly, the Nebinger School was the most difficult project to gather community information. However, we felt the project-based learning and educational aspects of this relatively new GSI development provided an opportunity for future community engagement and warranted inclusion on our tour.

Percy Street:

For community engagement on the Percy Street project, Bella Vista Neighborhood Association was contacted. The most responsive group was the Friends of Hawthorne Park, who expressed interest in involving students from nearby schools. For site information, a homeowner on Percy Street was our primary contact, as well as information gathered from the Water Department. GSI diagrams and technical details were helpful in understanding the technical achievements of this project, but contacting residents was important to get specific details on community interaction.

CONTACTS

Below is a list of relevant contacts for future project development. We (Alex and Danielle) would be the first people to contact if a student felt inclined to continue our efforts, but other contacts are important and necessary to grow the network of collaboration.

NAME	ORGANIZATION	CONTACT
Danielle Gambogi	University of Pennsylvania	drgambogi@gmail.com
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Ed Bell	Queen Village Sustainability	visard@erols.com
John	Friends of Bainbridge Green	610-489-4506
Rasa Vella	DeTours (for touring equipment)	margaret@detourstouring.com
Kate Evasic	Meliora Design	katee@melioradesign.com
Fred Nocella	Nocella Roofing	nocella3@gmail.com
Laura	Queen Village Sustainability	lel@greenlimbs.com
Julia Hancher	Philly Green Blog (resident)	julie@greenphillyblog.com
Neal Pais	Resident	neal.pais@gmail.com
Mark	Manton Street Park	mantonstreetpark@gmail.com
Italian Market Visitor's Center	Italian Market	(215) 278-2903
Tim Hitchens	Friends of Hawthorne Park	tahitchens@gmail.com

THE SITES

Below are project descriptions for each of the four sites on our tour. They represent information gathered from online publications about the sites as well as on the ground knowledge from interviews, emails and site investigations.

SOUTHWARK COMMUNITY GARDEN

Project Description:

Southwark Community Garden is located on Christian Street between 3rd and 4th Street in the Queen Village Neighborhood. The community garden is run by local residents and is a somewhat exclusive garden, with residents on waiting lists to reserve a gardening space. Residents and garden space owners are primarily successful professionals, many of whom are in environmental design or a related discipline. This neighborhood garden has resources and the ability in undertake a project like a green roof. The garden space has multiple green projects.

In the summer of 2011, the Queen Village Neighborhood Association and members of Southwark Community Garden responded to a request by Ed Bell, a local designer who proposed a green roof at the garden. The green roof was proposed at the gardening shed. With a smaller structure like a large shed, many concerns with commercial green roofs were avoided (no residents, low loading, no utilities). Ed Bell was able to undertake many of the costs by providing the expertise and running the green roof as a workshop for labor. Nocella Roofing installed the rubber roof membrane and drainage system. Then roof cuts were made, tar paper was laid on the roof. Then they installed copper scupper and downspouts and waterproofed the roof. The final volunteer process involved laying a geotextile fabric and covering with a stone and mulch growth medium. Sedum, a drought and wet-tolerant plant, was planted in the medium.



WHEN: Summer 2011

WHAT: Community Garden (rain barrels and green roof)

WHERE: 4th and Christian

HOW MUCH: undisclosed

WATERSHED: Delaware River

PARTNERS: Lawson Bell Architects, Nocella & Co.,
Neighborhood Gardens Association, PHS,

Green Treks Networks, Queen Village Neighbors Association

HERRON PARK SPRAYGROUND

Project Description:

South Philadelphia often appears to be a concrete jungle. Residents are notorious for removing trees that interfere with parking, emptying oil pans in storm drain, and creating a handful of other water issues. Herron Park, prior to construction, was no different. There was no impervious cover or green space. This is also a demonstration site. Like many projects, the park was in need of repair and there was support from the neighborhood. The designers thus sought to create a prototype for an “urban playground.”

For the Green City, Clean Waters program to gain success, those large spaces that are available must be converted to greened acres. Parks have the ability to at the very least become greened space, and hopefully present an opportunity to capture large volumes of stormwater from neighboring properties.

This site captures 100% of the site’s first inch of stormwater and conveys it to the naturally landscaped areas. The GSI tools installed include a Rain Garden, Porous Basketball Court, and playground. Each element was designed with respect to the others in order to maximize sustainable practices. It was also designed to reintroduce the human scale, creating an inviting and welcoming site through landscape, sporting activities, site amenities and architectural structures. New vegetated cover added to the site during this project included 70 trees, 136 shrubs, 2,500 grasses and 650 perennials.



The basketball court and rain garden function as one designed space, collecting, storing and dispersing water. The city’s Capital Projects Division of Public Property and Philadelphia Water Department worked together to complete the basketball court’s rehab. Directly below the basketball court’s porous asphalt surface is a storage tank composed of separate stone cells which capture runoff. Each cell is graded so that captured runoff flows towards the rain garden. Also, a peripheral drain connects to the cells and empties any excess water into the adjacent rain garden. Four monitoring wells have also been installed along the edge of the court, at the request of the University of Pennsylvania for future educational studies.



The 200 by 50-foot rain garden was designed as a concave retention basin. Sweeping masses of native grasses, shrubs and trees were selected based on seasonal attributes; as well as their tolerance of wet and dry conditions. Selections of flowers, leaf color and fruit were carefully considered for their ability to

attract birds, bees, and butterflies. The soil composition has a high content of sand, which promotes quick drainage to the vegetative root systems. Success of this basin required proper drainage, in order to avoid standing water which would encourage mosquito proliferation.

Seventy five percent of the play and spray areas are either vegetative or porous. The remaining twenty five percent is sloped, directing runoff and spray water into the planting beds. The safety surface of the play area is 100% recycled bonded rubber providing a natural mulch appearance. The rubber material also allows stormwater to permeate through its surface, slowing its speed and allowing it to travel to the plant root systems.

In addition to the new vegetation, catch-basin traps were constructed in each inlet to allow oil and floatable materials to rise to the top of an inlet, thereby preventing the pollutants from entering the sewer system.

The multi-agency collaboration among city government departments addressed stormwater management, velocity reduction, ecological restoration, future educational programs, and monitoring opportunities. Langan Engineering and Environmental Services also worked closely with the Philadelphia Water Department to receive a Green Project Review, a review process provided to redevelopment projects that disconnect 95 percent or more of their directly connected impervious area.



Information and photographs from (Temple-Villanova Sustainable Stormwater Initiative 2009)

WHAT: “An urban water park”

GSI: porous asphalt, rain garden, underground infiltration,

WHEN: Completion in 2009 (started 2007)

WHERE: 2nd and Reed Street in Pennsport

HOW MUCH: \$1,500,000

WATERSHED: Delaware River

SEWER TYPE: Combined

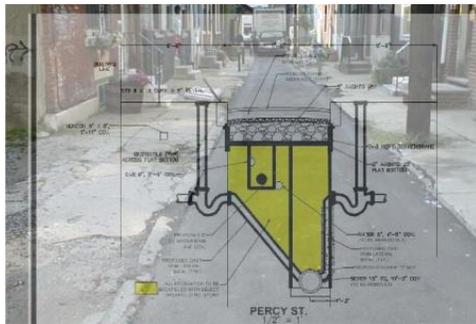
GREENED ACRE: almost 1/3 an acre (13,000 sqft)

PARTNERS: Capital Projects Division of Philadelphia Department of Public Property, Langan Engineering & Environmental Services, PWD

PERCY STREET

Project Description:

Percy Street is an alley that runs north-south through Philadelphia parallel to 9th Street. In 2011, the street was in need of new sewer lines which would demand invasive construction on the properties and street. This presented the perfect opportunity for installation of porous asphalt. There would be little or no heavy vehicle traffic, an existing construction site, and there was support from the community. Shortly after construction, Hurricane Irene offered real-time test for the pavement, both in its infiltration capability and testing for potential problems like basement flooding for residents. The pavement performed well following its installation. There are 8 inches of porous asphalt and a 30 inch stone infiltration bed. The street has no crown and water is distributed evenly to the underground infiltration bed via a weir and piping.



This project was not only a demonstration of porous pavement, but an example of how the Water Department and Streets Department can work together.

As of December 2013, the pavement was still performing well, but not flawlessly. The 800 block of Percy is adjacent to the Italian market, with one of the larger produce wholesalers in

the city on the south end of the block. The trucks and vans that load produce daily have created some



clogging of the pavement. On the north end, there is also some clogging that is believed to be caused by parked cars turning their wheels to pull out of parking spaces, causing rubber to fill the pores. Residents also noted that chewing gum and cigarette butts were getting caught in the pores, and they were disappointed that

the city had utility mark-outs on their brand new streets. Two residents had disconnected their downspouts and directed towards the pavement, which changes the loading ratio.

WHEN: May 2011

WHAT: porous asphalt and layer of stones on the 6 foot wide side-street

WHERE: 800 block of Percy Street (Percy and Christian)

HOW MUCH: construction cost of \$330,000

WHAT'S NEXT: Webster between 13th and Broad Street

WATERSHED: Delaware Direct Watershed

MAINTENANCE AND MONITORING: PWD does quarterly monitoring

PARTNERS: Philadelphia Streets Department, Philadelphia Capital Program Office

GEORGE W. NEBINGER SCHOOL

Project Description:

GSI can be useful in facilitating the management of large quantities of water. Schoolyards present a perfect opportunity for this type of development. Additionally, including GSI into schoolyards like Nebinger allows for educational opportunities like project-based learning and laboratory-style training.

Green Schools are a large part of the Green City, Clean Waters Program.

Students are provided the opportunity to participate in monitoring and maintenance, and funding is often more available with an educational component attached.

The EPA has its own Green Schools Program, and provided half of the funding for this project which was matched by the Water Department. GSI will be used as a tool in the classroom, field, and laboratory, serving as a demonstration opportunity for students and the community. The project also provides an innovative opportunity for Philadelphia students to collaborate with similar schools in the City of Rio de Janeiro. This collaboration is an extension of the Joint Initiative on Urban Sustainability (JIUS), a partnership among the US EPA, Brazil's Ministry of Foreign Affairs, the City of Rio de Janeiro, and the City of Philadelphia, which was formed to advance sustainable cities.

The current GSI practices include rain gardens, porous pavement and underground infiltration. Interestingly, when the rain garden was in construction during the summer of 2013, there were record rain events that caused basement flooding in neighboring homes. This project, when completed, looks to incorporate surrounding streets, so community support is essential.

WHERE: 6th and Carpenter

WHAT: Educational GSI project



WHEN: Still in construction (partially completed in summer 2013)

COST: \$400,000

WATERSHED: Delaware River

SEWERSHED: Combined sewers

PARTNERS: PWD, EPA, Partnership for the Delaware Estuary (PDE), School District of Philadelphia, Friends of Nebinger, Bella Vista Town Watch

WHAT'S NEXT

Looking forward is a big part of our project. Especially in close knit neighborhoods like those in South Philly, success in terms of stormwater management is about making connections between GSI projects. The goal is that as GSI projects increase in frequency, there will be improved connectivity between GSI logistics and community awareness, making tours a natural way to walk around a neighborhood and learn about water issues in Philadelphia.

We're hoping that the interactive map and this tour will be a step in that direction of linking projects, people and the community to encourage a network of local individuals, businesses and organizations that can come together and learn from one another and serve as organic links from one project to the next. We think that connecting the lines between GSI sites that have been implemented is what's coming next is the logical next step so that each site is not just an isolated stormwater management site with no other management site in mind.

There are several projects that are currently in design or slated for construction that build on those that we included and could serve as a basis for future presentations. Below are a few noteworthy projects for reference.

Bainbridge Green

Bainbridge Green is on Bainbridge Street between 3rd and 4th Street. There is no existing GSI at the site, but there are currently plans to install some Green Streets Tools. The plans were originally scheduled to be completed mid-November, but as of December 7th have still not been released.

Bodine Street:

Bodine Street is a small alley near Herron Park Sprayground. Like Bainbridge Green, no GSI exists there to date. While there are no active plans for the site, the alley presents an opportunity for tour participants to begin to visualize the opportunities for stormwater management. Bodine Street was featured in the Infill Philadelphia: Soak-It-Up competition, in which neighborhoods re-imagined their community with stormwater management features. Bodine alley, like many of the small alleys in South Philadelphia, can be reimagined with curb cuts, vegetated storage areas, downspout planters, cisterns,

and de-paved surfaces. Kate Evasic from Meliora Design offered to be a site specialist for the designs for Queen Village.

Webster St (between 13th and Broad Street)

Slated for construction as the second porous asphalt street in Philadelphia, this project will hopefully learn from the construction and maintenance issues of the Percy Street development.

ABOUT THE AUTHORS



Alex Cooper MSAG Candidate

In the fall of 2013 Alex was a first year MSAG Candidate. He currently works as the Community Engagement Coordinator at the Tookany, Tacony-Frankford Watershed Partnership and regularly coordinates and runs GSI tours in Philadelphia.



Danielle Gambogi MES Candidate

Danielle is an MES Candidate planning on graduating in the spring of 2014. She is interested in urban energy issues and sustainable design strategies.

REFERENCES

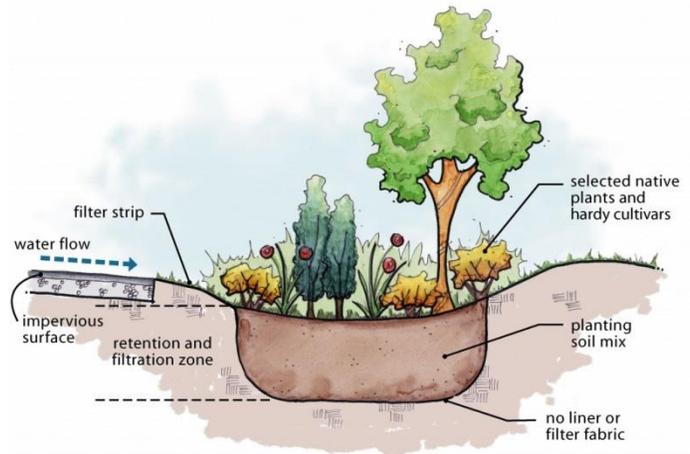
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- Philadelphia Water Department. *Green City, Clean Waters*. 2013. http://www.phillywatersheds.org/what_were_doing/documents_and_data/cso_long_term_control_plan (accessed December 2013).
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- Velocci, Kelly. *The Green Economy*. 2012. <http://www.thegreeneconomy.com/cool-efficient-beautiful-green-roofs/> (accessed December 2013).

APPENDICES

GREEN STORMWATER TOUR HANDOUT (to be handed out before the tour)

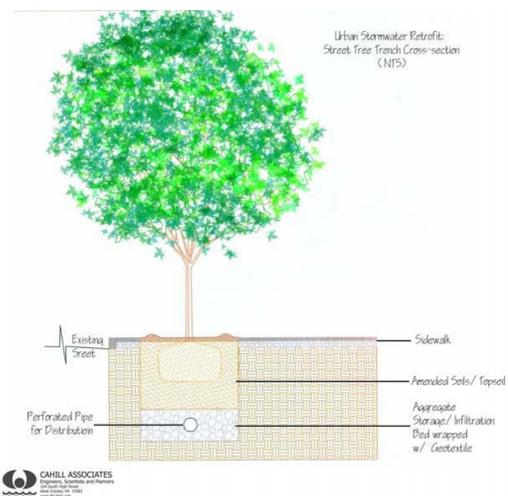
HOW TO IDENTIFY GREEN STORMWATER INFRASTRUCTURE? Various types of green stormwater management tools are used. The following are short explanations and pictures to help you identify and understand how they work.

Rain garden: a planted area that is lower than the surrounding area to catch stormwater before it goes into the sewer. Usually, it is a small garden which is designed to withstand the extremes of moisture and concentrations of nutrients, particularly Nitrogen and Phosphorus, which are found in stormwater runoff. Rain gardens filter pollutants, replenish groundwater and provide a habitat for animals. The plant species are selected for their ability to thrive in extremely wet and dry weather.



Rain gardens are ideally located close to the source of the runoff and serve to slow the stormwater as it travels downhill, giving the stormwater more time to infiltrate and less opportunity to gain momentum and erosive power.

Tree trench: Stormwater tree trenches are connected by a trench beneath the sidewalk that stores stormwater and also waters the trees. Runoff flows through a special storm drain into the tree trench where it is stored, infiltrated, taken up by the tree's roots and, in some cases, slowly released into the sewer system when capacity is available.



Porous asphalt: a particular blend of pavement that differs from normal asphalt because it allows water to infiltrate through the porous surface to an underground stone reservoir. This provides temporary underground storage for the water that would otherwise runoff the road and into the sewer system (Dauphin County Conservation District n.d.).

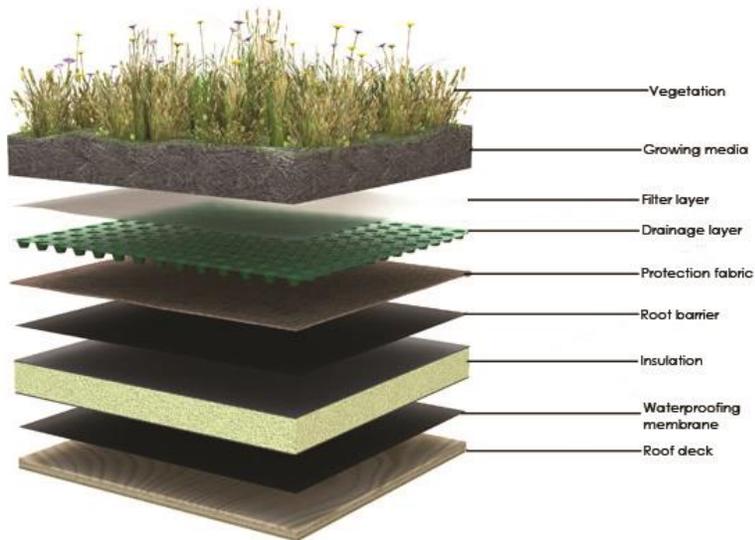
Benefits and Uses

- Filters contaminants from runoff prior to its discharge to the storm sewer system
- Reduces peak velocity and volume of stormwater runoff delivered to storm sewer system

- Can alleviate flooding downstream
- Applicable to all types of sites (residential/commercial/industrial)
- Recharges groundwater supply
- Reduces total amount of impervious cover
- Allows for land use in areas that otherwise would not meet stormwater retention guidelines
- Requires less need for curbing and storm sewers
- Provides better traction in icy conditions than traditional asphalt

Green Roof: a roof that has been covered (either partly or completely) with specific species of living vegetation to manage the stormwater that falls on the roof surface.

- Green roofs have been proven to absorb and permanently retain up to 50% of the rainfall they receive.
- Green roofs range in cost from \$10 per square foot for an extensive green roof to \$25 per square foot for an intensive green roof, and will extend the lifetime of the roof by 100-200%.
- An **extensive green roof** contains up to six inches of soil, is lightweight, accommodates shallow-rooted plant species and provides baseline stormwater, insulation and ecological benefits.
- An **intensive green roof** contains more than six inches of soil, accommodates a variety of plants including grasses, ground covers, ornamentals and vegetable plants, requires a greater roof load and provides maximum stormwater, insulation and ecological benefits (Velocci 2012).



Rainwater Harvesting System (rain barrels): A rain barrel is a system that collects and stores rainwater from your roof that would otherwise be lost to runoff and diverted to storm drains and streams. Usually a rain barrel is composed of a 55 gallon drum, a vinyl hose, PVC couplings, a screen grate to keep debris and insects out, and other off-the-shelf items. A rain barrel is relatively simple and inexpensive to construct and can sit conveniently under any residential gutter down spout (US EPA 2009).

Underground filtration system: an underground engineered system that

manages runoff that is diverted to one of the many types of GSI. Infiltration systems are most commonly seen under porous asphalt surfaces, rain gardens and other large-scale ground level stormwater management tools.

SOUTH PHILLY GSI TOUR AGENDA

Saturday, November 23rd

1:00 – Meet at **Herron Playground**

2nd and Reed Streets
Philadelphia, PA 19148

- Meetings and introductions
- Stormwater Management using Porous Asphalt and Rain Gardens- Danielle

1:20 – Depart

1:40 – Arrive at **Southwark Community Garden**

3rd and Christian Streets
Philadelphia, PA 19147

- Stormwater Management using Green Roofs – Anne Harvey

2:00 – Depart

2:10 – Arrive **Nebinger School**

Intersection of Frankford and Kensington Ave
Philadelphia, PA 19124

- Stormwater Management using Rain Gardens – Alex

2:30 – Depart

2:40 – Arrive **Percy Street**

9th and Christian
Philadelphia, PA 19147

- Stormwater Management using porous Asphalt – Meliora Design

3:00 - Arrive at **Wishing Well** for drinks

9th and Christian

3:30 – Depart for Alex’s House – Rainwater Harvesting Tutorial