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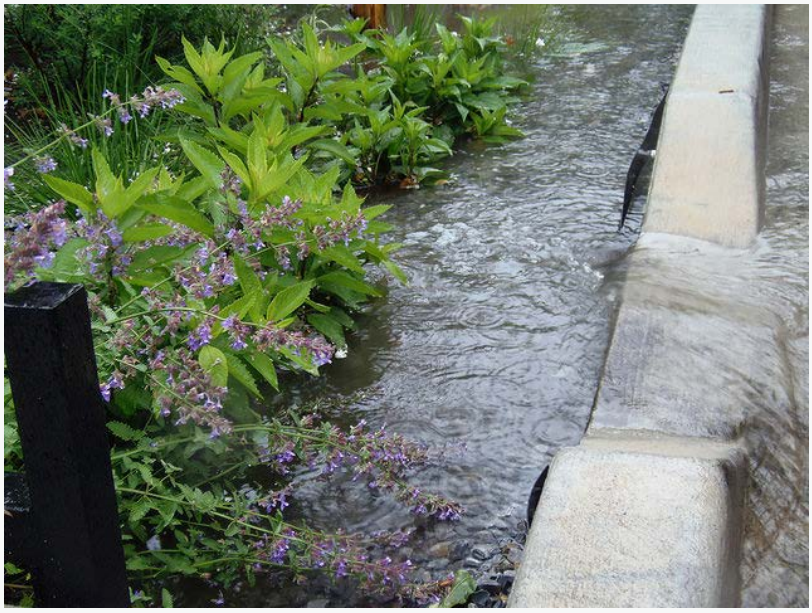

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Data Analysis Shows that Green Infrastructure Can Play an Important Role in Improving the Health and Cleanliness of Local Waterways

Cost-Effective Green Infrastructure Performed Even Better than Expected; Reduced Flow in Sewers by More Than 20 Percent

Report Will Guide Expansion of Green Infrastructure Plan in New York City and Inform Other Programs Across the Country

The Full Report is Available Here and Photos of Green Infrastructure Projects are Posted on DEP's Flickr Page

New York City Department of Environmental Protection (DEP) Commissioner Emily Lloyd today released a detailed analysis of the performance of three neighborhood-scale green infrastructure projects in New York City which demonstrates that they absorbed even more stormwater than anticipated and reduced the runoff entering the sewers by more than 20 percent. Located in the neighborhoods of Bushwick, East New York and Edenwald, the three demonstration areas were chosen because the sewers drains to a single pipe where flow meters were installed to measure the amount of stormwater both before, and after, construction of the green infrastructure. Within these defined areas DEP built 70 curbside gardens, or bioswales, that are specially designed

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to collect and absorb stormwater from the street and sidewalk and keep it out of the combined sewer system, where it can contribute to sewer overflows into local waterways. The work is part of the City's Green Infrastructure Plan, an alternative approach to improving harbor water quality that combines traditional infrastructure upgrades and the integration of more cost-effective green infrastructure, which captures and retains stormwater runoff naturally. Across the three demonstration areas, the green infrastructure managed the first inch of stormwater that fell on over 14 percent of the impervious area, which surpassed the goal of capturing the first inch that fell on 10 percent of the impervious area.

"New York City has aggressively built our Green Infrastructure program to help clean up our rivers, creeks and coastal waters and the performance data demonstrates that these have been smart investments," said **DEP Commissioner Emily Lloyd**. "The findings in the report will guide us as we dramatically expand the program in the coming years and should serve to inform other cities across the country as they look for cost-effective ways to reduce pollution in local waterways."

Nilda Mesa, Director, Mayor's Office of Sustainability: "Green infrastructure like bioswales has tremendous potential in an urban area like ours, where so much of our surfaces are hard pavement that cannot absorb heavy rains. Having the rains absorbed into the ground, instead of rushing into the sewers, means less flooding in our neighborhoods and cleaner waters. And preventing combined sewer overflows into our waterways can also prevent beach closures in the summertime. So many cities of a certain age have been grappling with these issues; this data shows just how effective green infrastructure is."

New York State Department of Environmental Conservation Commissioner Joe Martens said, "Recognizing the importance of protecting our waterways, communities across New York State are implementing green infrastructure projects to reduce pollution discharges that impair water quality and impact fisheries and habitats. I commend the City DEP for its commitment to using green infrastructure to further the goal of healthy water bodies and encourage them to continue to expand these efforts."

The three demonstration areas were developed in order to collect and analyze data on the volume of flow within the combined sewers both before, and after, construction of the green infrastructure. Prior to the installation of the bioswales, beginning in 2011, DEP installed depth and flow monitoring devices in the sewer pipes where they exit the demonstration areas and normal and peak flow levels were collected continuously for up to 16 months to provide pre-construction, or baseline, flow data. Once the bioswales were built, the pre-construction findings were compared to the post-construction flow data. By taking into account the total rainfall for the area, estimates were made as to how much stormwater was being managed by the green infrastructure and never making it into the sewer system. On average, across all three demonstration areas during a typical rainstorm in New York City, the green infrastructure reduced the stormwater runoff entering the sewer system by at least 20 percent.

The report also found that the inclusion of a stone gabion, which hydraulically connects the surface of the bioswale to the storage layer beneath the soil, helps to speed the absorption of stormwater. The use of a stone gabion has now been added to the standard design for all bioswales in New York City. In addition, information was also collected on the temperature in the vicinity of each bioswale, vegetation cover and visits by pollinators and wildlife using sensors, infra-red and time-lapse cameras, as well as human observation. This data is being compiled into a report on the ancillary benefits of green infrastructure that will be made available in the coming weeks.

Bioswales are built in city sidewalks and do not result in the loss of any parking spaces. They resemble standard street tree pits, except that they vary in size, have curb cuts that allow stormwater to enter and overflow if it becomes saturated, and have been designed in a way that will allow them to manage between 1,100 and 2,200 gallons each during a storm. DEP has developed

standard designs, specifications and procedures for building green infrastructure in the streets and sidewalks of New York City. In partnership with the Departments of Transportation and Parks and Recreation, DEP conducts an extensive site selection process that includes geotechnical investigations and surveys. During construction, the bioswales are excavated to a depth of five feet and are then backfilled with layers of stone and engineered soil. These layers contain void spaces that store the stormwater and promote infiltration. The addition of hardy plants further encourages infiltration through root growth and increases the capacity of the bioswale through evapotranspiration. The bioswales are designed so that all the stormwater is absorbed in less than 48 hours and dedicated maintenance crews ensure that they are functioning properly, including removing any trash that may have accumulated and pruning the trees and plants. The crews are active seven days a week, visit each bioswale approximately once a week and additional crews will continue to be added as the program expands. To date, approximately 300 bioswales have been built throughout New York City with 1,300 currently under construction and thousands more planned for the next several years. To view a video of a bioswale absorbing stormwater go here.

A 2012 modified consent order with the New York State Department of Environmental Conservation (DEC) included the ambitious goal of using green infrastructure to capture the first inch of rain that falls on 10 percent of the impervious surfaces within the city's combined sewer areas by 2030. The data collected from the three demonstration areas shows that the green infrastructure surpassed this goal and captured the first inch of rain that fell on over 14 percent of the impervious surfaces.

In addition to the bioswales, DEP also built on-site green infrastructure at the New York City Housing Authority's Hope Gardens Houses in Bushwick and the Seth Low Houses in East New York. Designed to manage stormwater runoff from impervious surfaces within the developments, bioretention areas, permeable pavement and subsurface detention systems collect stormwater that falls on the walkways and parking lots and keeps it out of the sewer system.

Since 2002, DEP has invested more than $10 billion in upgrades to wastewater treatment plants and related efforts to reduce CSOs and the cleanliness and health of New York City harbor water continues to improve to levels not seen in more than a century. However, CSOs remain the city's major harbor water quality challenge. As further "grey" infrastructure upgrades became increasingly expensive, in 2010 the City launched the Green Infrastructure Plan, an alternative approach to improving water quality that combines traditional infrastructure upgrades and the integration of green infrastructure to capture and retain stormwater runoff before it ever enters the sewer system. Over the next 15 years, DEP is planning for $2.4 billion in public and private funding for targeted green infrastructure installations, as well as $2.9 billion in cost-effective grey infrastructure upgrades, to significantly reduce CSOs. The Edenwald and Bushwick projects were undertaken in connection with the settlement of an enforcement action taken by New York State for violations of New York State law and DEC regulations.

DEP manages New York City's water supply, providing more than one billion gallons of water each day to more than nine million residents, including eight million in New York City. The water is delivered from a watershed that extends more than 125 miles from the city, comprising 19 reservoirs and three controlled lakes. Approximately 7,000 miles of water mains, tunnels and aqueducts bring water to homes and businesses throughout the five boroughs, and 7,500 miles of sewer lines and 96 pump stations take wastewater to 14 in-city treatment plants. In addition, DEP has a robust capital program, with nearly $14 billion in investments planned over the next 10 years that will create up to 3,000 construction-related jobs per year. This capital program is responsible for critical projects like City Water Tunnel No. 3; the Staten Island Bluebelt program, an ecologically sound and cost-effective stormwater management system; the city's Watershed Protection Program, which protects sensitive lands upstate near the

city's reservoirs in order to maintain their high water quality; and the installation of more than 820,000 Automated Meter Reading devices, which allow customers to track their daily water use, more easily manage their accounts and be alerted to potential leaks on their properties. For more information, visit nyc.gov/dep, like us on Facebook, or follow us on Twitter.

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