Waterways
Together we can

Continue implementing grey infrastructure upgrades

Use green infrastructure to manage stormwater

Remove industrial pollution from waterways

Protect and restore wetlands, aquatic systems, and ecological habitat
We turned our backs on many of our waterways over a hundred years ago, hid them behind buildings and highways, and then for too long poisoned and choked them. Now, once again, we are embracing them and remembering that they were the city’s founding asset and great glory. The reason we’re all gathered here at this particular spot on the North American coast is because the water pulled us here.

Tony Hiss // Manhattan

Few people realize that the Atlantic delivers impressive swells to New York City during hurricane season, a time when some gorgeous surfing can be observed on the gritty shores of Far Rock. As a mother of two, what draws me into the sea is not the thrill but the joy and serenity I feel catching waves under the rising sun before most people in the city have even risen from bed.

Jungwon Kim // Brooklyn

I live and work around the Bronx River, and I’ve been learning how to use the river for education and for recreation. We’ve worked hard to have this place revitalized and everything I do is basically centered on the community and the river.

Andre Rivera // Bronx

Not only does capturing stormwater prevent our harbors from becoming polluted, but it becomes a precious resource for greening the spaces where we live. I painted a mural in Cypress Hills, where captured stormwater sustains community gardens. These gardens provide better air for our children to breathe and healthy, local food for our communities to eat.

Katie Yamasaki // Brooklyn
Waterways

Improve the quality of our waterways to increase opportunities for recreation and restore coastal ecosystems

Water surrounds New York City, and the story of our harbor in many ways reflects the history of our city. The Hudson, East, Harlem, and Bronx Rivers, Jamaica Bay, and the Upper and Lower New York Bays have physically defined the city and supported trade, industry, diverse ecological communities, and recreation. Our waterways, as much as any other element of the city, distinguish our people and neighborhoods.

When Henry Hudson arrived over 400 years ago in what is now New York City, he encountered a land filled with forests, wetlands, and an abundance of nature. During storms, this undeveloped land naturally filtered rainwater into pristine waterways teeming with aquatic life.

New York City’s transformation into a global center of industry and commerce dramatically and irrevocably altered this natural environment. People drained coastal marshes, ponds, and streams to make room for development. After a series of cholera outbreaks in the 1840s, city leaders invested in sewers to remove sanitary sewage and discharge it directly into waterways. Their vision proved to be a wise expenditure, and by the late 1860s, the threat of cholera from wastewater in the streets subsided. Nonetheless, the quality of our waterways became progressively worse. Eventually, wastewater treatment plants were built near bathing beaches, but construction didn’t keep up with need in every waterway.

Industrialization also degraded our waterways. Wetlands were filled, and many waterways were deepened and their edges hardened with bulkheads and piers to support navigation and manufacturing. Oil refineries, factories, and shipyards clustered along our tributaries, and their waste products were often dumped into the water. While manufacturing declined after World War II, the health of the waterfront continued to suffer. For decades, stretches of waterfront sat largely abandoned while historic pollution seeped deeper into the soils and surrounding waters.

A lot has changed since then. Throughout the 20th century, the City built 14 plants that today are capable of treating 100% of the 1.1 billion gallons of sanitary waste that New Yorkers generate every day in dry weather. The City’s efforts were helped by landmark federal legislation that included the 1972 Clean Water Act, which for the first time established pollution discharge standards and made grants available to meet them. The City’s efforts have continued even after federal grants ended in the 1990s. We have invested more than $6 billion in harbor water quality improvements since 2002 alone.

In 2011, we are poised to certify system-wide attainment of Clean Water Act secondary wastewater treatment standards for the first time ever. And water quality in New York Harbor is cleaner now than at any time in the last century. Over 130 square miles, or 95%, of New York Harbor is available for boating. New Yorkers also have access to swimmable waters adjacent to the city’s 14 miles of public beaches in the Bronx, Brooklyn, Queens, and Staten Island. More than 116 square miles, or 75%, of the New York side of the harbor meets pathogen standards for swimming.

Despite these major improvements, we continue to face four primary challenges to the quality of our waterways. First, while our wastewater treatment plants can handle all of the volume the city generates on a dry day, the treated water released from our plants still contains comparatively high levels of nutrients, such as nitrogen. These don’t pose a public health risk, but they can impair water quality by depleting the dissolved oxygen that fish and other aquatic life need to survive.

Second, the majority of our sewer system accepts both sanitary and stormwater flows. There are design limits on the amount of stormwater flows the plants can handle without threatening the effectiveness of the wastewater treatment process. To protect treatment...
plants, the system has safety valves, known as combined sewer outfalls. Similarly, combined sewer outfalls are necessary in some locations because of limited capacity in the sewer system itself. These discharge excess sanitary and stormwater flow—otherwise known as Combined Sewer Overflows (CSOs)—into the city’s surrounding waterways during heavy rains.

While CSOs are the largest source of pollution entering our waterways, the number and potency of these events has dropped dramatically over the last 30 years, limiting water quality impairments to our smaller tributaries. Since 1980, we have increased our rate of CSO capture from 30% to over 72%. The portion composed of sewage has continued to decrease from 30% by volume in the 1980s to 12% in 2010. However, we still discharge an estimated 30 billion gallons of CSOs each year.

Third, some of our waterways are severely impaired by contaminated sediments that leach pollutants deposited decades ago. These legacy contaminants continue to degrade coastal ecosystems that never fully recovered from the levels of pollution and development that occurred during the 19th and 20th centuries.

Fourth, we also face challenges to our remaining natural areas within our waterways. The construction of bulkheads and hardened shorelines and the dredging of channels have significantly altered tidal wetlands, aquatic habitats, and hydrology. For the Hudson-Raritan Estuary as a whole, including New York City, only 14 square miles of coastal wetlands remain from an estimated 100 square miles when Henry Hudson arrived 400 years ago. We must protect remaining wetlands and restore them where they can make the greatest long-term contribution to water quality and the ecosystems necessary for the harbor to thrive.

As a harbor city, the waterways that surround and adjoin the five boroughs are among our greatest assets. Improving the quality of our waterways will enhance the quality of life for New Yorkers. Cleaner waterways will provide additional recreational opportunities and support the public access provided by our waterfront parks. Removing pollution from contaminated waterways will benefit local ecosystems and provide economic opportunities for surrounding neighborhoods. A healthy harbor will provide benefits not just for the people enjoying nature, but also for the other species that call this region home.

Our plan for waterways:

Continue implementing grey infrastructure upgrades
1. Upgrade wastewater treatment plants to achieve secondary treatment standards
2. Upgrade treatment plants to reduce nitrogen discharges
3. Complete cost-effective grey infrastructure projects to reduce CSOs and improve water quality
4. Expand the sewer network
5. Optimize the existing sewer system

Use green infrastructure to manage stormwater
6. Expand the Bluebelt program
7. Build public green infrastructure projects
8. Engage and enlist communities in sustainable stormwater management
9. Modify codes to increase the capture of stormwater
10. Provide incentives for green infrastructure

Remove industrial pollution from waterways
11. Actively participate in waterway clean-up efforts

Protect and restore wetlands, aquatic systems, and ecological habitat
12. Enhance wetlands protection
13. Restore and create wetlands
14. Improve wetlands mitigation
15. Improve habitat for aquatic species
Our Plan

We are one of the world’s great waterfront cities—a series of islands and archipelagos, with 520 miles of waterfront. But we have yet to fully realize the promise of our waterways as a source of recreation and inspiration. To fulfill this potential, we must improve the cleanliness of the water itself.

That is why we will upgrade our wastewater treatment plants. We will increase their capacity and improve the quality of the water they discharge. We will ensure that all 14 of the City’s wastewater treatment plants will meet monthly secondary treatment standards for the first time since the standards were established in 1972. We will also cut nitrogen discharges into Jamaica Bay, the East River, and Long Island Sound by 50% by 2020 in order to minimize negative effects on aquatic ecosystems.

We will make cost-effective “grey infrastructure” investments such as upgrading and constructing new detention facilities and pumping stations. These traditional strategies will reduce the impact of CSOs around some of our more polluted waterways, but they alone will not sufficiently raise the quality of our waterways to desired levels. We will address the root cause of CSOs by making a transformative investment in green infrastructure that captures or detains stormwater before it can enter and overwhelm the sewer system.

In 2010, we launched the NYC Green Infrastructure Plan. It will supplement traditional approaches with a $1.5 billion, 20-year effort to improve water quality by making the city greener and more permeable. This investment, combined with targeted cost-effective grey infrastructure, will reduce CSOs by 40%. It will save ratepayers more than $2 billion if the plan is implemented rather than an all-grey approach. Green infrastructure will not only improve the quality of our waterways. It will also clean the air, lower energy demand, reduce carbon emissions, increase species habitat and property values, and reduce the city’s vulnerability to the impacts of climate change.

We must also address contaminants that have lingered for decades. By working with our federal and state partners, we will ensure that our most contaminated tributaries are cleaned up. Similar partnerships will help us support ecosystem protection and restoration efforts.

Through the initiatives outlined below, we will improve the quality of our waterways and create a healthier habitat for fish and wildlife. Our efforts will help to ensure that we can more fully enjoy the waters that surround us.

Continue implementing grey infrastructure upgrades

The NYC Green Infrastructure Plan includes a hybrid of green and grey approaches, and we will continue to implement those grey infrastructure upgrades that are underway and are cost-effective. We will complete the expansion and modernization of the Newtown Creek Wastewater Treatment Plant and upgrade other plants to decrease nitrogen discharges into sensitive natural areas.

We will construct cost-effective holding facilities for CSOs and upgrade other grey infrastructure to improve water quality in our tributaries. We will also maintain and upgrade our sewer system to support existing communities, accommodate new growth, and reduce pollution. We have embarked on a massive investment program to enhance the quality of our waters and assure the health of our residents.

INITIATIVE 1
Upgrade wastewater treatment plants to achieve secondary treatment standards

Treating more than a billion gallons of wastewater a day is an enormous undertaking. Our massive wastewater treatment plants—which New York City pioneered in the early 20th century—are equipped to handle twice the volume of flow that would occur on a normal day of dry weather.

For the last 40 years, the City has increased its wastewater treatment capacity and enhanced the level of pathogens that are removed through the treatment process. The substantial improvement in the quality of effluent, or the water that leaves these plants, is one of the main reasons that the water within the harbor is cleaner than at any other point over the past 100 years.

To further improve water quality, we are in the midst of a $5 billion upgrade to the Newtown Creek Wastewater Treatment Plant. This massive upgrade will increase treatment capacity from 620 million gallons per day (mgd) to 700 mgd for a plant that serves approximately one million residents within a 15,000 acre drainage area. In 2011, we will certify that the Newtown Creek Wastewater Treatment Plant—the largest of our plants—meets the effluent discharge requirements of the Clean Water Act. Once the certification process is complete, it will be the first time that all 14 of the City’s wastewater treatment plants meet secondary treatment standards since they were established in 1972.

INITIATIVE 2
Upgrade treatment plants to reduce nitrogen discharges

Although not harmful to humans, high levels of nitrogen can impair coastal ecosystems. Nitrogen can cause algae blooms that rapidly deplete the water of oxygen under certain environmental conditions, typically in late summer.

We will complete $770 million worth of upgrades at the Bowery Bay, Tallman Island, and Wards Island wastewater treatment plants to reduce nitrogen discharges into the East River by more than 50%. We will also reduce the nitrogen discharged into Jamaica Bay by nearly 50% over the next 10 years. In February 2010, we reached an agreement with the New York State Department of Environmental Conservation (State DEC), the Natural Resources Defense Council, and other environmental groups under which we will dedicate $100 million to install new nitrogen control technologies at certain wastewater treatment plants in Jamaica Bay and another $15 million for marshland restoration projects. These investments, made in concert with $95 million the City has already committed for...
nitrogen control upgrades in Jamaica Bay, will significantly improve the health of one of New York City’s most valuable ecological areas.

INITIATIVE 3
Complete cost-effective grey infrastructure projects to reduce CSOs and improve water quality

Over the next 20 years, we will invest $2.9 billion to construct cost-effective grey infrastructure projects that reduce the amount of untreated water discharged into our waterways. We will implement two categories of grey investments—infrastructure that reduces the volume of CSOs and other projects that improve the water quality in waterways impacted by CSOs.

In some areas where it is cost-effective, we will reduce CSO volumes by building large detention facilities that capture and hold CSOs and pump back wastewater to a treatment plant when storms pass. We recently completed a rehabilitation of the 20-million gallon CSO detention facility at Spring Creek and a new 43-million gallon facility at flushing Bay. In 2011, we will complete a 50-million gallon facility at Paerdegat Basin that will capture 1.7 billion gallons of CSOs per year. This will enable Paerdegat Basin to achieve a greater than 90% attainment of existing dissolved oxygen standards and 100% attainment of existing pathogen standards.

Also in 2011, we will complete a 5-million gallon CSO facility at Alley Creek in Queens. We will increase the capacity of the Avenue V Pumping Station in Brooklyn from 20 mgd to 30 mgd. This will help reduce CSOs and increase oxygen levels in Coney Island Creek. We will increase the capacity of the existing Gowanus Canal Pumping Station from 20 mgd to 30 mgd. Together, these grey infrastructure projects will reduce CSOs by more than 8.2 billion gallons a year.

We will implement other CSO-related grey infrastructure projects to improve water quality. We will invest $50 million to reactivate the Gowanus Canal Flushing Tunnel. The tunnel was opened nearly 100 years ago, but has not operated at its full capacity since it fell into disrepair in the 1960s. It brings oxygen-rich water from the Buttermilk Channel, which is fed by the East River, into the canal to improve overall water quality and mitigate the effects of CSOs. The existing single pump will be replaced with three pumps, increasing the daily flow of water into the canal by 40%. We will also complete an in-water aeration system in Newtown Creek and a destratification facility at Shellbank Creek.

INITIATIVE 4
Expand the sewer network

To support current residents and future growth, we will prioritize the extension of sanitary and storm sewers to neighborhoods throughout the five boroughs that need additional capacity.

On the Rockaway Peninsula, we have spent almost $55 million to construct separate storm sewers since 2002. This investment has improved water quality and reduced flooding and sewer backups. We will target Southeast Queens for separate sewer projects to increase capacity and reduce street flooding. We will also finish key projects on the South Shore and Mid-Island of Staten Island, in Hunts Point in the Bronx, and in the Springfield Gardens, Maspeth-Middle Village, and Hunters Point neighborhoods in Queens.

We will also invest in High Level Storm Sewers (HLSS) to keep water out of our combined sewer system. HLSS partially separate the flow in combined sewer areas by capturing 50% of rainfall and diverting it into our waterways through permitted outlets. We will build HLSS in the Throgs Neck area of the Bronx, the Gowanus neighborhood of Brooklyn, and in the Laurelton neighborhood of Queens.
INITIATIVE 5
Optimize the existing sewer system

Building new sewers that separate stormwater from wastewater is an effective, but expensive solution to CSOs. The most cost-effective way to reduce CSOs is to optimize the existing sewer network. In the large areas of the city where the combined sewer system is well-established, we will optimize the sewer system by repairing catch basins, fixing tide gates, and cleaning interceptor sewers.

Catch basins help control flooding from heavy rains. When built with special hoods, they prevent street debris from reaching our sewers. Our 144,000 catch basins are an important part of the sewer system that prevents blockages and keeps trash off our beaches. We have established a system to prioritize repairs by risk and set targets for catch basin repair time. More than 2,350 catch basins are in need of repair. By 2014, we will inspect all catch basins and seek to substantially eliminate the repair backlog.

The tide gates that cover CSO discharge points are also in need of repair. Damaged tide gates allow wastewater to leak out and corrosive salt water to leak in. To combat this problem, we will continue to implement a tide gate rehabilitation survey that inspects 25 tide gates per month. We will make repairs as needed in order to ensure maximum CSO storage and treatment plant productivity.

Built-up sediment and debris within portions of our sewer system are of similar concern. 138 miles of large intercepting sewers connect the system to the wastewater treatment plants. For our system to operate at full capacity, these interceptor sewers must be clear of any blockages or potentially damaging debris. In spring 2010, we launched an effort to clean the entire interceptor sewer network within two years, beginning with the neighborhoods with the most severe flooding issues. We are also using sonar and video surveys to catalogue the extent and location of sediment and impacted areas. We will establish a permanent program to maintain the maximum capacity of this vital infrastructure once the initial cleaning and rehabilitation is complete.

Use green infrastructure to manage stormwater

Trying to reduce CSOs entirely with traditional grey infrastructure would be very expensive. Nor would it maximize the water quality gains we can make with public funding. Therefore, we will shift some of our investment dollars to a more sustainable approach that not only improves the quality of our waterways, but also provides multiple additional benefits.

Green infrastructure improves the quality of waterways by using vegetation and other features on buildings, roads, and parks to absorb and retain stormwater. By considering all surfaces of our environment as opportunities to enhance drainage, we can reduce the amount of stormwater runoff that reaches our sewers immediately after a rainfall. Our use of green infrastructure to manage stormwater is part of a comprehensive approach to a complicated problem. The benefits will be immediate and come at a lower cost.

INITIATIVE 6
Expand the Bluebelt program

Using green infrastructure to manage stormwater is not a new concept for New York City. In fact, since the early 1990s we have relied upon wetlands and natural areas in our Bluebelt system in Staten Island to absorb stormwater runoff, thereby eliminating the need for costly storm sewer systems. Using natural systems in place of traditional sewers has saved taxpayers $80 million in infrastructure costs, raised property values, and restored damaged habitats.

The Bluebelt system is a successful model of a cost-effective sustainable stormwater management strategy that provides multiple benefits in addition to improving water quality.
The Bluebelt system is composed of streams, ponds, and wetland areas that treat and retain stormwater prior to its release into the harbor. It provides effective stormwater management for more than 14,000 acres of Staten Island, or about one-third of its total land area. In effect, we have reshaped the natural environment to filter drainage from buildings, lots, and streets, instead of constructing sewers through which this runoff would be sent to surrounding waterways.

This same strategy can be applied in other lower-density areas with key natural features. In Staten Island, we will expand the Mid-Island Bluebelt to Oakwood Beach, New Creek, and South Beach. We will also expand the use of this approach in parts of Queens and other boroughs where it is cost-effective and there is sufficient space.

**INITIATIVE 7**

**Build public green infrastructure projects**

New York City experiences a tremendous volume of runoff from rooftops, streets, and other impervious surfaces every time it rains. To address the root cause of runoff—impermeable surfaces—we must design, build, and maintain stormwater source controls, or small installations that control stormwater where it meets impervious surfaces. By implementing a distributed system of source controls throughout our built environment, we will capture rainwater before it enters our over-burdened sewer system.

In 2008, the City undertook a comprehensive study of the costs and benefits of adopting citywide source control scenarios in the streets, sidewalks, private and public buildings, and parks. The result was a Sustainable Stormwater Management Plan that was the first in the country to analyze the location and feasibility of source controls in a dense, urban environment on a citywide basis. The plan included a rigorous analysis of capital and maintenance costs and potential benefits of widespread source controls. It concluded that many would be just as effective as traditional CSO controls, for a fraction of the cost.

One major initiative of the Sustainable Stormwater Management Plan was to implement 30 pilot projects that would test promising source control technologies in New York City. There are several demonstration projects underway. Swales and stormwater-capturing tree pits allow water to pool in underground holding areas until it can dissipate. Blue roofs slow roof water from draining too quickly and overwhelming storm sewers. Permeable pavement allows water to seep through and be absorbed into the ground rather than becoming runoff. By 2013, we will complete these pilot projects by collecting monitoring data and publishing the findings.

Building on the Sustainable Stormwater Management Plan, we released the NYC Green Infrastructure Plan in 2010. The plan provides an implementation strategy for launching a source control program. We committed $187 million in fiscal years 2012 through 2015 to immediately begin implementing the plan. At the same time, we are seeking approval from the State DEC and the United States Environmental Protection Agency (EPA) to modify existing regulatory agreements necessary to fully implement the plan. We are working with the State DEC to integrate green infrastructure into the current CSO program and in the Long-Term Control Plans that will be completed for 13 waterbodies by 2017. Each Long-Term Control Plan will undertake a detailed examination of the level of green infrastructure investment necessary to meet water quality standards.

To implement sustainable stormwater source controls across the city, we will work through an interagency Green Infrastructure Task Force. We will exploit opportunities provided by planned public infrastructure projects. We will develop approved specifications for source controls in commonly-used applications. We will streamline design and permitting processes for the incorporation of source controls in public projects.

We are prepared to spend $1.5 billion on green infrastructure over the next 20 years. This investment, combined with cost-effective grey infrastructure investments, will reduce CSOs by 40%. Through these investments, we will capture the first inch of rainfall on 10% of impervious surfaces within combined sewer areas. The budget includes funding for maintenance and operations to ensure that green infrastructure continuously performs as designed. Implementing the NYC Green Infrastructure Plan, rather than an all-grey approach, will save New Yorkers more than $2 billion.

**INITIATIVE 8**

**Engage and enlist communities in sustainable stormwater management**

Incorporating green infrastructure within neighborhoods is best accomplished by working with the people who live there. Because of differences in soils, slopes, and adjacent land uses, solutions in the Canarsie neighborhood of Brooklyn may be different from solutions in the West Village of Manhattan. This creates both the need and the opportunity for innovation. Local communities can also provide essential stewardship support for green infrastructure installations.
Since 2008, we have launched over 30 green infrastructure pilots ranging from bioswales along roadways to green roofs on public buildings. These projects provide specific data on costs, maintenance needs, and the effectiveness of various forms of green infrastructure. This information will help implement green infrastructure citywide.

Some types of green infrastructure, such as enhanced tree pits, take familiar elements of our urban environment and redesign them so that they are able to capture stormwater. Traditionally, street trees were planted in heavy soils within confined pits that restricted root growth and provided limited soil moisture and oxygen levels. This leads to stunted growth, damaged sidewalks, and does little to capture stormwater runoff. Using enhanced tree pits will not only improve stormwater management but also improve the health and growth of our street trees.

Enhanced tree pits use inlets to capture stormwater runoff from the sidewalk and funnel it into the soil where it can be absorbed by tree roots and infiltrate. The enhanced tree pits are bigger at 100 square feet compared to 25 square feet for a traditional pit. Two curb cuts allow stormwater to enter the pit from the street and allow overflow to travel back to the street for conveyance to storm sewer catch basins. These pits also include native plants, subsurface storage, and specially-engineered soil to filter pollutants and absorb greater quantities of stormwater runoff.

By using enhanced pits, our street trees will grow larger, absorb more stormwater, sequester more carbon, and provide more environmental co-benefits. Healthier trees provide a larger cooling effect, additional habitat, and higher property values. So far, we have installed five enhanced tree pits that will be closely monitored to measure the storage of stormwater and to form the basis of our planning efforts. Already, these pilots have been copied in standard designs for bioswales and enhanced tree pits that can be used in most Department of Transportation and Department of Design and Construction road reconstruction projects.

One way of encouraging innovation is by providing grants to local groups to develop and implement green infrastructure projects that are right for their neighborhoods. In 2009, we awarded $2.6 million to five projects through the Flushing and Gowanus Green Infrastructure Grant Initiative. This program targets projects in the Flushing Bay or Gowanus Canal CSO drainage areas to fund construction of a green roof, vegetated swales, bioretention basins, and treatment wetlands. In early 2011, we launched a new $3 million Green Infrastructure Grant Program to fund efforts by private property owners, businesses, and not-for-profit organizations to install stormwater source controls within combined sewer drainage areas. We expect to expand the Green Infrastructure Grant Program in coming years.

Grant programs are just one of the ways we will partner with local stakeholders to shift to more sustainable stormwater management. We have formed the Green Infrastructure Citizens Group, which is open to the public and headed by the Green Infrastructure Steering Committee, made up of civic organizations, environmental groups, developers, engineers, and design professionals. They will meet regularly to ensure that their input factors into future planning and implementation efforts. In partnership with the State DEC, we will seek public input into future regulatory decisions through meetings of these groups and through waterbody-specific advisory groups leading up to the creation of Long-Term Control Plans. Community engagement will ensure that our investments provide the greatest benefits to both local communities and the city as a whole.

**INITIATIVE 9 Modify codes to increase the capture of stormwater**

Modifying design codes is another effective way to incorporate sustainable source controls and other forms of stormwater management within our built environment.

Since the 2007 release of PlaNYC, we have made several key changes. Through zoning amendments initiated by the Department of City Planning, new commercial parking lots are now required to include perimeter and interior green infrastructure. Buildings in lower density districts are no longer allowed to pave over their entire front yards. New developments citywide must plant street trees and, in lower density areas, provide sidewalk planting strips.

These measures will allow less stormwater to enter the sewers. They will increase or protect the amount of permeable surfaces that absorb rainfall and help reduce CSO events and local flooding by slowing the rate of runoff. We will build upon these measures by improving stormwater management practices on private sites in several key ways.

To ensure that private investment in source controls keeps pace with public investments, we will tighten existing requirements for stormwater management on all new development and redevelopments. By further limiting the rate at which stormwater can be released from sites, developers and owners will invest in green infrastructure and other source controls. Based on development trends, we estimate that an additional $900 million of green infrastructure will be built over the next 20 years.

We will strengthen requirements for capturing stormwater from construction sites. Under federal and state regulations, construction sites over one acre must reduce the amount of stormwater runoff they generate. These rules have little effect in New York City where most construction sites are well below one acre. To close the gap, we will propose local legislation mandating that smaller construction sites follow additional requirements to reduce stormwater runoff. Better stormwater management at construction sites will reduce the amount of dirt and debris that washes into the sewers.

We will evaluate opportunities to detain stormwater on rooftops. Blue roofs are one of the source controls with the greatest potential to increase stormwater capture rates at low cost. Blue roofs, or rooftop detention systems, are a detention technique whereby a flow restriction...
device around drains holds back water while the storm surge passes, and then slowly releases the water out to the sewers. We have successfully built blue roofs on new schools throughout the city, but we have not yet proved that blue roofs could be cost-effectively installed on existing buildings. We are currently piloting blue roof systems on existing buildings. We will study the results to determine whether we will adjust codes to require blue roofs on existing buildings in the future.

We will address the inconsistent rules and regulations that are an impediment to incorporating sustainable source controls within sidewalks. Well-designed sidewalks can reduce stormwater runoff, increase the longevity of trees, and reduce the urban heat island effect. We will develop and implement a single, consistent sidewalk standard that includes permeable strips, water storage capacity, and increased planting and recycled materials within all new sidewalk construction. This will not only provide new opportunities for the implementation of stormwater source controls, but also create a healthier tree canopy.

We will examine ways to reduce stormwater runoff from unenclosed industrial uses. Although current regulations require source controls for certain types of new construction, there are fewer controls for undeveloped sites on which many of these uses operate. Runoff and emissions from open uses can produce a poor environment for other businesses, discouraging investment in industrial areas, as well as pollute waterways and adversely affect air quality and the quality of life in adjacent residential areas. To address these issues, we will explore zoning requirements and land use controls for certain, potentially polluting unenclosed commercial and manufacturing uses to improve upon existing controls for noise, odor, dust, and stormwater discharge.

**INITIATIVE 10**

**Provide incentives for green infrastructure**

Much of the existing impervious urban landscape will not be redeveloped and is not controlled by the City. Many private property owners lack either the incentive or the means to install sustainable source controls on their own. By realigning incentives, we will enable residents, businesses, and property owners to partner with us in our effort to reduce CSOs and clean up our waterways—efforts that benefit all New Yorkers.

New York City’s water and sewer use charges are currently based on the volume of potable water consumed, not the property’s discharge of stormwater. The result is little correlation between the stormwater generated by a property and the stormwater fees that the owner pays.

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We will evaluate the opportunities for a separate stormwater rate and credit system that charges landowners for their runoff and provides incentives for them to reduce impervious surfaces. As an initial step, we are piloting a separate stormwater charge for parking lots that is aligned with the burdens that those lots put on the system which then has to be paid for by everyone else. The pilot stormwater charge applies to approximately 300 lots that currently have no water service and therefore don’t pay towards the City’s costs to collect and treat the stormwater they generate. These stand-alone parking lots are charged $0.05 per square foot of property area, a figure derived from the City’s stormwater-related capital and expense budget items.

We will use the results of this pilot to determine whether and to what extent a stormwater charge could be applied more broadly throughout the city. We will also evaluate the feasibility of creating a crediting program that would give property owners an incentive to install approved green infrastructure technologies in exchange for reduced stormwater fees.

We will continue encouraging the private sector to incorporate green infrastructure into their property through our Green Roof Tax Abatement program, which was passed by the New York State Legislature in 2008 and implemented by the City in 2009. Owners qualify with the installation of a green roof on at least 50% of the rooftop area and a cool roof and preparation of a maintenance plan. The program, which was passed by the New York State Legislature in 2008 and implemented by the City in 2009, provides an abatement from City property taxes of $4.50 per square foot of legally-installed green roof, up to $100,000. Property owners qualify with the installation of a green roof on at least 50% of the rooftop area and a cool roof and preparation of a maintenance plan. The program is currently scheduled to run until 2013. We will evaluate the program’s efficacy to determine whether to extend or modify it.

**Remove industrial pollution from waterways**

The presence of industrial pollution has been a long-standing issue for New York’s shoreline. Lingering contaminants have proven to be a lasting legacy of our working waterfront. During the first half of the 20th century, oil, coal tar, ink, and other pollutants were routinely dumped into waterways, and some discharges such as PCBS continued much later. The passage of the Clean Water Act mostly put an end to this blatant environmental degradation—but the effects of these pollutants are still felt to this day.
INITIATIVE 11
Actively participate in waterway clean-up efforts

Some of New York City’s waterways contain contaminated sediments caused by past industrial use. The Gowanus Canal and Newtown Creek were both designated as Superfund sites in 2010 by the EPA. We will work with the EPA and the State DEC to assist in the investigation of the contamination and the study of potentially feasible remedies.

Even before the Superfund listings, we had begun substantial projects to improve the water quality of the Gowanus Canal and Newtown Creek. At the Gowanus Canal, we will address stagnant water, CSOs, and odor by upgrading the Gowanus Flushing Tunnel, expanding the capacity of the canal’s pumping station, and building a new interceptor sewer. At Newtown Creek, we are installing equipment to increase oxygen levels in the water.

In addition to the ongoing work at the Superfund sites, we will investigate CSO-related and other sediments that lie at the bottom of the Paerdegat Basin, Flushing Bay, Flushing Creek, Bergen Basin, Thurstons Basin, Hendrix Creek, and Fresh Creek. Dredging these tributaries will remove CSO sediments that cause odors at low tide.

Protect and restore wetlands, aquatic systems, and ecological habitat

Wetlands are a biologically-rich intersection of land and water. They act as natural filtration systems by slowing and retaining stormwater runoff and trapping pollutants that would otherwise contaminate downstream waterways. Wetlands also provide an undeveloped edge to the urban coastline that can reduce storm surge and mitigate the impacts of erosion. Their highly-productive ecosystems form the base for estuarine and aquatic food webs. This biological productivity makes them ideal foraging and breeding sites for shorebirds, fish, and invertebrates.

Despite the significant loss of historical wetlands and streams, New York is still home to many critical natural areas. Large swaths of wetlands in Staten Island, along Long Island Sound, and Jamaica Bay are some of the most valuable natural habitat in the country. Jamaica Bay is an important resting place for endangered migratory birds and is home to more than 325 different avian species.

Vital wetland habitats are not the only natural systems within the harbor in need of restoration and habitat creation. Eelgrass, oysters, and ribbed mussels were all once widespread throughout the harbor. The loss of these species means the loss of some of nature’s finest filtration systems. We must improve degraded areas and create new habitat by managing ecological functions. We can’t merely protect existing natural resources—we must actively restore them.

INITIATIVE 12
Enhance wetlands protection

In many ways, the health of our harbor mirrors that of our wetlands. Wetlands are no longer being drained and filled like they were only a few decades ago. However, wetlands still face a variety of threats ranging from legacy pollution to climate change.

In 2005, we formed the Wetlands Transfer Task Force to assess available City-owned properties that contain wetlands. The group was tasked with addressing the future of City-owned wetlands, as well as broader questions regarding wetland management and policy. In its 2007 report, the task force recommended 82 parcels for transfer to the Department of Parks and Recreation (DPR) and 111 additional parcels for further review. We have completed a comprehensive review of these 193 parcels to determine existing conditions, including field inspections of all parcels.

We have already transferred 9 parcels to DPR. While some of the remaining parcels are acceptable for transfer now, the majority are degraded, with unresolved dumping and encroachment issues evident. Some parcels have other potentially significant environmental problems. We will finalize the transfer of those wetlands properties that don’t suffer from environmental degradation. We will also identify resources that will allow for the incorporation of additional parcels into the City’s park system.

New York City’s wetlands face challenges far more serious than how the City manages its own wetlands. In January 2009, we released a report that assessed the vulnerabilities of existing wetlands and identified additional policies to protect and manage them. New York City Wetlands: Regulatory Gaps and Other Threats found gaps in federal and state regulations—particularly for small freshwater wetlands less than 12.4 acres, unmapped wetlands, and adjacent upland buffer areas.

The report identified the need for more accurate mapping as an important step in improving protection of vulnerable wetlands. State regulation requires wetlands to be mapped in order to enjoy protection by New York State. However, wetlands naturally expand, contract, and migrate, which makes current and accurate mapping essential to ensure their protection. State DEC tidal wetlands regulatory maps are based on aerial photography from 1974, and freshwater wetland maps have not been updated since 1995. New maps of wetland areas would identify those areas falling through the gaps of regulatory protection. We will work with state and federal partners to update wetlands maps.
We will expand protection through the New York City Waterfront Revitalization Program (WRP). This program establishes policies for the review of all discretionary actions by City, state, or federal government entities within the city’s coastal zone and takes into consideration protection of natural waterfront areas. As we update the WRP in the coming year, we will consider designating additional sites of ecological importance, such as the Upper Bronx River, Arverne, Plumb Beach, southern portion of the Arthur Kill shoreline, portions of the Raritan Bay shoreline, Staten Island Greenbelt, and Staten Island South Shore Bluebelts.

More than regulatory enforcement is needed to protect tidal salt marshes, New York City’s most abundant and visible type of wetland. Salt marshes are in decline around the city due to inundation from sea level rise and a variety of complex interactions in the urban ecosystem. We will collaborate with state, federal, and university researchers to evaluate both the vulnerability of salt marshes and strategies to provide protection.

We will develop a comprehensive strategy that addresses wetlands management and protection. In 2009, the City Council passed Local Law 31 requiring the Mayor’s Office to create a wetlands strategy by March 1, 2012. Through this process, we will evaluate appropriate legal requirements, incentives, management, funding, and enforcement mechanisms to protect, restore, and expand wetlands, associated buffer areas, and the streams corridors that connect them.

INITIATIVE 13

**Restore and create wetlands**

Protecting existing wetlands is not enough to reduce the threats to our natural systems. We must restore degraded wetlands and create new habitats to replace losses that have occurred.

We have undertaken wetlands restoration projects in connection with the construction of recent CSO detention facilities. At Alley Pond Park in Queens, we recently completed 16 acres of restoration to revive the local ecosystem and improve water quality. We will create 38 acres of new and restored habitat along Paerdegat Basin near Jamaica Bay.

We have also partnered with state and federal agencies to share resources and expertise and achieve the greatest benefit for wetlands within the region. This collaboration has led to the development of the Comprehensive Restoration Plan (CRP), a joint project of the U.S. Army Corps of Engineers (Army Corps), the EPA’s New York-New Jersey Harbor Estuary Program (HEP), and the Port Authority of New York and New Jersey (Port Authority).

CASE STUDY

**Jamaica Bay Restoration**

Kayaking through the brackish waters and marsh grasses of Jamaica Bay, it is easy to forget you are less than 10 miles from the bustling streets and tall towers of lower Manhattan. The buildings, traffic, and people disappear in this 26-square-mile natural sanctuary that is home to over 325 bird and 91 fish species. But this diverse and ecologically-rich habitat is threatened by rising sea levels, pollution, non-native species, and sediment deprivation. Most of all, it suffers from historic dredging and filling. A century ago, there were over 16,000 acres of salt marsh lands around the bay. Today there are just 800 acres, plus pockets of deep water borrow pits and navigational channels.

We have made major commitments to enhance water quality by improving stormwater runoff, reducing CSOs, and cutting nitrogen discharges into the bay in half. Although better water quality in the bay is essential, the City and multiple state and federal agencies are actively restoring marsh islands to enhance and protect fish and wildlife. We have partnered with the Army Corps of Engineers, the National Park Service, State DEC, and the Port Authority to restore the Elders Point marsh island complex, which was among the most eroded in the bay.

Long ago, the Elders Point marshland was a contiguous 132-acre island teeming with birds, fish, and other aquatic life. But years of erosion and sediment loss cleaved the land into separate islands connected by tidal mudflats. Reconstruction of Elders Point East was completed in 2006 and Elders Point West was completed in 2010. The restoration and establishment of the appropriate tidal elevations to support *Spartina alterniflora* (Smooth Cordgrass) growth used approximately 500,000 cubic yards of clean sand dredged from the bottom of New York Harbor. This material was dredged to deepen the shipping channels to accommodate larger vessels. Native plants grown from seed collected from within Jamaica Bay have been used to restore over 80 acres of habitat.

Restoring the Elders Point marsh would not be possible without the partnership of City, state, and federal agencies. This partnership brings together critical resources, leveraging limited funding and scientific knowledge to produce sustainable and cost-effective restorations. These efforts that will help to promote an ecologically vibrant Jamaica Bay that can be enjoyed by future generations.
The CRP is a master plan and strategy that establishes broad goals for restoring wetlands and other ecosystems in the Hudson-Raritan Estuary. We will work with our partners to implement specific ambitious, yet achievable ecosystem restoration targets in the harbor.

Our work with state and federal partners has resulted in the completion of over 165 acres of restored or enhanced wetlands since 2002. In Jamaica Bay, we worked with the Army Corps, State DEC, the Port Authority, and the National Park Service to restore more than 80 acres at Elders Point in 2009. We also restored 22 acres at Gerritsen Creek.

In the next three years, we will work with state and federal partners to invest over $54 million at 17 sites to restore and enhance over 58 acres of wetlands and adjacent habitat. We will complete wetlands restoration projects in the Bronx at Pugsley Creek Park, Soundview Park, and along the Bronx River. We will also restore wetlands along Randall’s Island, at Calvert Vaux Park in Brooklyn, at Meadow Lake in Queens, and at Freshkills Park in Staten Island. We have also committed $15 million for additional wetlands restoration in Jamaica Bay, and we will seek to leverage this funding by collaborating with our federal and state partners.

We have worked with state and federal partners to invest over $74 million to restore over 175 acres of wetlands since 2002, but that amount falls far short of what is need to restore all degraded wetlands in the harbor. There is no stable funding source for wetlands restoration and management, and most restoration projects have been conducted using relatively small funding sources. Compared to other areas across the country of similar ecological importance—such as the Chesapeake Bay and the Great Lakes—Jamaica Bay receives far fewer federal dollars. We will advocate for our fair share of federal funding for wetlands and ecosystem restoration.

**INITIATIVE 14**

**Improve wetlands mitigation**

Large-scale wetlands destruction no longer happens regularly. However, on occasion, wetlands must be filled for essential infrastructure or economic development projects. All proposed projects in designated wetland areas are subject to regulatory oversight that requires applicants to avoid, minimize, and, if necessary, mitigate any damage.

Mitigation is the practice of restoring, enhancing, or protecting wetland functions to offset their loss elsewhere as a result of construction projects. The current mitigation system in New York State requires restoration at the site of the disturbance or at a nearby location. This system often is not practical in New York City due to a lack of available space for on-site mitigation. It is also inefficient as the existing system often encourages restoration projects that are small, expensive, and of lesser habitat value. These significant flaws mean that we are not getting the greatest benefit from the money being spent.

Federal regulators acknowledge these failings and encourage the use of alternative mitigation mechanisms. One alternative is in-lieu fee mitigation, which allows wetlands loss to be mitigated by paying a fee to a fund that then aggregates payments to larger restoration projects. Another option, mitigation banking, uses a similar approach by encouraging large-scale wetland restoration projects to generate “credits” that can be transferred to compensate for wetlands loss within a predetermined area.

Both mechanisms provide numerous benefits over the current system by consolidating funding into larger projects that produce economies and ecologies of scale. By consolidating restoration projects and permitting approvals, these alternative mitigation strategies can save taxpayers and regulators time and money. We will work with the State to develop wetland mitigation alternatives that will make the regulatory process more efficient and increase wetland restoration and creation opportunities.
New York Harbor School

New York Harbor is a source of inspiration. Nowhere is this better illustrated than at the Urban Assembly New York Harbor School. Established in 2003, Harbor School was born with the belief that the harbor could provide a previously untapped potential for excellence in secondary, maritime public education.

The creation of Harbor School is part of our ambitious efforts to reform public education and replace under-performing schools. Harbor School welcomed students from an existing high school in the Bushwick neighborhood of Brooklyn. Within four years, graduation rates at Harbor School were more than triple the rate of the school that it replaced. And college retention rates are far higher than other high schools with similar demographics.

Harbor School’s approach is to engage students, most of whom live below poverty and are considered at-risk, by using the waterways that surround the city as their classroom. Harbor School provides a rigorous, college-preparatory education built upon the city’s maritime environment.

In 2010, Harbor School became Governors Island’s first permanent tenant since the Coast Guard abandoned the island in 1995. This location is not just symbolic. It also provides unique opportunities to provide hands-on education. Harbor School has embraced oyster restoration as a vehicle to teach marine science. In 2010, students raised 300,000 oysters from larvae as part of their aquaculture class. The juvenile oysters were placed on the Oyster Restoration and Research Project’s reefs by Harbor School student scuba divers.

In 2011, Harbor School will expand into their new Marine Science and Technology (MAST) Center, a 9,000 square foot, two-story structure located alongside the water and partially constructed over the harbor. The facility will be critical for marine science education as it will house aquaculture facilities to raise native New York species.

By providing a maritime-based education for young adults, we are not just preparing students for college and teaching valuable skills. We are also investing in the long-term health of the harbor.

INITIATIVE 15
Improve habitat for aquatic species

New York Harbor used to be filled with oysters, eelgrass, and mussels. To recoup lost water quality benefits and increase the biological diversity and resilience of the region, we have launched pilot programs to test the feasibility of reintroducing these three species into the harbor. The pilots will establish the potential water quality benefits of reintroduction, test whether reproduction of these species is naturally-occurring, and help determine whether current restoration methods successfully restore or replace damaged or lost habitat.

Oyster reefs were once abundant in New York Harbor, but overfishing, disease, and pollution all but eliminated these once-dominant features by the early 20th century. We are working to address whether sustainable oyster populations can be reintroduced in our waterways through the Oyster Restoration and Research Project (ORRP). This partnership, led by the Hudson River Foundation, New York/New Jersey Baykeeper, the Urban Assembly New York Harbor School, the Army Corps, the HEP, and the Port Authority, has constructed six small reefs throughout the harbor in 2010.

Initial results indicate that the oyster spat, or larvae, that were placed on the pilot reefs have survived and grown. But questions still remain about whether the oysters will reproduce and thrive as a self-sustaining species. We will work with the ORPP partners to better understand suitable environmental characteristics, appropriate locations, necessary water quality conditions, costs, and benefits. We will expand the size of our pilot project and undertake additional restoration efforts. We will also work with our ORPP partners to develop a strategy to evaluate the scientific findings and expand restoration efforts should the pilots prove successful.

We will also pilot the reintroduction of eelgrass. This species has the potential to serve as an important source of habitat and shelter for fish and shellfish. Much like trees do on land, eelgrass stabilizes sediments, reduces erosion, and naturally removes nitrogen from the water. We have sown 3,500 plantings since 2009 as a part of our effort to improve the ecology of Jamaica Bay. We will sow an additional 2,000 plantings in April 2011.

The final pilot project will evaluate the ability of ribbed mussels to filter nutrients and other pollutants from the water. The filtering capacity of mussels is well known, but it is unclear if that capacity could be tapped and applied in the harbor. In 2011, we will construct several artificial structures in Jamaica Bay to evaluate ribbed mussel growth and measure the effectiveness of these species in removing nutrients and particulate organic matter from the water.

Conclusion

Improving the quality of New York City’s waterways is a long-term commitment that requires consensus about priorities and goals.

We must remove historical pollution that has had a prolonged and damaging effect on our waterways. We must also address the present-day pollution that comes from CSOs and continue finding ways to restore natural systems. As these investments can be costly, we need to focus on those problems that can affect public health or prevent New Yorkers from accessing their waterfront today.

These improvements will allow millions of New Yorkers to access areas that have been off limits to recreational use for decades. They will also revitalize our city’s aquatic ecosystems. Our commitment to improving our waterways is a critical element of our environmental stewardship for the next generation, which needs and deserves a clean and healthy harbor ecosystem.