



The mouth of the Hudson River in Lower Manhattan.

## CHAPTER 3

# Vision 2020 Citywide Strategies

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With the city's waterfront much improved—and with the public's interest in a productive and accessible waterfront at an all-time high—it became necessary to develop a new master plan for the shoreline. In 2008 the New York City Council passed Local Law 49 requiring that the Department of City Planning complete a comprehensive waterfront plan drafted in consultation with city, state, and federal agencies and with input from the public. The legislation called for the new plan to be submitted to the Mayor, the Council, the Public Advocate, each Borough President, and each community board. *Vision 2020* satisfies the City Council mandate and represents what the City seeks to accomplish on the waterfront and in the waterways over the next 10 years and beyond.

### VISION 2020 PLANNING PROCESS

*Vision 2020* is the result of a major planning effort involving thousands of people who are engaged in, and passionate about, the waterfront and waterways. In developing the plan, the Department of City Planning reached out to government agencies, independent groups, and members of the public for their ideas and recommendations.

Within city government, a Technical Advisory Committee was formed in 2009 and met monthly throughout the planning process. This steering committee was comprised of staff from the Mayor's Office, the Department of City Planning, the NYC Economic Development Corporation, the Department of Environmental Protection, the Office of Emergency Manage-

ment, the Department of Parks & Recreation, and the Department of Housing Preservation and Development.

In addition, City Planning formed a Waterfront Planning Working Group to advise it and the other agencies involved in formulating the plan. The Working Group—composed of civic, environmental, recreational, and industrial leaders (see Acknowledgments for Working Group members)—met monthly starting in March 2010 to discuss the plan and vet recommendations.

Engaging members of the broader public was a priority as well. City Planning conducted an extensive outreach campaign to solicit input from waterfront enthusiasts, waterfront property owners, community boards, recreational boaters, and other interested members of the public. The agency held a series of public meet-



Ian Douglas, Metropolitan Waterfront Alliance

*Vision 2020* is the result of an active, participatory planning process. Above left: Public workshop on the Blue Network. Above right: The second citywide meeting, held in October 2010.

ings, beginning with a citywide presentation on April 8, 2010, at which staff introduced preliminary goals and issues. Over the spring and summer, City Planning held seven public workshops—one in each borough, to explore issues on a local level and discuss specific reaches, and two additional workshops devoted to the Blue Network organized around the themes of Use of the Waterways, Urban Ecology, and Climate Resilience.

In addition to the public workshops, City Planning gave presentations on *Vision 2020* at meetings organized by the Metropolitan Waterfront Alliance (MWA), a non-profit umbrella group dedicated to making the waterfront and waters of the New York Harbor clean and accessible spaces for education, work, and play. These sessions helped bring out the more than 400 member organizations of the MWA to comment and make recommendations on issues related to their areas of expertise, which include everything from mass water transit and the working waterfront to water recreation.

While face-to-face meetings and public presentations were taking place, City Planning maintained a website to provide information about *Vision 2020* and give notice about upcoming public meetings. People could also send in ideas and questions through the website and by e-mail—and they did. Over the course of the year more than 500 comments were submitted electronically, including sug-

gestions for environmental education centers, waterfront parks, improved maritime infrastructure, and emergency evacuation routes. In September, preliminary draft recommendations of the plan were posted on the website, and the public was invited to comment.

As comments flowed in, City Planning organized its second citywide public meeting, held on October 12, to present the draft recommendations and solicit feedback. The agency continued to compile a list of the proposals made over the preceding months, both for citywide policy changes as well as detailed site-specific improvements. In consultation with partner agencies and the public, City Planning assessed each proposal for its ability to meet the goals and address the issues identified in the plan. Each proposal was also examined for whether it could be implemented within the 10-year time frame of the plan. From this list came the hundreds of recommendations for improving the waterfront contained in *Vision 2020*.

The first part of the plan addresses the eight broad goals and offers citywide strategies for achieving these goals. The second part contains neighborhood strategies. It is organized by reaches and specifies recommendations for individual sites along the waterfront.

## NEW YORK CITY COMPREHENSIVE WATERFRONT PLAN

### GOAL 1

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Expand public access to the waterfront and waterways on public and private property for all New Yorkers and visitors alike.

Parks, piers, esplanades, beaches, and other kinds of publicly accessible spaces on the shoreline provide opportunities for recreation, relaxation, sightseeing, and waterfront events. The City has dramatically expanded publicly accessible waterfront space since 1992, and it plans to secure even more waterfront access, taking fuller advantage of New York's unique geography and allowing residents and visitors to experience our city as a waterfront metropolis. Not only do we want more places where people can reach the water's edge, we also seek additional spots where people can gain access to the water itself.

### GOAL 2

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Enliven the waterfront with a range of attractive uses integrated with adjacent upland communities.

The reclamation of the waterfront is not complete without uses that make it a desirable destination. Well-designed areas—including housing, stores, and parks—draw people to the waterfront and increase the public's awareness and enjoyment of the water's edge. Integrating waterfront spaces with upland communities through wayfinding and transportation improvements can connect more people with the coastline, promoting the role of the waterfront in the everyday lives of all New Yorkers.

### GOAL 3

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Support economic development activity on the working waterfront.

Port and maritime industries are valuable economic assets—crucial to New York's prosperity. They provide thousands of jobs and generate more than one billion in tax revenue. Looming maritime developments—such as the expansion of the Panama Canal—create both opportunities and challenges for New York's commercial shipping industry. By addressing issues such as the air draft of bridges along major shipping channels within the Port of New York and New Jersey and by exploring targeted incentives, recruitment, and coordinated regulatory policies, the City can help the working waterfront adapt and prosper.

### GOAL 4

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Improve water quality through measures that benefit natural habitats, support public recreation, and enhance waterfront and upland communities.

New York's waterways are the cleanest they have been in more than a century. Addressing ongoing sources of water pollution—such as stormwater run-off, combined sewer overflows, and contaminated sediment—can further improve the conditions of our waterways. Continuing to invest in water infrastructure, upgrade wastewater treatment facilities, and find sustainable solutions to manage stormwater will ensure that New York Harbor remains a vital resource for recreation, commerce, and natural habitat.

## GOAL 5

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### Restore degraded natural waterfront areas, and protect wetlands and shorefront habitats.

Natural waterfront areas are diverse and valuable assets, providing habitat for an astonishing variety of species and yielding benefits for the whole city. Wetlands are foraging and breeding grounds for shorebirds, fish, and invertebrates. They also filter the water and mitigate storm surges by absorbing the impact of waves. Beaches, bluffs, near-shore shallows, and submerged lands perform vital functions, too. Protecting and restoring natural areas and crafting citywide policies and programs to improve ecological systems will advance the health of the waterfront, the waterways, and all of New York.

## GOAL 6

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### Enhance the public experience of the waterways that surround New York—our Blue Network.

Our waterways are a great resource, and *Vision 2020* proposes to better connect people with them—physically, visually, and culturally. Increasing waterborne transportation, promoting water recreation, and creating the waterfront infrastructure needed for events, cultural activities, and educational programs will allow residents and visitors to engage more fully with the Blue Network and help New York realize its potential as a great waterfront city.

## GOAL 7

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### Improve governmental regulation, coordination, and oversight of the waterfront and waterways.

The waterfront is dynamic, requiring constant maintenance, repair, and oversight. Today many governmental entities—each with a different mandate—have jurisdiction over the shoreline. The complex regulatory process for in-water construction makes it difficult for private and public owners of waterfront property to build and maintain necessary structures. To enhance the shoreline with the parks, housing, and commercial and recreational activity envisioned in this plan, we need clearer procedures and better coordination at all levels of government.

## GOAL 8

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### Identify and pursue strategies to increase the city's resilience to climate change and sea level rise.

Although *Vision 2020* focuses on the next 10 years, it also recognizes the need to plan for a much longer time frame. Over the next century, rising sea levels and more intense storm activity associated with climate change will affect our coastal city and the region. Many neighborhoods bordering the waterfront already experience flooding and storm surges, and these events are expected to increase. This plan explores steps that can be taken to build long-term resilience.



## GOAL 1

Expand public access to the waterfront and waterways on public and private property for all New Yorkers and visitors alike.

# EXPAND PUBLIC ACCESS

## Esplanades that let us stroll by the water.

Parks with room to fly a kite. Piers where anglers can cast rods. Vistas of New York Harbor that open up from neighborhood streets. Publicly accessible spaces along the shoreline bring us into contact with the rivers, streams, inlets, and bays that border the city. And the places that make up this public waterfront offer infinite opportunities for recreation, sightseeing, events, and other activities that enrich the lives of people living in and visiting New York.

Public open spaces on the waterfront can transform neighborhoods, turning previously inaccessible lands into vibrant community gathering areas that foster economic growth. The creation of Hudson River Park, for example, turned the once-derelict shoreline on the west side of Manhattan into a world-class destination with a greenway, stunning views of the water, and a range of recreational offerings. The 150-acre park has sparked tremendous residential and commercial investment in adjoining neighborhoods, bringing foot traffic into stores and tax revenues to the city. Likewise, the new Brooklyn Bridge Park—which opened in 2010 and is Brooklyn’s most significant new park in more than 100 years—not only has benefited those who live nearby but has become a draw for tourists as well. Re-imagining waterfront areas for creative temporary and seasonal uses—such as the popular Water Taxi Beaches on Governor’s Island and in Lower Manhattan—has attracted people to previously under-visited parts of the waterfront all over the city. Evidence

abounds that adding exciting and well-designed destinations to the water’s edge will lure residents and tourists alike.

Nearly half of New York City’s 520-mile waterfront is now part of its open-space network, thanks to new public and private investments as well as effective waterfront zoning regulations. Today there are approximately 220 linear miles of waterfront devoted to shorefront public parks or public spaces on private property, with more than 20 linear miles of publicly accessible shorefront spaces being developed or planned on public property (see Figure 1, page 26).

Since 2002, the City has acquired 373 acres of waterfront land for parks. With this land the City has created new parks, such as West Harlem Piers Park in Manhattan and Barretto Point Park and Mill Pond Park in the Bronx. And it has advanced other significant open-space projects including Brooklyn Bridge Park, Governors Island, Freshkills Park on Staten Island, and Manhattan’s Harlem River Park Greenway and East River Esplanade South.

There are plans for the continued expansion of waterfront open space with additional parkland and publicly accessible areas created through private development. As the city’s waterfront access increases, it will be important to improve connections to and between public-access areas and maintain design excellence in public spaces. Accessible, well-designed public spaces on the shoreline will help more people experience all that New York City’s geography has to offer.

## IMPROVING CONNECTIVITY AND CONTINUITY

Although New York City has opened large portions of the waterfront to public enjoyment in recent decades with the creation of new parks and esplanades, there are still interruptions and barriers to public access within this network. While public access is not possible or desirable on every stretch of the waterfront, the City is committed to improving the connectivity of waterfront pathways and better connecting neighborhoods with the shore.

### Areas with Limited Access

The overall continuity of waterfront public access can be improved by targeting gaps in otherwise continuous stretches of public access. In redeveloping areas, some gaps in access will be addressed as individual properties undergo redevelopment for residential or commercial use, with public access required under zoning. In other areas, different solutions may be necessary. For example, on the east side of Manhattan there is near-continuous public access to the waterfront from lower Manhattan to 145th Street except for a significant gap between East 38th and 58th streets. Here, access to the waterfront is cut off by the FDR Drive and the United Nations Headquarters. There are challenges to establishing continuity of access in such areas, including the presence of existing buildings, roadways, or grade differences; the rights of private property owners; security concerns; regulatory limitations on building out over the water; and expense. Arriving at solutions to achieve connectivity under these conditions will require an assessment of practical alternatives and engagement with a range of stakeholders.

In other areas of the city, public access to the waterfront is limited by historic or current uses along the waterfront. In these areas, neighborhoods adjacent to the waterfront are physically and visually cut off from the shoreline and thus cannot enjoy what could be a valuable asset. For example, the neighborhoods along Staten

“For many New Yorkers, the waterways are their main connection to the natural world. We need to be able to get close enough to feel the strength and beauty and power of the water.”

—Lee Stuart, longtime community organizer in the Bronx



The UN Headquarters interrupts waterfront access.



Opaque fences block views on Staten Island's North Shore.

Island's North Shore are only across the road from the Kill Van Kull, a major strait of New York Harbor. Yet there are few ways for people to get to the waterfront. Industrial properties and vacant land border the shoreline, and opaque fences limit even getting a glimpse of the water. Elsewhere, major pieces of infrastructure or steep slopes create a seemingly impassable barrier between a neighborhood and the water. In the Brooklyn neighborhood of Spring Creek, for instance, the Shore Parkway cuts off access to Jamaica Bay from inland residential areas. And in the Bronx, steep slopes along the Hudson River and active rail lines prevent Riverdale residents from having direct access to the waterfront. By targeting such areas for improved waterfront access, the City will make dramatic progress in providing an opportunity for all New Yorkers to reach and enjoy the shoreline.

Sometimes waterfront access can be provided in conjunction with certain public facilities, helping neighborhoods where access is limited, and, at the same time, offering a rare look at crucial municipal services and functions. For instance, a new quarter-mile-long walkway alongside the Newtown Creek Wastewater Treatment Plant in Brooklyn gives visitors an up-close view of the waterway and the wastewater treatment plant. It also gives the public a chance to learn about water quality and the cultural and historical significance of the area.

Connections with public transportation are important to public access. Due to the historical development of the city's transportation infrastructure, few subway lines provide direct

access to the waterfront. In areas the subway doesn't reach, buses, pedestrian paths, and bicycle lanes can offer connections to the shore. Signage and other forms of wayfinding are important for promoting the use of waterfront public spaces and ensuring safe access for pedestrians, cyclists, and others.

In neighborhoods with limited access where there is a concentration of redevelopment sites, a Waterfront Access Plan (WAP) can be a useful tool. A WAP tailors the public-access requirements of waterfront zoning to the specific conditions of a particular area. Where redevelopment is expected to occur along a large, continuous waterfront area, a WAP can provide for coordinated planning and connectivity among adjacent sites. A WAP is able to address area-specific goals, such as identifying key locations for unobstructed views of the water that would best serve an upland community. The Department of City Planning has created five WAPs to date in conjunction with rezonings in Brooklyn, Queens, and the Bronx.

### Public Waterfront Access in Industrial Areas

In industrial waterfront areas, desires for public access must be balanced with the needs of industrial businesses as well as safety and security concerns. There are many port sites within the city where public access is restricted due to Homeland Security regulations. And even in areas where federal security requirements do not apply, business operations on private property are often not compatible with access for the

visiting public. However, in many areas of the city where industrial land cuts off upland communities from the water, limited public access can sometimes be provided at specific points where it does not infringe on the activity of the working waterfront. Locations within or adjacent to the seaward termination of public streets can provide opportunities for public access. Such locations have been transformed into public-access points at Barretto Point Park in Hunts Point in the Bronx; Grand Ferry Park in Williamsburg, Brooklyn; the end of Manhattan Avenue in Greenpoint, Brooklyn; and numerous street-end parks in the South Richmond neighborhood of Staten Island.

In areas where direct access is dangerous or not feasible for other reasons, access points on public overlooks can visually connect people to the waterfront. Maritime overlooks—such as the viewing platform at the Port Jersey-Port Authority Marine Terminal in Bayonne, NJ—allow the public to see the activity of the working waterfront without interfering in the operations of industrial businesses. Creating visual access at such sites, as well as visitor centers and tour programs, can educate the public about the ongoing activities and importance of the working waterfront. The Brooklyn Navy Yard, for instance, offers regular public tours of the industrial park and is constructing a new exhibition and visitors center to celebrate its past, present, and future.

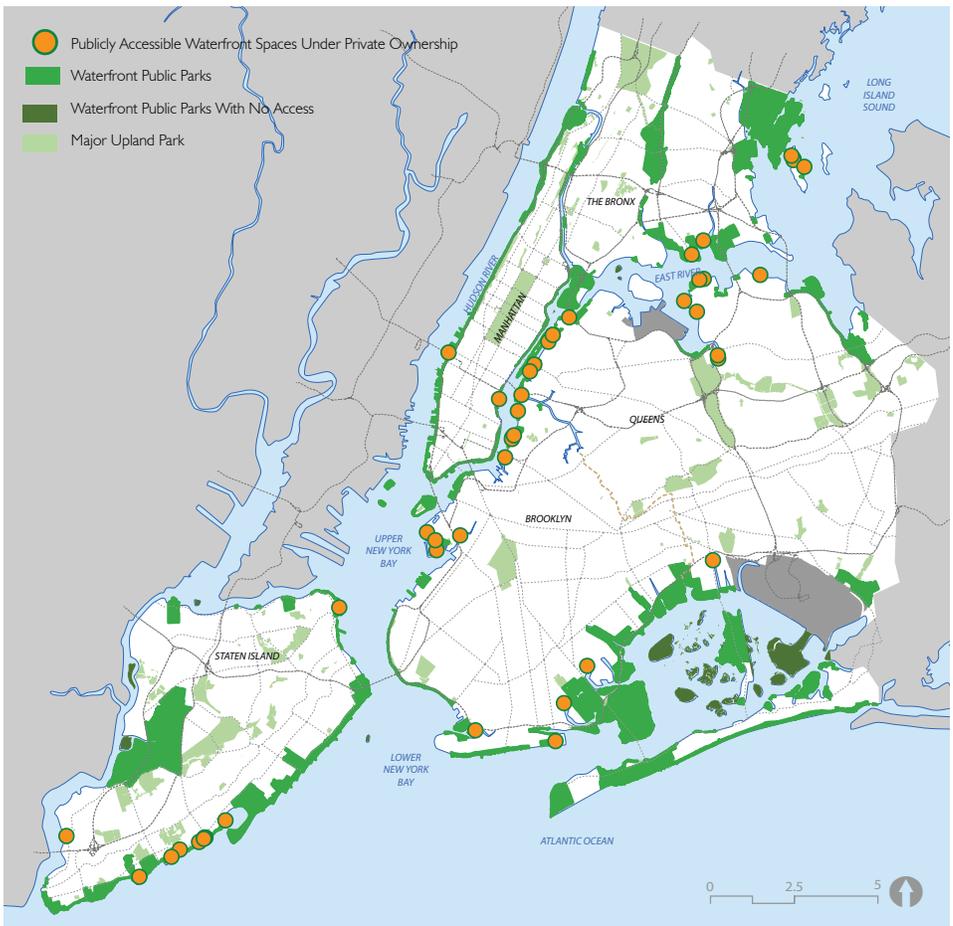


Figure 1: Publicly Accessible Waterfront Spaces on Public and Private Land.

### Public Access to the Water

As water quality has improved throughout New York Harbor, water recreation has become increasingly popular. As a result, people are calling for more ways to get out onto, and even into, the water itself.

There are, of course, many forms of water recreation, each with its own access requirements. For instance, motorized pleasure boats have very different requirements for landings and upland space than human-powered boats do. To ensure the safety of recreational users, efforts to increase access to the water must take into consideration water quality, currents, tides, and shipping channels. (Issues related to creating provisions for water recreation are discussed further in the section of *Vision 2020* devoted to the Blue Network, beginning on page 84.)

### Waterfront Greenways

Waterfront greenways connect people to the water's edge and provide for recreation and

movement along the shore. A greenway is a pathway for non-motorized transportation along natural and built linear spaces, such as rail and highway rights-of-way, parklands, esplanades, and, where necessary, city streets. Waterfront greenways provide a pleasant and safe means of accessing the waterfront for pedestrians, joggers, cyclists, in-line skaters, and others.

A greenway can also increase access to the waterfront by linking to waterfront access points in areas where continuous public access along the waterfront is not feasible, such as in industrial areas like Hunts Point in the South Bronx. The *South Bronx Greenway Plan*, developed by the New York City Economic Development Corporation, locates the greenway on the waterfront when possible, with the majority of the path placed farther inland to avoid incompatible uses or other barriers. Plans call for signs along the path to lead people to public-access points on the waterfront, linking the greenway with the shoreline and connecting waterfront spaces.

There are waterfront greenways in parts of

all the city's boroughs, but the full network is not yet completed. In 1993 the Department of City Planning released *A Greenway Plan for New York City*, which established a framework for building an ambitious 350-mile greenway system. Since this plan was first released, the waterfront greenway network has become substantially more robust (see Figure 2, page 28).

The construction of the Hudson River Park Greenway in the late 1990s, for instance, created an important link between northern and southern Manhattan. After the completion of a missing chunk between 83rd and 91st streets in 2010, this route now runs uninterrupted from Dyckman Street in Inwood to Battery Park in Lower Manhattan. The greenway has attracted as many as 7,000 cyclists in a day, making it one of the country's most heavily used bikeways.

Plans and initiatives are under way in each borough to expand the waterfront greenway network. The Brooklyn Waterfront Greenway, when completed, will be a 14-mile-long bicycle and pedestrian path stretching along the Brooklyn waterfront from Greenpoint to the Shore Parkway. It is envisioned as a path for both commuters and recreational users that will knit neighborhoods together and enhance access to the waterfront. The Brooklyn Greenway Initiative, a non-profit organization, was formed in 2004 to pursue the planning and funding for the project, and a wide range of community and civic groups and elected officials have been engaged in this effort. Building on the work of these groups and individuals, the New York City Department of Transportation has constructed substantial portions of the greenway. In 2008, a section of the route opened south of Atlantic Avenue along Columbia Street. The following year, a new two-way bike path on Kent Avenue in Williamsburg opened. And in the summer of 2010, the Flushing Avenue bike path was completed, providing a link between Kent Avenue and downtown Brooklyn. The Department of Transportation is currently conducting a master-planning process to determine a route for the final sections of the path and identify gaps in the network to target.

## ENSURING HIGH-QUALITY OPEN SPACES

As New York continues to expand its inventory of publicly accessible open space at the water's edge, it is critical to ensure the design quality of these spaces. The city with the most diverse population in the world has an equally diverse waterfront—520 miles of shoreline encompassing densely populated neighborhoods as well as wetlands, beaches, esplanades, and piers. Each portion of the waterfront demands design that reflects its own distinctive landscape and character.

The City of New York has developed an extensive waterfront design vocabulary. This is due to the experience of the Department of Parks & Recreation and the Economic Development Corporation in constructing waterfront open spaces, and of the Department of City Planning in administering design standards for privately developed waterfront access areas. This design vocabulary guides not only the physical look and feel of waterfront spaces but also shapes programming and amenities and addresses environmental priorities (see “Design Principles for Waterfront Public Spaces,” left).

The City's groundbreaking waterfront zoning regulations, outlined in the 1992 *Comprehensive Waterfront Plan* and enacted in 1993, require the provision of publicly accessible open space when waterfront properties are redeveloped for most residential or commercial uses. The new spaces created in conjunction with private development—a shore walkway and connections to the adjacent neighborhood—generally provide for passive recreation. Since 1992, public access has been provided on 12 privately owned sites throughout the city, with another six projects under construction, and 16 more approved or planned.

In 2009, the Department of City Planning completed an award-winning zoning text amendment that improved and refined the waterfront public open space design standards. These changes created rules that provide for a variety of seating and shade features. They also incorporated high-performance environmental elements such as increased planting and permeable paving materials.

Public parks created on City-owned property can provide for a more varied and extensive set of experiences. Waterfront parks range from small street-end parks to regional parks



Pier 15, now under construction at East River Esplanade South in Lower Manhattan. Rendering by SHoP Architects.

### Design Principles for Waterfront Public Spaces

The following principles are intended to guide the development of publicly accessible waterfront open spaces. Design measures reflecting these principles should be incorporated where appropriate and to the extent possible.

#### Access:

- Provide opportunities for the public to get to the water's edge.
- Make open spaces and upland connections inviting—entrances to open spaces in particular should clearly convey that the public is welcome.
- Vary the relationship between walkways and the waterfront edge, especially in areas where plantings can be installed next to the water.
- Connect shoreline path systems.

#### Amenities:

- Provide a sufficient quantity and variety of seating, including seating with backs and armrests, as well as companion spaces for those using wheelchairs or similar devices.
- Offer amenities and activities appropriate to the neighborhood and context.
- Install lighting that does not create excessive glare.
- Employ fences and sea rails that are as transparent as possible; avoid placing top rails at the eye level of those seated.
- Provide views of the water from lawn areas, unobstructed by benches or trees.
- Consider a varied landscape design vocabulary, including edge treatments, as appropriate to the program, site, and context.
- Incorporate or reference significant historic features or natural conditions associated with the site.
- Comply with City policies that discourage the use of tropical hard woods; encourage the use of sustainable and renewable materials.
- Provide both sunny and shaded spaces.

#### Environment:

- Promote the greening of the waterfront with a variety of plant material, including shrubs and groundcover, for aesthetic and ecological benefit.
- Use water- and salt-tolerant plantings in areas subject to flooding and salt spray.
- Maximize water-absorption functions of planted areas.
- Preserve and enhance natural shoreline edges.
- Design shoreline edges that foster a rich marine habitat.
- Design sites that anticipate the effects of climate change, such as sea level rise and storm surges.

#### Water Access:

- Provide connections between land and water, including opportunities for water recreation where appropriate.
- Provide water-dependent and water-enhancing uses at the water's edge such as fishing sites, boat launches, and get downs to the water.
- In the design of the spaces, encourage the experience of the land from the water and the water from the land. Treat the edge as a zone of exchange, not separation.
- Encourage dock construction and tie-up space for recreational, educational, or commercial vessels, as appropriate to the context, on piers, platforms, and bulkheaded shorelines. Provide ladders or other means of safely accessing the water or watercraft on such sites.

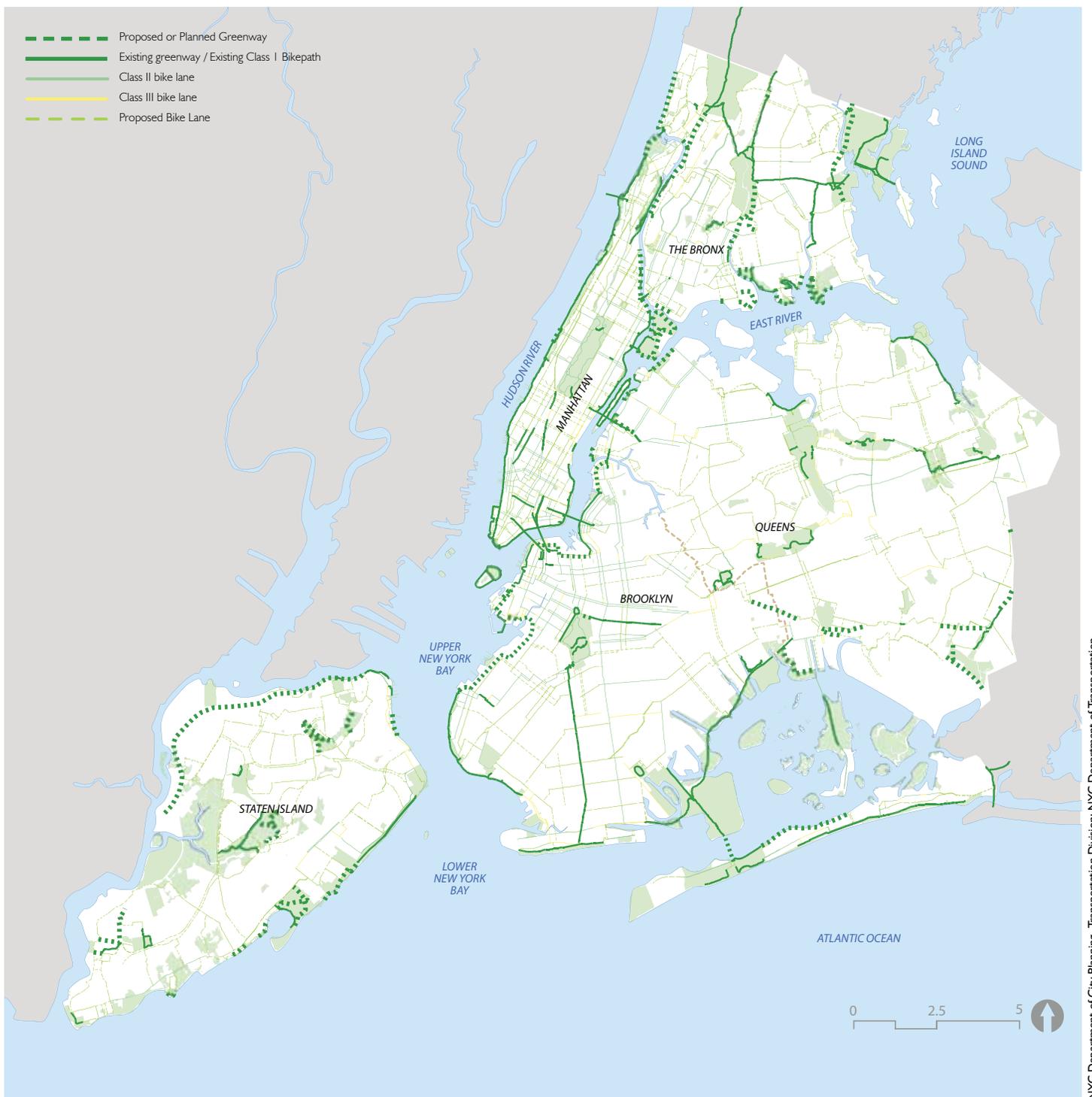


Figure 2: Existing and Proposed or Planned Greenways in New York City.

rich in amenities. The Department of Parks & Recreation (DPR) has just released new high-performance guidelines describing best practices for planning, design, construction, and maintenance of city parks. These new guidelines, created in keeping with *PlaNYC*, will promote design for the 21st century, seeking not only to

meet the recreational needs of the more than 9 million people who are expected to live in New York City by the year 2030, but also increase climate resilience and environmental benefits. The new guidelines emphasize the importance of sustainable landscapes and ecological services, and the need for increasingly versatile, acces-

sible sites. DPR expects the implementation of these guidelines to improve every park project and, ultimately, every New Yorker's quality of life.



Hudson River Park Trust

The Hudson River Park Greenway in Manhattan is one of the country's most popular bikeways.

## FUNDING PARKS AND PUBLIC ACCESS

The establishment of public parks and open space on the waterfront requires not only the availability of land but also funding for open-space improvements and ongoing maintenance and operation. Securing funding is one of the largest hurdles that the public waterfront faces today.

Public funding for all parks is difficult to secure due to pressures on government budgets, and waterfront parks often carry additional costs. The capital costs of developing waterfront parks can often be significant due to the high cost of acquiring waterfront land, constructing extensive infrastructure such as bulkheads and docks, and remediating sites that are contaminated. Managing waterfront parks can cost more on a per-acre basis than other parks. Management costs include non-recurring maintenance costs (which are the major repairs and replacement of capital items such as docks, bulkheads, benches, railing, lighting, and pavement) and recurring maintenance costs (including non-capital items such as cleaning, landscaping, utili-

ties, and insurance). The cost of management also encompasses administrative costs, such as personnel salaries and related supplies; security costs; and programming costs.

### Sources of Funding

Funding for parks and open space typically comes from public sources, private sources, or, often, a combination of both. Public sources, including city, state, and federal programs, are all limited by budget constraints, particularly during the current economic recession. As a result, there is a need to explore alternative funding sources for parks, and to establish mechanisms to enable parks to pay for themselves.

In New York City, public financing of park construction and maintenance often involves the coordination of multiple city agencies, including the Department of Parks & Recreation, the Department of Transportation, and the Economic Development Corporation. State funding sources include matching grants from the New York State Environmental Protection Fund, and the state is also directly involved in the ownership and maintenance of specific parks in New York City through the New York

State Office of Parks, Recreation and Historic Preservation, though funding for both programs has been substantially reduced as a result of the recession. The U.S. National Park Service manages 10 national parks within New York Harbor, including Gateway National Recreation Area. Some federal funding for acquisition of open space for parks or development of outdoor recreation facilities has been available through the Land and Water Conservation Fund, though the fund relies on federal congressional appropriations and has never been fully funded for the \$900 million annually for which it was initially authorized. Despite funding challenges, the City is unwavering in its commitment to creating great public spaces on the waterfront and is bringing those spaces about in a variety of ways.

### New Public Access Achieved Through Private Development

New York City's waterfront zoning regulations created a mechanism to leverage private investment for the construction and maintenance of publicly accessible waterfront spaces. The zoning rules require that developers of residential



Figure 3: Greenpoint-Williamsburg Waterfront Access Plan

and commercial properties build and maintain specified public-access areas, with construction of the open spaces completed before the residential or commercial buildings may be occupied. In addition, municipal and state agencies have the ability to enter into agreements with waterfront property owners that require private landowners to maintain publicly accessible spaces on private properties; restrictive declarations attached to the properties ensure these provisions are met. In other situations, public spaces are built by private developers, who then transfer ownership to the City of New York, with the developer providing private funds for the maintenance of the space. This places liability with the City and allows public oversight of the operation of open spaces, relieving the private property owner of this responsibility.

This innovative technique of using private resources to create publicly owned and managed public spaces was used in Greenpoint and Williamsburg, Brooklyn, as a result of the 2005 Greenpoint-Williamsburg Waterfront Access Plan (see Figure 3) and rezoning. The public waterfront spaces at Northside Piers and Williamsburg Edge, two residential developments on Kent Avenue in Williamsburg, have been built in accordance with these new regulations. The public spaces—which include a walkway, seating areas, pier access, and a variety of planted areas—were built by the developers of the properties in phases, in conjunction with the construction of residential buildings, but once the open spaces were completed, title was transferred to the City of New York.

In 2009 zoning text amendments extended this technique beyond Greenpoint-Williamsburg. With the consent of the Department of Parks & Recreation, other locations around New York City will be able to utilize this public-private partnership model to create new public spaces.

## Revenue for Park Maintenance and Improvement

Funding for the maintenance and upkeep of parks can be provided by revenue generated through developments and other activities within and adjacent to open space. In Manhattan's Battery Park City, funds for park maintenance and operations are generated by development on public property. The Battery Park City Parks Conservancy, a non-profit organization charged with operating the 36 acres of open space within Battery Park City—all of

it protected, mapped parkland—is funded primarily by residents of Battery Park City, the developers, and the Battery Park City Authority, the public benefit corporation that manages the entire site. Hudson River Park, on the other hand, is owned and operated by the Hudson River Park Trust, a non-profit public benefit corporation. Three commercial nodes within the park were created to fund park development and maintenance.

In some instances, special assessment districts could fund waterfront park maintenance and operations. Bryant Park, though not on the waterfront, could provide a model for the use of a special assessment district for a waterfront park. Bryant Park is a public park operated by the Bryant Park Corporation, a private not-for-profit Business Improvement District (BID) funded by assessments levied on property owners in the immediate vicinity. The corporation raised funds for capital improvements to the park in the 1980s and is credited with transforming what was once a dangerous place into a lively amenity for the midtown area. The BID is responsible for all aspects of park maintenance and manages income-generating activities such as events and restaurant concessions.

Another means of leveraging private financial resources for parks and open space is the licensing of land within or adjacent to a park to a private entity. For instance, a nonprofit organization could propose licensing parkland to provide recreational activities.

Other sources of revenue for parks, including waterfront parks, include concessions, generally for food service and recreation, and private donations from individuals and foundations.

While private revenue can provide resources for parks and open space, there are issues that need to be considered. Funding park maintenance through dedicated funding from nearby developers, property owners, and tenants can potentially create inequities in park upkeep if the outcome is that parks in high-rent neighborhoods receive sufficient funding while parks in lower-income communities do not. There are also concerns related to the perceived privatization of public space. Management by a private entity or too much commercial activity within a park may not only limit actual public access to the space, it may also create the impression that the space is not open and welcoming to all members of the public.

The 1992 *Comprehensive Waterfront Plan*



South Cove, one of the public spaces in Battery Park City, Manhattan.

identified ways to open up New York City's waterfront. The next step is to create a more connected, well-designed waterfront. Planning for public access must recognize the particular opportunities and challenges that exist in each area along the shoreline. Waterfront areas can incorporate a mix of publicly and privately owned open spaces, all of which are inviting to the public. These areas can provide for different types of active and passive recreation that appeal to a diverse range of people. With sound planning and high-quality design, these spaces can provide linkages to adjacent communities and a variety of experiences—natural, active, eye-opening, contemplative, surprising.

# Expand Public Access: Strategies and Projects

This plan envisions a waterfront in 2020 that is inviting and accessible for New Yorkers and visitors alike. Nearly half of New York City's waterfront is already part of its network of open space, but work remains to be done to expand and improve public access.

To realize this goal, the City will pursue the following set of strategies over the next 10 years. The City will promote the creation of public spaces on the waterfront and ensure that

these spaces are seamlessly integrated into the life of the city. The City will also seek to improve the quality of public spaces and address the challenges of funding the creation and maintenance of these spaces.

*Vision 2020's* 10-year strategies are complemented by the *New York City Waterfront Action Agenda*, a set of projects chosen for their ability to catalyze investment in waterfront enhancement. The City commits to initiating these

projects over the next three years and will be tracking progress on an ongoing basis. For each project, the lead agency and implementation year are noted.

Together, these strategies and projects lay out a comprehensive vision for the waterfront and waterways and a plan of action to achieve that vision.

## 1. Create new publicly accessible waterfront spaces.

### VISION 2020 STRATEGIES

- Work to expand public access to the waterfront in neighborhoods with significant barriers to access.
- Assess opportunities for visual or public access on all waterfront developments where feasible such as view corridors, point access, or walkways.
- Establish street-end parks and public spaces where feasible and appropriate, with consideration for views, natural areas, multi-purpose docks, stormwater management, and interpretive signage to educate the public about marine natural resources, historic sites and uses, and the maritime industry.
- Prepare Waterfront Access Plans where appropriate to coordinate public access to the waterfront across and from multiple sites where redevelopment is planned.

### ACTION AGENDA PROJECTS

- Develop or acquire more than 50 acres of new waterfront parks by investing \$30 million (full list of projects on facing page).

## 2. Create a more connected waterfront.

### VISION 2020 STRATEGIES

- Establish criteria for providing more public access to the waterfront including routes to public waterfront sites for mass transit, car, foot, bicycle, and boat.
- Seek to extend borough-wide waterfront greenways in all five boroughs wherever feasible. Explore opportunities and means of creating a larger setback from the water's edge for waterfront development to facilitate the creation of a greenway where connectivity to other portions of the greenway is possible. Where appropriate, explore opportunities for the greenway route to celebrate maritime and other water-dependent uses while recognizing the safety, security, and operational needs of some waterfront properties.
- Improve wayfinding from upland areas to waterfront public spaces and from one waterfront public space to another. Consider establishing a citywide waterfront signage program to make wayfinding easier and more consistent throughout the city to direct the public to waterfront parks, commercial waterfront attractions, ferry terminals, areas suitable for fishing, public piers, docks and launch sites, and greenways.
- Consider appropriate alternatives to the zoning requirement for opaque fences around open industrial uses, to facilitate public views of the waterfront. Examine opportunities to preserve or create panoramic water views from public spaces.
- Evaluate the use of "marginal streets" at the waterfront and reassess vehicular use of these streets.
- Promote New York City beaches as destinations for New Yorkers and visitors and encourage access by public transportation.

### ACTION AGENDA PROJECTS

- Develop waterfront greenways and esplanades by investing more than \$120 million (full list of projects on facing page).

### 3. Ensure public open spaces are high quality, support diverse uses, and are well-funded.

#### VISION 2020 STRATEGIES

- Publicly accessible waterfront open spaces that are constructed by City agencies should follow the Design Principles for Waterfront Public Spaces (described on page 27) to the extent practical.
- Provide opportunities on the waterfront for a wide range of activities from quiet contemplation to active recreation.
- Improve inspection, maintenance, and operations funding for the public waterfront. To support the high maintenance costs of waterfront public spaces, explore potential revenue sources such as the incorporation of revenue-generating uses or other innovative mechanisms.

#### ACTION AGENDA PROJECTS

- Expand or improve existing waterfront parks by investing more than \$200 million (full list of projects below).

#### Waterfront Action Agenda Projects to Expand Public Access

Develop or acquire more than 50 acres of new waterfront parks by investing \$30 million:

- Throgs Neck, the Bronx: Complete new 9.5 acre Ferry Point Park. (DPR, 2013)
- Williamsburg, Brooklyn: Continue the phased acquisition, remediation, and development of the new Bushwick Inlet Park. (DPR, 2013)
- DUMBO, Brooklyn: Re-open the 5.3-acre Empire Fulton Ferry Park with "Jane's Carousel" installed in new all-weather pavilion, and improve landscaping and public amenities. (BBP, 2011)
- Greenpoint, Brooklyn: Construct 1.5-acre Transmitter Park, including a playground, small pier, benches, and trees. (EDC, 2012)
- Sunset Park, Brooklyn: Complete ball-field, multi-use path, comfort station, and landscaping of 22-acre Bush Terminal Piers Park. (EDC, 2012)
- Long Island City, Queens: Complete construction of a new 5-acre waterfront park at Hunter's Point South, featuring a dog run, comfort stations, concession, playground, basketball courts, green stormwater infrastructure, and public ferry access. (EDC, 2013)
- Freshkills, Staten Island: Develop the first public access areas overlooking Main Creek. (DPR, 2013)

Develop waterfront greenways and esplanades by investing more than \$120 million:

- South Bronx: Complete improvements to the South Bronx Greenway. (EDC, 2012)
- Complete Bronx River Greenway improvements. (DPR, 2013)
- Brooklyn Bridge Park, Brooklyn: Develop Brooklyn Bridge Park Greenway, linking the Columbia Street Greenway to DUMBO. (DOT/BBP, 2012)
- Brooklyn Navy Yard, Brooklyn: Complete redesign of Flushing Avenue between Williamsburg Street West and Navy Street. (DOT, 2013)
- Red Hook, Brooklyn: Build a multi-use path to connect Atlantic Basin to the Brooklyn Waterfront Greenway. (DOT, 2011)
- Sunset Park, Brooklyn: Complete study of bicycle and pedestrian connection from Hamilton Avenue Bridge to 2nd Avenue and Sunset Park path. (DOT, 2011)
- Release *Brooklyn Waterfront Greenway Master Plan*, guiding creation of a 14-mile, multi-use waterfront path between Newtown Creek and the Shore Parkway Greenway. (DOT, 2011)
- Lower Manhattan: Complete construction of 8.5 acres of East River Esplanade South between Battery Maritime Building and Pier 35, including Pier 15, to feature water uses, educational uses, and café. (EDC, 2012)
- Randall's Island, Manhattan: Complete waterfront pathways, including the Bronx shore pathway, comfort stations, and seawall repairs. (EDC, 2013)
- Sherman Creek, Manhattan: Complete the Sherman Creek Waterfront Esplanade Master Plan to reclaim the Harlem River waterfront from Sherman Creek Inlet to W. 208th St. (EDC, 2011)
- Washington Heights, Manhattan: Restore the High Bridge over the Harlem River, and restore access paths within Highbridge Park to improve connectivity between Northern Manhattan and the Bronx. (DPR, 2011)
- Complete Manhattan Waterfront Greenway improvements, including Battery Bikeway, Dyckman Ramp, and a segment of the Lighthouse Link. (DPR, 2013)
- Freshkills, Staten Island: Construct portions of the new greenway. (DPR, 2013)
- Stapleton, Staten Island: Begin construction of 6-acre waterfront esplanade. (EDC, 2011)

Expand and improve existing waterfront parks by investing more than \$200 million:

- Orchard Beach, the Bronx: Replenish with clean sand, and expand the South Jetty to reduce further beach erosion. (DPR, 2011)
- Soundview Park, the Bronx: Reconstruct playground and athletic courts and build a new comfort station. (DPR, 2013)
- Brooklyn Bridge Park, Brooklyn: Complete improvements, including Squibb Park pedestrian bridge, upland recreation areas between Piers 1-6, and active recreation on Pier 5. (BBP, 2013)
- Governors Island, Manhattan: Commence parkland and open space development, including restoration of historic open spaces and improvements to all gateway dock facilities. (TGI, 2012)
- Coney Island, Brooklyn: Complete new 2.2-acre Steeplechase Plaza, including performance space, public art, water features, and retail. (EDC, 2012)
- Fort Washington Park, Manhattan: Construct pedestrian bridge and a multi-use path. (DPR, 2013)
- Hudson River Park, Manhattan: Construct an upland esplanade in Tribeca, reconstruct the bulkhead between 39th and 43rd streets, and reconstruct Pier 97 at 57th Street. (HRPT, 2013)
- Long Island City, Queens: Complete design and reconstruction of the public-access pier at 44th Drive in the Anable Basin. (DCAS, 2013)
- Rockaway Beach Park, Queens: Construct new sports field, athletic courts, playgrounds, skate park, picnic area, performance space, lawns, and landscaping. (DPR, 2013)
- Ocean Breeze Park, Staten Island: Complete new regional athletic facility and indoor horseback-riding arena. (DPR, 2013)



## GOAL 2

Enliven the waterfront with a range of attractive uses integrated with adjacent upland communities.

# ENLIVEN THE WATERFRONT

By 2020 New York City's population is expected to reach 8.7 million, and by 2030 it will hit 9.1 million. People of all income levels will need places to live. They will need places to work and shop. And they will need places to gather with their neighbors. Development on the waterfront can help meet the housing demand for a growing population as well as provide jobs, generate tax revenue, and offer crucial services for New Yorkers.

Experience over the past two decades has shown that the waterfront is a tremendously attractive setting for residential development. Housing on the shoreline satisfies the deep human desire to be on the water and offers the chance to have bracing views of ships and shorebirds and glittering water. Waterfront development sites have proven so alluring that builders have gone to the extra expense of cleaning up contamination by past industry, building infrastructure, and providing public access and affordable housing.

Development on the shoreline can benefit not only those who live, work, and shop on the waterfront. By providing new publicly accessible areas for recreation and relaxation, waterfront development can serve upland areas, too. Opening up neighborhoods to the waterways—the city's largest contiguous open space—will make New York more livable and attractive, enhancing quality of life for everyone. Drawing people to the water will heighten awareness of the Blue Network and the historic sites on the city's shoreline.

Much of the waterfront, of course, is already occupied. Large portions of the waterfront are currently zoned for residential use; parks, airports, and Significant Maritime and Industrial

Areas take up other considerable stretches of shoreline (see Figure 1, page 37).

But vacant and underutilized land remains. In many cases, zoning or other land-use changes will be required before those areas can be developed. Contamination from past industry will need to be remediated in some places, and infrastructure built. But these challenges can be overcome. A shoreline enlivened with a range of productive, publicly accessible uses will help New York grow and prosper and become an even more exciting place than it is today.

## DEVELOPMENT OPPORTUNITIES

Today the sites on the New York City waterfront that present opportunities for commercial, housing, or mixed-use development vary widely in size and potential. Some are historic structures that could be used for small-scale commercial, cultural, or educational uses—such as Pier A on the Battery in Lower Manhattan. Others are larger areas with several vacant sites that could provide mixed-income housing and community facilities in conjunction with open space—Sherman Creek in Northern Manhattan, for example. There are publicly owned sites, such as the one south of the 138th St. Bridge in the South Bronx, which could be redeveloped with residential or commercial uses, creating a new destination on the Harlem River. There are also privately owned sites with redevelopment potential, such as Anable Basin in West Queens, which could enhance recreational access to the water and provide housing. Sites for non-residential development near industrial areas could be developed with a mix of commercial and

light industrial uses, bringing new investment to neglected waterfront areas, such as the North Shore of Staten Island (for a complete inventory of current waterfront redevelopment sites, see Appendix C, starting on page 175).

An area that has undergone redevelopment in recent years but still presents opportunities is Greenpoint in Brooklyn. The 2005 *Greenpoint-Williamsburg Land Use and Waterfront Plan* opened up approximately two miles of waterfront for mixed-use and residential development, including affordable housing, and as many as 50 acres of open space. Development of the southern portion of the rezoned waterfront in Williamsburg is already near completion with Williamsburg Edge (1,200 units), Northside Piers (900 units), and 184 Kent (340 units). Waterfront sites in Greenpoint, such as Greenpoint Terminal Market, remain to be developed. These rezoned sites will provide for thousands of units of mixed-income housing, bringing new activity to this waterfront area and giving Greenpoint residents access to the East River and connections to new and expanded public space at Transmitter Park and Newtown Barge Park.

While waterfront development has proven remarkably robust in the past 18 years, sites come with specific challenges and considerations. These include the need to provide new infrastructure, to remediate contamination from past industrial use, and to preserve historic buildings and structures.

## IMPROVING INFRASTRUCTURE CAPACITY

On some parts of New York's shoreline, water and sewer infrastructure may be needed to accommodate new development. The sewer system is already operating near capacity in some areas. While new residential or commercial development often reduces the rate of stormwater runoff from what were once paved industrial sites, such development can lead to increased flows of sanitary sewage. When this occurs in a combined sewer system, it reduces capacity for stormwater in that system, and if capacity is exceeded during wet weather, street

“The waterfront can be an important means of housing the million plus residents coming to New York by 2030. But in creating that housing, and the commercial activity that goes with it, we need to make sure that development benefits upland neighbors as well as those who live and work on the water.”

—Rob Pirani, Vice President for Environmental Programs, Regional Plan Association



Figure 1: Shoreline Zoning (within 2,000 feet of the water). Residential zoning is dominant, but significant portions of the waterfront are also devoted to parks, airports, and industrial uses.

flooding, sewer back-ups, and the release of pollutants into surrounding waterbodies may occur.

The City continues to invest in expanding the capacity of the water supply and sewer systems, including in areas where new development is occurring. The Department of Environmental Protection recently enacted new procedural safeguards to ensure that development in growth areas can proceed only when sufficient sewer capacity is demonstrated.

In addition, in many areas performance of the combined sewer system can be improved through sustainable stormwater management strategies that help to regulate the flow of stormwater into the system. As described in *PlaNYC* and the *NYC Green Infrastructure Plan*, a network of source controls has the potential to significantly reduce pollution through incremental investments made over the next 20 years and

beyond. Promising best management practices include blue and green roofs to retain stormwater; underground water storage systems that allow infiltration and slow the release of stormwater to the sewer system, road alterations that let runoff soak into the ground, and rain barrels that store water in warm weather. Incorporating these and other stormwater-management techniques in new developments, as well as existing sites where feasible, can reduce flows into the sewer system. To help reduce stormwater runoff, the Department of City Planning recently expanded requirements for planting and permeable surfaces in waterfront developments, commercial parking lots, and front yards.

## REMIEDIATING CONTAMINATED SITES

*PlaNYC* estimated that New York City has 7,600 acres of brownfields—vacant or underutilized sites where redevelopment is impeded due to the presence, or perceived presence, of contamination by hazardous materials.

In New York City, contaminants are commonly found on properties with a history of heavy industrial use. Since industry often located on the shore, many brownfields are on waterfront sites. Properties with a history of landfill—and much of the city’s current land area is actually landfill, built up over time from low-lying marshland, or created in the waterways—might be suspected of contamination.

Brownfields can remain underutilized or abandoned for years or decades, in part because of the significant potential for liability and financial risk for brownfield property owners and financiers. There is of course the substantial cost of site remediation and ensuring that the public or workers on the site are not exposed to contaminants and that contaminants are not released through site disturbance. Nevertheless, it is possible to surmount these obstacles when the value offered by new uses is sufficient to provide incentive for investment. With the city’s strong economy of recent decades, public and private real-estate investment, with government brownfield assistance, has yielded substantial cleanup and reinvestment.

City, state, and federal governments have developed numerous programs to encourage responsible brownfield cleanup and redevelopment. On the City level, all 11 major brownfield initiatives proposed in *PlaNYC* were enacted through the passage of Local Law 27 of 2009, known as the New York City Brownfield and Community Revitalization Act. One such initiative, the New York City Local Brownfield Cleanup Program (NYC BCP), is the first environmental remediation program in the nation to provide municipal oversight of brownfield cleanups. The Brownfield Incentive Grant (BIG) Program provides an easy and flexible way to reduce the cost of brownfield redevelopment through grants that assist property owners through the development process. The BIG Program offers funding for more than 100 environmental and land-development services, reducing the cost of brownfield cleanup and making redevelopment of brownfield sites more



The Greenpoint Terminal Market site on the Brooklyn waterfront.

competitive with development on clean sites. The Mayor's Office of Environmental Remediation is currently developing a Green Property Certification Program to provide certification that a former brownfield site has been cleaned up. Certification will be awarded to properties that complete the NYC BCP or the equivalent program on the state level.

New York State's environmental remediation efforts include the Brownfield Cleanup Program (BCP). This program, which is intended to enhance private-sector cleanup of brownfields, addresses contaminants including hazardous waste and petroleum and provides liability relief and tax credits for cleanup and redevelopment. A BCP Certificate of Completion provides liability protection and allows site redevelopment. The state's Brownfield Opportunity Areas (BOA) Program helps municipalities and community-based organizations address local brownfields by providing assistance with land-use planning, site assessment, and environmental and economic analyses for strategic parcels. New York City is home to 17 BOAs, including 13 in waterfront communities.

## UTILIZING HISTORIC PROPERTIES

Waterfront areas are home to many historic structures and archaeological sites connected to various threads of New York's history. Ward's Point, on the southern tip of Staten Island, was a base camp frequented by American Indians until the 18th century. In Lower Manhattan, the South Street Seaport Historic District commemorates the original port of New York City. Fort Wadsworth on Staten Island is a fortified battery from the 18th century. And the Brooklyn Clay Retort and Fire Brick Works in Red Hook dates from the mid-19th century and is one of the earliest manufacturing structures in the area.

Such sites promote an understanding of New York's history and provide a sense of identity and uniqueness of place. Protecting these resources safeguards the city's historical, aesthetic, and cultural heritage for the benefit of current and future residents and visitors. Preservation can also have economic benefits, improving property values and enhancing New York's attractiveness for tourism.

These historic assets need to be accounted for in redevelopment plans. There are a variety of ways to approach these waterfront resources, including historic designation, heritage tourism, and adaptive re-use.

### Historic Designation

In New York City, historic preservation mechanisms include protection as New York City landmarks or listing on the state or national historic registers. The New York City Landmarks Preservation Commission (LPC) is charged with identifying and designating the city's landmarks and historic districts, and regulating any changes to designated structures. There are nearly 500 New York City landmarks and about 30 historic districts on or near the waterfront. To be eligible for landmark designation, the building, property, or object must be at least 30 years old and possess special character or special historical or aesthetic interest or value as part of the development, heritage, or cultural characteristics of the city, state, or nation. The city's landmarks range from parks to bridges, dry docks to water towers. An historic district

is an area that represents at least one period or style of architecture typical of one or more aspects of the city's history, giving it a distinct sense of place. Landmark or historic district designation limits the ability of an owner to alter or demolish significant buildings, and subjects such buildings to an additional review by the LPC.

The New York City Waterfront Revitalization Program (WRP), which reviews all discretionary actions by city, state, or federal government entities within the city's coastal zone, takes into consideration protection of historic resources. Policy 10 of the WRP is "to protect, preserve, and enhance resources significant to the historical, archaeological, and cultural legacy of the New York City coastal area."

The state and national registers are the official lists of buildings, structures, districts, objects, and sites significant in the history, architecture, archaeology, engineering, and culture of New York and the nation. Registered properties and properties determined eligible for the registers receive a measure of protection from the effects of projects that are sponsored, licensed, or assisted by the state or federal governments through a notice, review, and consultation process. Listing also makes properties eligible for federal and state tax credits for historic rehabilitation, but it does not place any restrictions on private owners of properties.

## Heritage Tourism

Historic resources on or the near the water's edge can be protected, maintained, and promoted as heritage tourism sites, further enlivening New York's waterfront and showcasing its maritime past. Historic districts like Governors Island and the South Street Seaport not only celebrate the city's past, they also provide a venue for contemporary events and programs. These sites and events draw tourists as well as residents, bolstering the tourism industry.

Historic vessels are another way to promote understanding of New York's maritime heritage. Today historic ships throughout the city and neighboring areas offer educational programming and public events. Despite the success of these programs, they face many challenges such as permitting and insurance difficulties. In addition, historic ships have specific docking needs that are hard to meet.

## Adaptive Reuse

Adaptive reuse is another strategy to promote preservation of historic waterfront structures.

Many of these structures were built to accommodate uses or perform functions that are no longer relevant. Nineteenth-century industrial buildings, for example, are ill-suited to the needs of today's working waterfront. However, such historic resources can be adapted for contemporary uses with alterations that modify buildings while retaining their essential historic features or character. For example, at the Brooklyn Army Terminal—designed by Cass Gilbert, built in 1918, and now on the National Register—substantial but architecturally sensitive renovations have enabled the complex to house small-scale light manufacturers and back-office tenants as well as the new BioBAT bioscience development center.

Even where new uses differ dramatically from historic uses, the redevelopment of historic sites often presents a chance to display and interpret that site's history for the public. Along the waterfront, there are historic features or pieces of infrastructure that can be preserved and incorporated into the design of new spaces.

This has been done successfully throughout the city, such as at the Gantry Pier at IKEA Waterfront Plaza in Red Hook, Brooklyn, where cranes and piers were retained and industrial artifacts displayed in publicly accessible areas accompanied by commemorative plaques.



The Clipper City Tall Ship, just off Sunset Park. In the background: the 1918 Brooklyn Army Terminal.

Bernard Eite for the Metropolitan Waterfront Alliance

# Enliven the Waterfront: Strategies and Projects

This plan envisions a waterfront in 2020 that is further enlivened through the redevelopment of waterfront sites with a range of attractive uses and high-quality public spaces. In addition to providing housing and jobs for people of diverse income levels, these developments will draw people from upland neighborhoods and beyond to the water's edge.

To realize this goal, the City will pursue the following set of strategies over the next

10 years. These strategies will continue efforts to promote the redevelopment of waterfront properties, where appropriate, while addressing the challenges these developments may face, such as infrastructure capacity, the presence of contaminants, and the need to preserve significant historic buildings and structures.

*Vision 2020's* 10-year strategies are complemented by the *New York City Waterfront Action Agenda*, a set of projects chosen for their ability

to catalyze investment in waterfront enhancement. The City commits to initiating these projects over the next three years and will be tracking progress on an ongoing basis. For each project, the lead agency and implementation year are noted.

Together, these strategies and projects lay out a comprehensive vision for the waterfront and waterways and a plan of action to achieve that vision.

## 1. Spur reinvestment in the waterfront.

### VISION 2020 STRATEGIES

- Continue to identify opportunities for redevelopment for a range of uses to make productive use of waterfront land.
- Create a waterfront where the city's needs for new housing and jobs for people of diverse income levels are satisfied in attractive and safe surroundings.
- Consider locations appropriate for allowing a wider range of uses on certain properties to spur reinvestment in underutilized waterfront sites and infrastructure.
- Encourage the integration of water-dependent and water-enhancing uses within developments on the waterfront.
- Seek partnerships to examine the relationship between waterfront investment and upland economic impact. This research may include examining how small waterfront businesses such as vendors, recreational rental services, restaurants, and retailers spur reinvestment in upland and adjacent waterfront areas.
- Encourage a mix of uses, as appropriate, to activate public waterfront spaces, such as temporary programming (movie screenings, craft fairs, etc.) of publicly owned waterfront parking lots and other under-utilized sites during off-peak times.

### ACTION AGENDA PROJECTS

- Catalyze more than \$150 million in public and private investment in waterfront development projects (listed on facing page).
- Conduct educational programming for children, including movie screenings and music, dance, and arts events on the waterfront throughout the five boroughs. (DCA, 2011)

## 2. Incentivize the cleanup and redevelopment of waterfront brownfield sites.

### VISION 2020 STRATEGIES

- Work with the U.S. Environmental Protection Agency and a range of stakeholders to minimize collateral effects of Superfund designation on investment in properties near Newtown Creek and the Gowanus Canal.
- Leverage redevelopment of brownfield sites through Brownfield Incentive Grants from the Mayor's Office of Environmental Remediation (OER).
- Encourage property owners to attain NYC Green Property Certification, where appropriate, and enroll in the voluntary NYC and NYS brownfield cleanup programs. Continue to engage Brownfield Opportunity Area grantees.
- Increase the awareness of environmental cleanup resources and tools including OER programs.
- Work with the New York State Department of Environmental Conservation to develop a model cleanup program for waterfront properties.
- Assess infrastructure needs of waterfront redevelopment sites.

### ACTION AGENDA PROJECTS

- Revise zoning to encourage redevelopment and reuse of waterfront industrial sites by allowing greater flexibility to achieve certain goals, such as brownfield clean-up, adaptive reuse of outmoded buildings, expansion of maritime uses, and provision of in-water infrastructure. (DCP, 2013)

### 3. Increase knowledge of historic resources on the waterfront and promote preservation and adaptive reuse.

#### VISION 2020 STRATEGIES

- Conduct citywide study of potential historic resources on the waterfront to identify buildings and structures of historic significance.
- Establish new—and strengthen existing—policies to further protect historic resources and historic character along the waterfront.
- When redevelopment sites on the waterfront have significant historic features or conditions, encourage the commemoration, incorporation, or referencing of those historic elements.
- Prevent shoreline erosion in locations where it would jeopardize historic properties.
- Recognize historic vessels as important resources, worthy of consideration for their special needs. Attention should be paid to providing infrastructure such as water and electricity, protection from wakes caused by increased traffic on the harbor, and uniform policies for permitting and insurance to facilitate public programming for historic vessels.

#### ACTION AGENDA PROJECTS

- Seek partnerships and funding to conduct citywide study of historic resources on the waterfront. (DCP, 2013)
- Brooklyn Navy Yard: Open exhibition and visitors center. (BNYDC, 2011)
- Create uniform landing protocol and application for City-owned properties to facilitate docking of historic vessels. (Mayor's Office, 2012)

#### *Waterfront Action Agenda Projects to Spur Reinvestment in the Waterfront*

- Brooklyn Army Terminal, Brooklyn: Commence first phase of a commercial life sciences and technology center (BioBAT), and support workforce development and training programs, creating 1,000 jobs. (SUNY Downstate/EDC, 2012)
- Brooklyn Bridge Park, Brooklyn: Issue RFP for adaptive reuse of Empire Store. (BBP, 2011)
- Brooklyn Bridge Park, Brooklyn: Finalize agreement for community and cultural use at Tobacco Warehouse. (BBP, 2012)
- Brooklyn Navy Yard, Brooklyn: Issue RFP to privatize the 6-acre DCAS Auction lot to allow for redevelopment. (DCAS/BNYDC, 2013)
- Brooklyn Navy Yard, Brooklyn: Begin public review and plan for redevelopment of the 6-acre Admirals Row site, which will create approximately 500 industrial and retail jobs. (BNYDC, 2011)
- Brooklyn Navy Yard, Brooklyn: Expand Steiner Studios to create a new studio and an ancillary entertainment and media space. Expansion will create 1,200 jobs. (BNYDC, 2013)
- Brooklyn Navy Yard, Brooklyn: Begin construction on the Green Manufacturing Center. (BNYDC, 2013).
- Coney Island, Brooklyn: Complete development of 6.5-acre amusement park in historic Coney Island Amusement Area. (EDC, 2012)
- Mill Basin, Brooklyn: Complete property transfer for commercial development with associated waterfront open space and permanent protection of Four Sparrows Marsh along Flatbush Ave. (EDC, 2011)
- Sunset Park, Brooklyn: Issue RFP for the lease and development of a 130,000-square-foot property at the Bush Terminal Complex, creating approximately 100 industrial jobs. (EDC, 2011)
- Sunset Park, Brooklyn: Relocate NYPD tow pound to revitalize maritime-related activities in South Brooklyn Marine Terminal. (EDC, 2012)
- Williamsburg, Brooklyn: Commence redevelopment of the Domino Sugar factory, with 30 percent affordable housing units, commercial space, community facility, and publicly accessible waterfront open space. (HPD, 2013)
- Edgemere, Queens: Continue construction in Urban Renewal Area, adding an additional 434 housing units, 5.5 acres of parkland, 4 acres of restored wetlands, and infrastructure and pedestrian improvements to the existing 307 housing-unit development. (HPD/DPR/DDC, 2013)
- Hunter's Point South, Queens: Commence construction of 900-1,000 new housing units, and complete construction of schools, roadways, and infrastructure. (HPD/SCA/EDC, 2013)
- Rockaways, Queens: Transform vacant lot at the Beach 80th St. Marina into a public waterfront esplanade, including docks, piers, a kayak launch, and a retail facility/catering hall. (EDC, 2011)
- Rockaways, Queens: Complete construction of new phase of Arverne by the Sea: the Dunes, a development of 270 two-family homes and a new YMCA recreation center. (HPD, 2011)
- Stapleton, Staten Island: Begin mixed-use development agreement of 7-acre New Stapleton Waterfront site. (EDC, 2011)
- St. George, Staten Island: Execute development agreement for residential, retail, and open space at the 24-acre, former Coast Guard site. (EDC, 2011)
- Battery Park, Manhattan: Complete renovation and restoration at historic Pier A for public use. (BPCA, 2011)
- Lower Manhattan: Develop hotel, restaurant, and community use at Battery Maritime Building. (EDC, 2011)
- Stuyvesant Cove: Invest through in-kind contributions in Solar One, the city's first solar-powered Green Energy, Arts, and Education Center, for maintenance and operations of the adjacent park. (EDC, 2013)



## GOAL 3

Support economic development activity on the working waterfront.

# SUPPORT THE WORKING WATERFRONT

As New York reinvents portions of the waterfront for living, playing, and relaxing, it is critical to invest in the parts of the waterfront devoted to working. The working waterfront is vital to the economy of the city. It is home to the Port of New York and New Jersey—the third biggest port in the country and the premier maritime complex on the East Coast—as well as the many tugboat and barge operators, marinas, and ship-repair outfits that provide maritime support services to the Port. The waterfront is not only the preferable place of business for many firms, it is essential to their daily operations. And workers, in turn, depend on these businesses for their livelihoods.

Over the last half-century, the ports, maritime support services, and other industries that make up New York's working waterfront have changed in profound ways, both technological and economic. Although the waterfront no longer teems with stevedores loading and unloading ships tied up to docks lining the waterfront, port activities are essential to the movement of goods and materials into the New York metropolitan region, the largest consumer market in North America. As a result of advances in shipping technology, primarily the development of containerized shipping, waterborne freight operations have been consolidated and now occupy a smaller number of facilities, even though the total volume of goods shipped into New York has grown considerably. Volumes are expected to continue to increase, and so will demands on maritime support services. At the same time, changes to global shipping patterns that will result from the expansion of the Panama Canal have implications for the Port and the many businesses that sustain it.

The changes in global shipping, together with long-term economic trends, have also affected New York City's industrial businesses. Industrial uses, which once occupied much of the shoreline, are no longer a dominant presence on the waterfront, with the industrial sector in decline here as elsewhere in the country, and with many manufacturers today not obligated to locate on the shoreline for export purposes. The City has made important efforts to sup-

port the remaining industries on the waterfront as well as address the legacy of past industry—cleaning up brownfield sites and finding new uses for buildings dating to manufacturing's heyday. However, much more needs to be done to support and attract industry on the waterfront.

The City must also contend with maintaining the vast public waterfront infrastructure developed to support maritime businesses—much of it created at a time when New York was still a manufacturing powerhouse with a sizable export trade. This infrastructure includes the publicly owned marine terminals such as the Hunts Point Terminal in the Bronx, New York Container Terminal in Staten Island, Bush Terminal in Brooklyn, and the cruise terminals in Manhattan and Brooklyn. Many piers, boat tie-ups, and bulkheads are also publicly owned. With less use, much of this small-scale infrastructure is in deteriorating condition, but fishermen, distributors, and other local businesses still depend on it in many locations. Maintenance of these facilities is critical to the efficiency and safety of water-dependent businesses on the working waterfront.

As manufacturing has declined, other sectors of the economy have grown, and this has brought increased demands for housing and services. It is important to find ways to maximize investment on the waterfront while integrating maritime activity. Other challenges facing the working waterfront today include promoting more environmentally sustainable business operations along the shore and providing public access where feasible.

## PORT COMMERCE AND SHIPPING

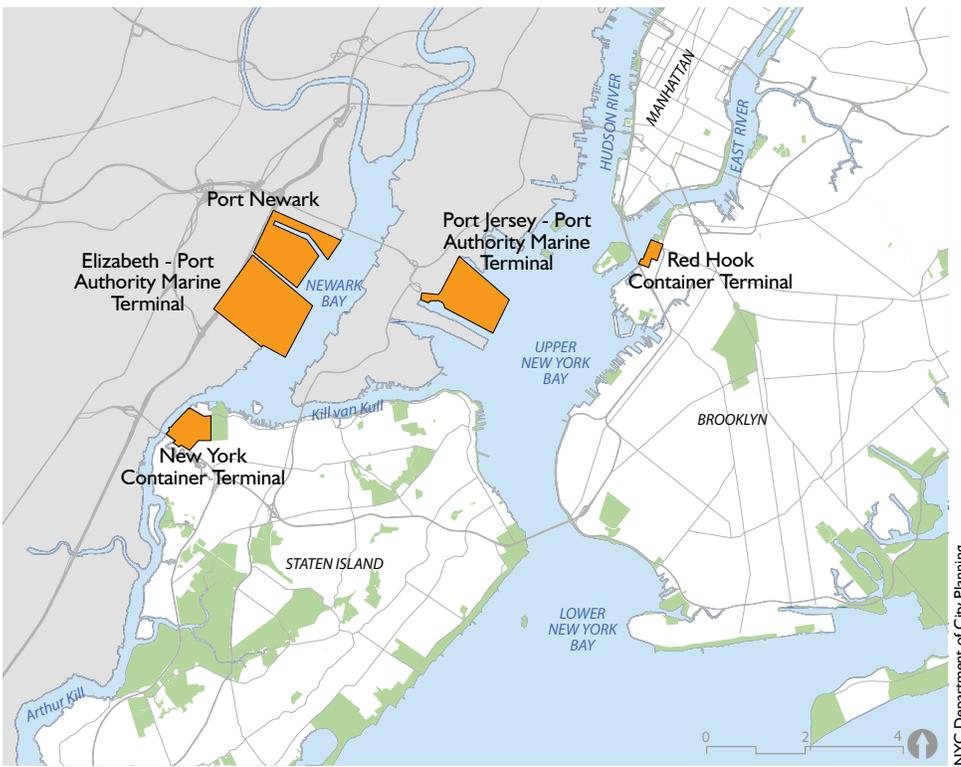
From its founding as a Dutch trading post, New York has always been a port city. Today the Port of New York and New Jersey is a thriving network of public and private marine terminals (see Figure 1, page 45) that together make up the third largest port complex in the continental United States. Most other major ports are on the Gulf of Mexico, as seen in Figure 2 (page 46), which shows the 25 largest ports in the continental U.S. and the 25 U.S. counties with the most jobs in water transportation and maritime support services. This locale provides a year-round moderate climate that is advantageous in ship repair; serves as the gateway to the Mississippi River, the shipping channel for much of America's agricultural, coal, and petroleum products; and functions as the base for a large segment of America's fishing fleet.

Although New York doesn't have the climate advantages of the Gulf, it remains the largest East Coast port. In 2009, the Port of New York and New Jersey received 4,430 calls from vessels of all types, nearly twice as many as the next largest East Coast port, in Norfolk, Virginia. The Port supplies goods to a consumer shed stretching from Canada to Pennsylvania and into the Midwest.

About half of the vessels calling on the Port carry containers filled with goods including chemicals, machinery, food, clothes, shoes, and other consumer products. The Port handles a tremendous volume of non-containerized cargo as well. Bulk cargo volumes include pe-

"You can't get things done in the Harbor without barges like ours. You need barges to dredge the channels. You need them to build bridges, piers, and bulkheads. You need them to maintain all the rest of the marine infrastructure on which New York depends."

—Bob Hughes, owner of Hughes Bros. Incorporated, a six-generation family business



NYC Department of City Planning

Figure 1: Marine Container Terminals of New York Harbor.

troleum and construction materials such as aggregates and cement powder.

Moving containerized goods and non-containerized cargo in and out of the region by water is more fuel-efficient than ground, rail, and air transportation. A single standard deck barge carries the equivalent of 58 large semi trucks and can handle one ton of cargo on a gallon of diesel fuel. According to a study from the Fletcher School of Law & Diplomacy at Tufts University, a self-propelled vessel is six times more efficient than trucks on a per-ton basis.

Although the economic and environmental benefits of using the region's marine highways are difficult to quantify, they are real. The reduction of truck miles driven on New York City's overtaxed street network results in a significant savings in dollars for businesses and improved air quality for communities. According to the Federal Highway Administration, trucks account for only 10 percent of vehicle miles traveled nationally, but are responsible for more than 40 percent of total highway maintenance costs—costs that are avoided when goods are moved by water. Because New York's waterways provide a lower cost and less energy-intensive means of transport, it is important to support waterborne shipping.

### Global Shipping Trends

As the regional economy has shifted from manufacturing to services, global economic currents increasingly affect maritime industries here. Today foreign imports dominate port trade. In 2008, there were 3.5 times the number of foreign imports than foreign exports. The volume of foreign and domestic general cargo by imports and exports in the Port of New York and New Jersey from 1991 to 2009 is shown in Figure 3 (page 47). Note that the reopening of the New York Container Terminal in 1996 facilitated growth in maritime trade. The 16 percent drop in trade from 2008 to 2009 was brought about by the global recession that began in December 2007 and continued through 2008. As lending contracted and unemployment rose, demand for construction materials and discretionary consumer goods declined.

Although 2009 trade fell to levels below the previous four years in the New York Harbor, trade in waterborne cargo is projected to rise significantly over the long term. In 2009, the Port handled 2.6 million containers, a drop of 13.6 percent from the 2008 volume of 3.1 million containers, but since the beginning of 2010 container volumes have increased about 16 percent. Bulk cargo volumes, which also fell

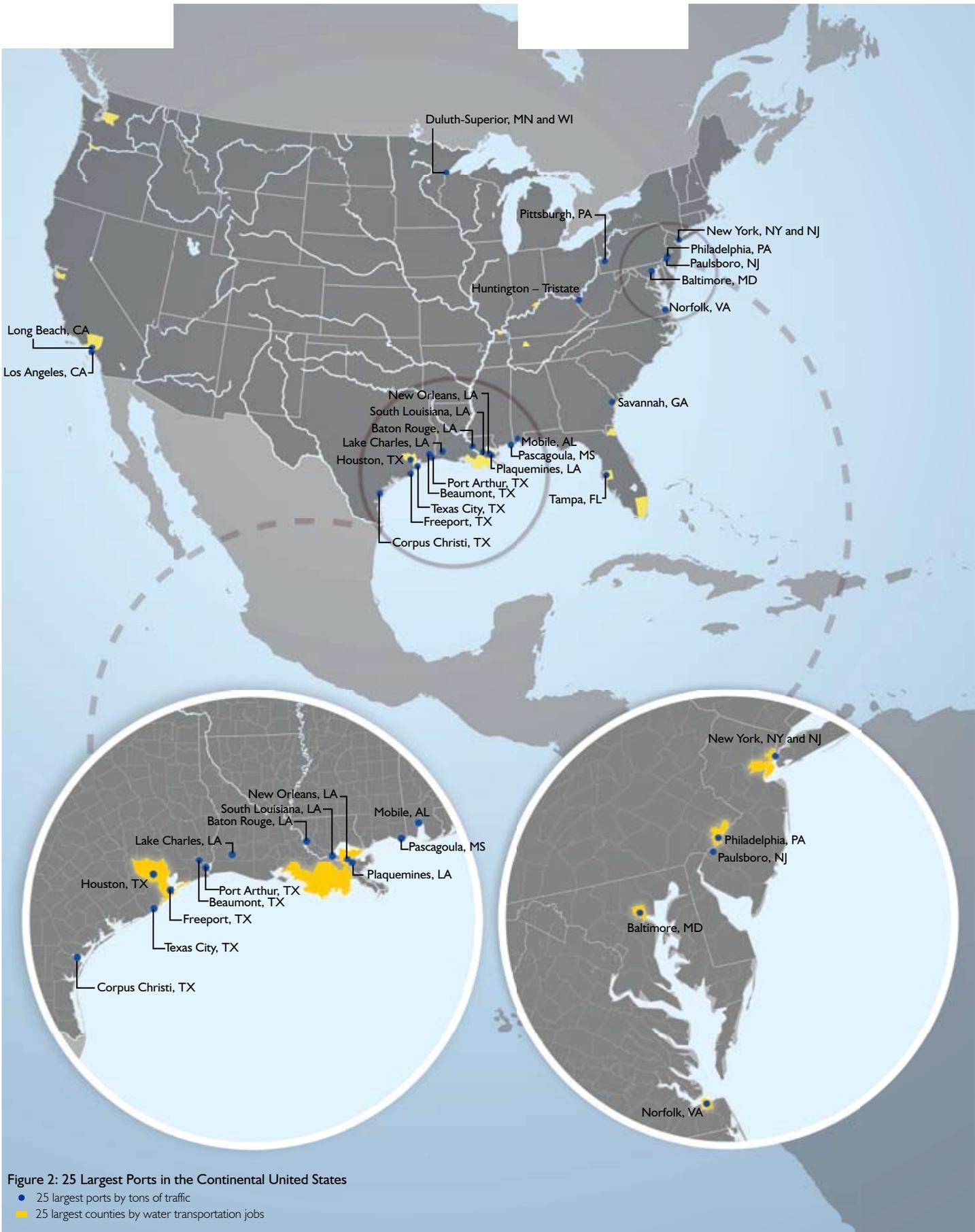
during the recession—from 55 million metric tons in 2008 to about 50 million in 2009—are experiencing a comeback, too.

Along with fluctuations in trade volumes, shifts in shipping patterns are part of the reality of today's port. Dramatic changes in deep-sea shipping have occurred since the publication of the 1992 *Comprehensive Waterfront Plan*. These changes have largely been driven by trends in world trade since the end of the Cold War as well as the ascendancy of China and the Far East as the center of consumer-goods manufacturing.

Since the early 1990s, the preferred method for getting consumer goods from Asia to the New York region has been a combination of ocean, rail, and truck transport. The goods arrived via vessel at California ports, chiefly Los Angeles and Long Beach, where they were loaded onto rail cars for transport east. Trucks then transported goods to distribution centers serving the New York region. Over the past five years this method of shipping to the U.S. East Coast has been replaced by an all-water route via the Suez Canal or Panama Canal, with the majority of goods arriving in port facilities in New Jersey, and then transported to distribution centers where cargo is broken down for final delivery by truck. The Port regularly receives scheduled shipments via the Suez Canal and Panama Canal, and shipments are expected to increase in the coming years, with the growth rate escalating beginning in 2014 once the Panama Canal is deepened and widened to accommodate larger container vessels.

There are significant differences between the Panamax vessels that currently use the Panama Canal and the Post-Panamax vessels that will be able to navigate the Canal once the expansion is complete (see Figure 4, page 47). Current Panamax vessels carry 4,500 TEUs (20-foot-equivalent unit) with an average draft of 12 meters (39.5 feet). Post-Panamax vessels carry nearly three times as much—12,000 TEUs—with an average draft of 15 meters (50 feet).

Maritime industry experts are divided as to the significance of the Canal's expansion for the New York region. Bigger vessels will be able to use the Canal to reach the East Coast, but many large vessels have already taken advantage of the Suez Canal to get to the New York area. The Panama Canal option, however, will reduce transit times for larger vessels, making it more economical for those vessels to deliver



goods directly to the East Coast.

The Post-Panamax vessels are too large to safely navigate New York Harbor's shipping channels as currently engineered. The Port's activity could be affected if the larger vessels are not successfully accommodated. Norfolk and other ports are already being renovated in preparation for the completion of the Panama Canal expansion in 2014.

### Expanding the Capacity of Port Facilities

The growth of trade in the Port has led to massive public and private investments. These investments will help the Port meet the needs of Post-Panamax vessels and accommodate further trade growth.

The Army Corps of Engineers and the Port Authority of New York & New Jersey have invested \$1.2 billion in deepening the major shipping channels to Newark Bay and Upper Bay port facilities in preparation for larger oceangoing cargo vessels. Currently the Army Corps is deepening select shipping channels to 50 feet as part of the second phase of the Harbor Deepening Project. These channels include the Kill Van Kull and Arthur Kill Channels off the shores of Staten Island. The work is anticipated to be completed in 2014, the same year the Panama Canal expansion is expected to conclude.

Marine terminal facilities throughout the region have been upgraded. Over the past 10 years, the Port Authority has invested \$1.5 billion in port infrastructure, including three new on-dock rail yards, improved roadway connections, and security upgrades. Rapid change to New York regional port facilities occurred around 2000 when several important marine terminal leases reached the end of their terms. The Port Authority entered into new leases with terminal operators, fostering major investments. Recently, the Port Authority concluded a leaseback deal with Global Container Inc. that

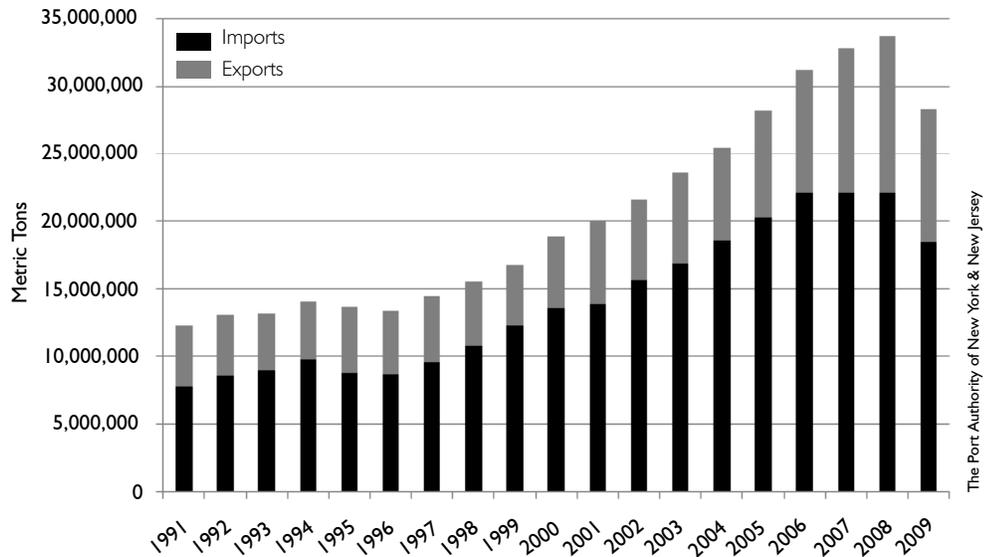


Figure 3: Oceanborne General Cargo Tonnage in the Port of New York and New Jersey, 1991 to 2009.

will expand its Jersey City terminal, adding 70 acres and replacing a former automobile import facility.

In New York, the New York Container Terminal, closed in 1986 during an uncertain period for ocean shipping into the Port and reopened in 1996, now has benefited from almost \$1 billion in investment. These investments have resulted in deeper water, an expanded pier area, an on-dock rail yard, installation of new Post-Panamax container cranes, and several other improvements that have made this New York facility as competitive as its New Jersey neighbors. To keep pace with the forecasted rise in containerized cargo volumes, additional measures are planned to expand the New York Container Terminal. This expansion, if approved by regulatory agencies, would result in the development of a 39-acre vacant site east of the existing container terminal and would feature a new 50-foot-deep berth for Post-Panamax container ships. The expansion would increase the

efficiency and throughput capacity of the New York Container Terminal by 78 percent, from approximately 450,000 lifts/765,000 TEUs per year to approximately 800,000 lifts/1,360,000 TEUs per year.

Despite all these investments, the Port Authority, the City, and the States of New York and New Jersey must continue to contend with other significant obstacles in readying ports for post-Panamax vessels.

### Bayonne Bridge Modification

The Port Authority is addressing the low clearance of the Bayonne Bridge, which traverses the Kill Van Kull, connecting Bayonne, NJ, to Staten Island. This steel-arch span—designed by bridge builder Othmar Ammann and architect Cass Gilbert and built in 1931—provides only 151 to 156 feet of clearance between the surface of the water and the underside of the bridge. The limited air draft already prevents large ships from entering the Staten Island and

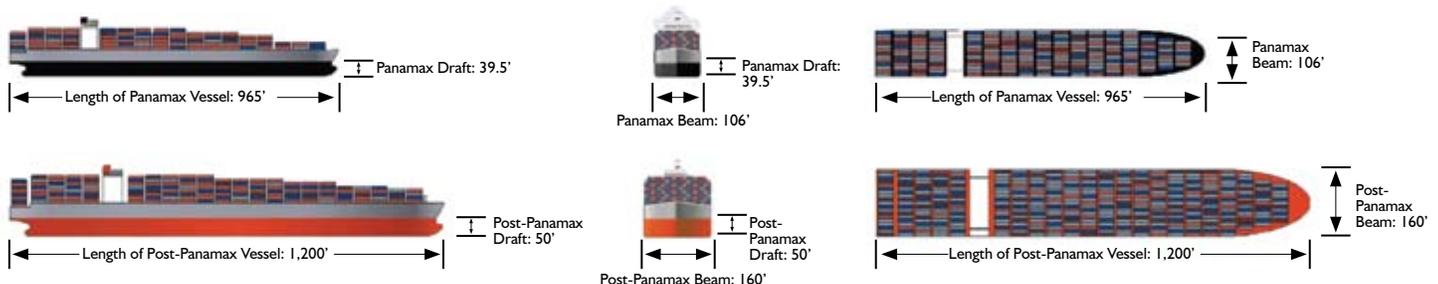


Figure 4: Comparison of Panamax and Post-Panamax Container Vessels

Autoridad del Canal de Panama

New Jersey port facilities located on the western side of the bridge.

In 2008 the Port Authority commissioned a navigational clearance study to evaluate alternatives to the existing bridge and their costs and benefits under a range of scenarios. The U.S. Army Corps of Engineers, consultants on the study, assessed three possible solutions: elevating, or jacking, the existing bridge to a height of 215 feet; constructing a new bridge with a clearance of 215 feet; and constructing a bored or an immersed tunnel. The predevelopment and construction costs for any single solution could range from \$1.3 to \$3.1 billion, but the study determined that the long-term economic benefits would outweigh the costs.

After reviewing the alternatives, the Port Authority recently announced its preferred solution: raising the bridge's roadbed to 215 feet. The "Raise the Roadway" solution will involve reconstruction of the existing approaches, ramps, and main span roadway to allow the crossing to accommodate larger ships for years to come. This bridge modification is believed to be the most cost-effective alternative, and has the fewest environmental and neighborhood impacts. It will preserve the iconic arch while resolving the navigational clearance restriction. This decision lays the groundwork to complete the federal National Environmental Policy Act (NEPA)-required Environmental Impact Statement analysis, the next step required for the project.

### **Improving Regional Freight Movement**

The outmoded rail freight network east of the Hudson River poses yet another set of challenges for the efficient movement of goods in the region. Today only 2 percent of the more than 320 million tons of goods shipped annually to the Port enter the East-of-Hudson metropolitan region by rail. This means that the majority of freight is trucked into New York City, Long Island, and Connecticut via already overtaxed roads. As the metropolitan region continues to grow, so, too, will consumer demands. Increasing rail shipments would provide a cleaner and lower-cost alternative to trucking, but the rail infrastructure is non-existent at critical junctures and is antiquated throughout large portions of the East-of-Hudson region. Further compounding the problem, freight trains must share stretches of the rail network with passenger trains, which leaves a small daily window of opportunity for freight usage.



The Bayonne Bridge, dating from 1931, will be modified to accommodate larger ships.

To explore alternatives and improvements to the rail freight system east of the Hudson River, in 1998 the New York City Economic Development Corporation undertook a study titled the *Cross Harbor Freight Movement Project* in conjunction with the Federal Highway Administration and the Federal Railroad Administration. The Port Authority is conducting the Draft Environmental Impact Statement, which includes examining improved rail floats and tunnels (rail and rubber tire). The Port Authority also seeks to reduce potential impacts—such as construction, noise, and traffic—to upland communities that may be affected by the project.

In addition, the Port Authority is implementing projects that will upgrade the existing rail freight network. The various projects will repair the railcar float system in Brooklyn and New Jersey; address vertical clearance impediments on the lower Montauk Branch in Queens; and improve the signal system to the lower Montauk Branch.

The working waterfront and entire regional market will be greatly affected by the Bayonne Bridge modification and the outcome of the *Cross Harbor Freight Movement Project*. Although these long-term capital projects are not expected to be constructed within the 10-year horizon of *Vision 2020*, decisions made related to these projects will enhance the vitality of the Port and the city's working waterfront for decades to come.

## MARITIME SUPPORT SERVICES

Port facilities are not able to function without an effective network of tugboat and barge operators and ship repair firms. These maritime support services are the connective tissue of the Port. As waterborne commerce increases in response to demand for consumer goods and commodities in the growing region, demand for maritime support services will increase as well.

The New York Harbor's fleet of tugs and barges is impressive. In 2004, the U.S. Army Corps of Engineers estimated that almost one quarter of all tugs and barges on the East Coast were registered in New York City, a total of more than 200 tugboats and 1,000 barges.

The tugboats are the workhorses of the maritime industry. In 2005, there were 21,295 tugboat calls of service, a figure representing a 4 percent average annual growth rate over the preceding four years. Tugs perform myriad functions throughout the Port including towing barges; assisting oceangoing vessels to safely navigate to and from port; and positioning barges alongside large vessels for fueling and sludge servicing.

Tugboats are also critical components of the City's emergency-preparedness strategies. Tugs were crucial in the World Trade Center

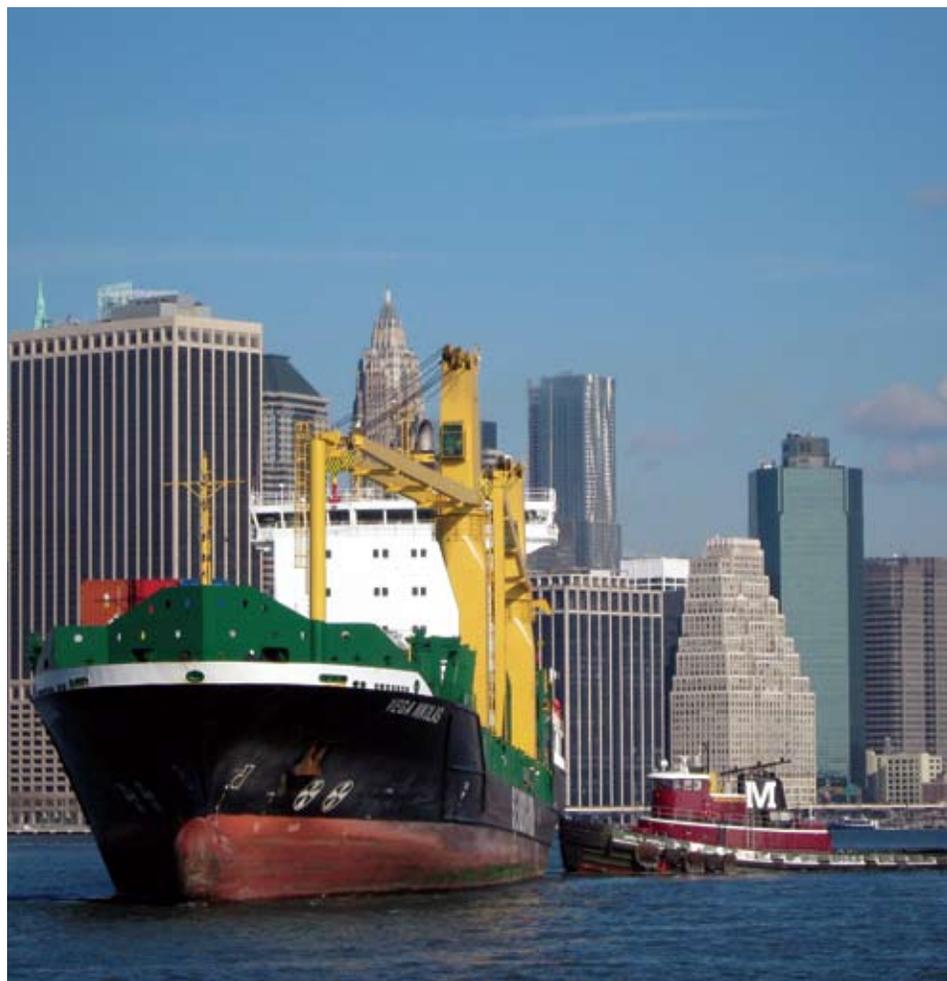
Recovery Project and the rescue of passengers from and recovery of the USAirways plane that made an emergency landing in the Hudson River in January 2009. They respond to emergency calls from other waterborne vessels on a regular basis.

Barges transport both dry and liquid cargo and provide a multitude of services. They can assist oceangoing vessels, transporting goods over shorter distances and in water too shallow for the larger boats. A dry barge, also known as a scow, can carry the equivalent of 60 truckloads in cargo. Barges can also form articulated tug barges, multiple barges that are attached and propelled by a tug for enhanced carrying capacity. A tug propelling six barges can remove upwards of 360 trucks from the roads. A tank barge, which transports liquids, is capable of removing up to 1,500 trucks from the congested highways in New York City and the region.

The *Maritime Support Services Location Study (MSSLS)* that was published in 2007 provided updated information about current and future demand for tugs, barges, ship repair, and land-side repair. The study was funded by the New York Department of State and conducted by the State University of New York Maritime College (SUNY Maritime) in conjunction with the New York City Economic Development Corporation and the Brooklyn Navy Yard Development Corporation. As part of the study, a survey was commissioned of all water-dependent businesses located in the Significant Maritime and Industrial Areas (SMIAs), the six shoreline areas of the Bronx, Queens, Brooklyn, and Staten Island that were designated in the 1992 *Comprehensive Waterfront Plan* to help preserve and foster working waterfront activities in the city. These areas encompass key maritime-related facilities and infrastructure and industrial businesses that rely on the nearby nexus of maritime activity.

The study estimated that demand for future tugboat services could rise to 33,000 calls for service annually by 2016. This would represent a 57 percent increase over tow demand in 2007.

As demand for additional tugs and barges grows, so will the need for tie-up and mooring space. The 2007 study indicated that the demand for tie-up and mooring space in the Harbor exceeded the supply. Approximately 90,000 linear feet is provided within the city's SMIA, and vessels also tie up and moor within New York City but outside the SMIA, such as in Flushing Bay and Westchester Creek, and in



With the aid of a tugboat, the Vega Nikolas container ship turns around in the Upper New York Harbor to berth at Pier 10 at the Red Hook Container Terminal, Brooklyn.

New Jersey. Due to limited pier and bulkhead space, boats may tie up alongside other docked vessels and moor at buoys in the open water.

Ship repair facilities are also in short supply in the New York/New Jersey area, particularly after a number of facilities were converted to other uses over the last decade. This has led vessel operators to seek services outside of the region. There are currently 14 ship repair facilities in New York City—three at the Brooklyn Navy Yard and 11 in Staten Island, all constructed in the early part of the 20th century. In 2007, according to the *MSSLS*, New York City had an unmet demand of approximately 35 repair docks (including graving and dry docks), but by 2016 that unmet demand may nearly double.

The study did not examine the economic feasibility of providing these facilities compared with the alternative of obtaining services in other areas on the East Coast. The costs of land acquisition, construction, and labor in New York

City are substantially higher than they are in Baltimore, Maryland, or in Norfolk, Virginia—the closest competing ports—placing New York City at a cost disadvantage in developing new repair facilities. Without subsidy and technical assistance, new ship repair facilities are unlikely to be built. Given the financial hurdles in developing new graving docks and dry docks, the economic viability of existing facilities is crucial to the operation of the maritime industry in New York Harbor.

### Other Challenges Facing the Maritime Industry

The maritime industry is directly dependent on the availability of waterfront space and the use of the waterways to do business. These operations often require building structures in waterbodies regulated by state and federal agencies. The viability of maritime industrial businesses in New York City depends on the ability to

receive the necessary environmental permits to build new facilities and to maintain existing structures. This issue, critical to the maritime industry, is discussed further in the section of *Vision 2020* devoted to improving governmental regulation, coordination, and oversight, beginning on page 96.

Another challenge is finding qualified workers. Though jobs in the maritime industry are typically well paid and offer an important diversity for the city's economic base, many jobs within the maritime industry are filled by workers from outside the New York metropolitan area. New York City residents are typically unaware of the opportunities in the field, and few vocational training programs are currently available. The State University of New York Maritime College in the Bronx and Urban Assembly New York Harbor School, a public high school on Governors Island, offer important opportunities for training New York's students for jobs within the maritime industry.

Yet another challenge facing today's maritime industry is finding cost-effective methods for disposing of dredged material. Dredging is needed to maintain many of the berthing facilities around the Harbor because of its naturally shallow depths. The current cost of dredging within the Port of New York and New Jersey is prohibitively expensive for small maritime businesses. Some businesses have had to reduce their operations or close entirely because of dredging needs; others have had to respond to shallow draft conditions by making inefficient operational adjustments. This has led to decommissioning terminals—as seen along the Harlem and Bronx rivers and Westchester and Eastchester creeks—or rotating larger vessels to deeper draft tie-ups along the Hudson River during low tide.

## Marinas

Commercial and public marinas are important assets for New York City, providing seasonal employment as well as recreational opportunities. Marinas also add character to the neighborhoods where they are clustered. Marina support services offer skilled and unskilled jobs. Marina uses include full-service marinas, accessory docks, and single docks for private recreational vessels. Marina support activities include boat repair and maintenance, boat storage, fueling, waste pumpout, and sail making and repair. Marinas and marina support activities tend to cluster in areas with moderately deep wa-

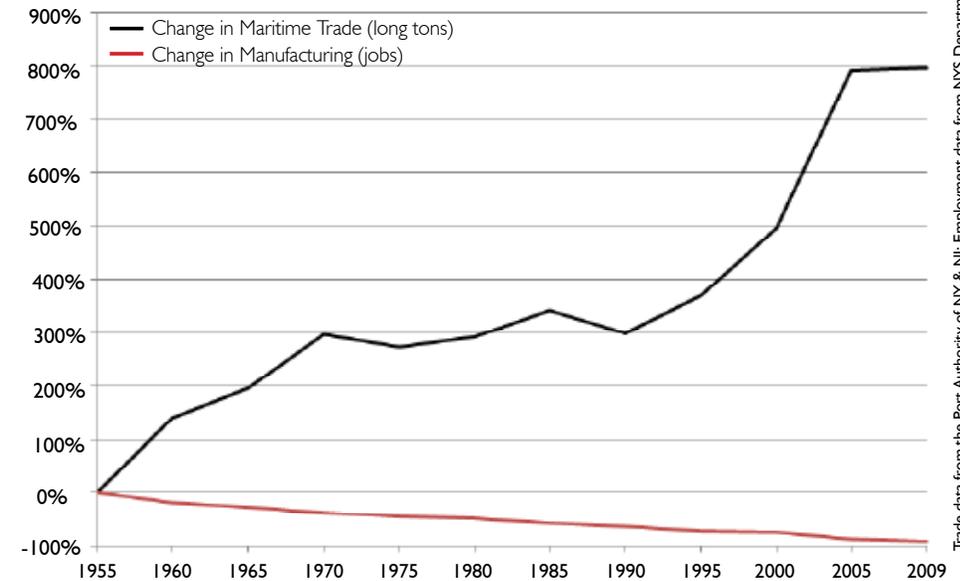


Figure 5: Percentage Change in Maritime Trade and Manufacturing Jobs in New York City since 1955.

ter protected from currents, strong winds, and wave action, and where conflict with maritime and maritime support vessel activity is minimal.

Marinas are permitted in all commercial and manufacturing zones. Marina support services are permitted in these zones as well, with the exception of certain commercial zones (C1 and C4 – C6) due to frequent noise and odors associated with these businesses. The Zoning Resolution does not permit new marinas to be built in residential zones, though marinas can be built in C3 and C3A districts, where low-density housing is also allowed.

Marinas are reasonably well distributed along the New York City coastline where industrial uses are limited, but notable clusters of marinas and marina support services have formed on City Island, Gerritsen Beach, Hamilton Beach, Broad Channel, and around Great Kills Harbor. Approximately 150 marinas and boat launches exist in New York City, according to data from the U.S. Coast Guard and the New York City Police Department (see map on page 87); this includes full- or limited-service marinas and yacht clubs, many located on parkland. Full-service marinas are land-intensive and generally face financial challenges related to seasonal use, regulatory hurdles, dredging costs, and real-estate pressures. Due to these factors, the number of marinas has been dwindling over the decades.

## LEGACY ISSUES OF INDUSTRIAL USES

Over the last half-century, industrial uses on the waterfront have declined in New York City, just as they have elsewhere in the country. With fewer businesses requiring piers and facilities for boat tie up, much of the shoreline infrastructure dating from the industrial age is no longer used and is in disrepair. Brownfields are another legacy of the industrial era. Historically, many industrial businesses were operated with little regard to the contamination of the land and nearby waterways. In addition, many pre-World War II industrial buildings on the waterfront have been rendered obsolete by technological advances in manufacturing processes. Breathing new life into these inactive buildings by adapting them for new uses is an important challenge and opportunity.

## Trends on the Industrial Waterfront

In 1955, there were more than 1.8 million industrial jobs in New York City, and about half of those jobs were in manufacturing. The industrial sectors—manufacturing, wholesale trade, transportation, utilities, and construction—accounted for 56 percent of the city's private employment at that time. Many of the city's manufacturers located at the water's edge because businesses were reliant on shipping goods by



The former Bethlehem Steel Corporation Shipyard on the North Shore of Staten Island was the site of extensive ship construction from the 1920s through World War II.

water directly to and from their plants. Commodities were baled and hauled in every manner for delivery.

An experiment in the use of standardized cargo containers in shipping and truck transportation was conducted in 1956 in the Port of Newark and had reverberations for years afterward, contributing to the decline of manufacturing centers in New York City and throughout the Northeast. In 1962, the world's first containerized port opened in Elizabeth, NJ, not only revolutionizing the system of maritime trade but marking a transformative moment for the interrelated sectors of ground and rail transportation. The development of containerized transport made convenient access to highways a leading factor in where manufacturers decided to locate. With the construction of the Interstate Highway System, manufacturing migrated out of New York and other older cities.

The decline in industrial jobs in New York City from 1955 to 2009 was accompanied by a rise in Port trade (see Figure 5, page 50). By 2008, the number of industrial jobs in New York City fell to approximately 543,000, about 18 percent of all private employment, and only 96,000 of those jobs were in manufacturing. In 2009, the latest year for which annualized labor data is available, manufacturing jobs dropped to under 84,000. Although manufacturing is a shadow of what it was in the mid-20th century—down to less than 10 percent of the manu-

facturing jobs in 1955—waterborne trade rose by nearly 900 percent in this period.

Due to the decline of manufacturing, the amount of waterfront land used for manufacturing has shrunk considerably. Disinvestment has been widespread, extending from the shoreline into the upland industrial areas.

The 1992 *Comprehensive Waterfront Plan* noted that along the waterfront, zoning still to a great extent reflected the mid-20th-century predominance of industrial uses. The manufacturing districts mapped in 1961 were based on land-use patterns of 1955, and in 1992 the zoning had remained largely unchanged, with one-third of the waterfront still zoned for industrial uses. Despite the rezoning of several waterfront sites for non-industrial uses in recent decades, approximately the same share of waterfront area in New York City is zoned for industrial uses today.

### Recent Strategies to Spur Economic Development

To bolster the remaining industrial uses, the Bloomberg Administration in 2005 designated 18 areas of the city Industrial Business Zones (IBZs). The Administration created IBZs to stabilize primarily industrial areas in the Bronx, Brooklyn, and Queens. Manufacturers that re-located to IBZs became eligible for a tax benefit, and, in addition, the Administration committed not to support the rezoning of industrial prop-

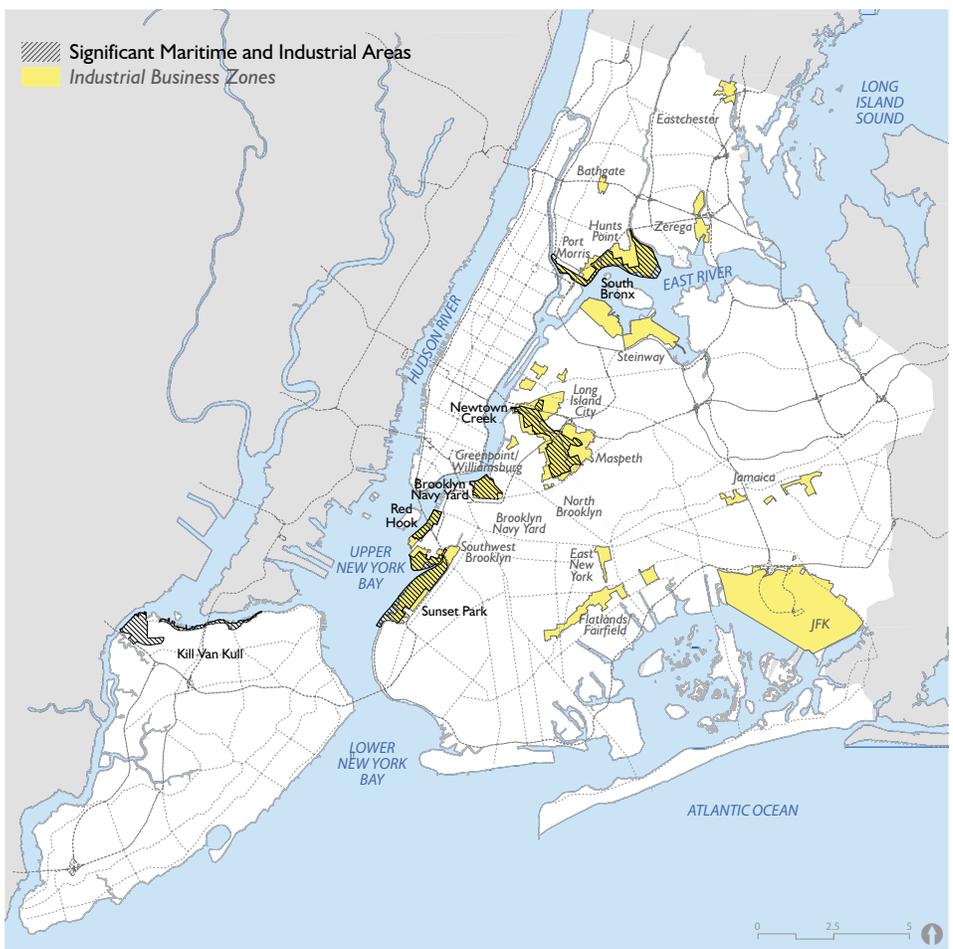
erty for residential use. The City contracted with nonprofit organizations to facilitate access to government-funded business assistance programs. The organizations also act as liaisons to City agencies to expedite the resolution of problems affecting industrial businesses, such as nuisance complaints and limited loading and parking zones in these areas.

Many IBZs are on the waterfront. The IBZs encompass the Significant Maritime and Industrial Areas (SMIAs), with the exception of the Kill Van Kull SMIA in Staten Island (see Figure 6, page 52). The Kill Van Kull SMIA is located in the Staten Island North Shore Ombudsman Area, in which there is funding for a nonprofit service provider. Rather than create an IBZ on the North Shore in 2005, the City determined that further study of the area was necessary. The City will soon issue the *Staten Island North Shore Land Use and Transportation Study*, which identifies opportunities for industrial retention and growth.

While IBZs are important business centers and the IBZ program has provided benefits to companies in them, these areas have continued to lose industrial jobs. According to the Quarterly Census of Employment and Wage (QCEW) data from the New York State Department of Labor, the IBZs in 2008 contained approximately 25 percent of New York City's industrial jobs and 11 percent of industrial firms. IBZs lost a total of nearly 11,000 industrial jobs between 2000 and 2008, while gaining approximately 12,000 non-industrial jobs. This represents a loss of 10 percent of all industrial jobs and a gain of 32 percent in non-industrial jobs.

However, industrial firms in the IBZs show resilience. According to the QCEW data for 2000 and 2008, a relatively even number of new industrial businesses replaced those that were lost, with new arrivals in construction and warehousing firms and departures in manufacturing and transportation. Furthermore, 41 percent of the industrial firms located in IBZs in 2000 still existed in 2008, while 35 percent of non-industrial firms were still in place. However, these remaining industrial firms in IBZs tended to become smaller operations compared to their non-industrial neighbors. Industrial firms shrank from an average size of 48 employees in 2000 to an average of 41 employees in 2008 while the non-industrial firms grew from an average of 39 to 51 employees.

The City is currently working on studies of each IBZ to identify issues and opportunities to



NYC Department of City Planning

**Figure 6: Significant Maritime and Industrial Areas and Industrial Business Zones**

improve each industrial area. Recommendations will vary by area but may include improving traffic and parking regulations to increase access for goods and employees, promoting clusters of similar industrial businesses, area-specific marketing, and identification of infrastructure needs.

The Significant Maritime and Industrial Areas rebounded as business centers. This was largely due to the robust growth of non-industrial sectors, but there were also modest gains in the industrial sectors. The 2008 QCEW showed that there were almost 1,400 firms and almost 44,000 jobs located in the SMIA. The non-industrial jobs in the SMIA accounted for approximately one-third of all jobs, and the non-industrial firms accounted for approximately 28 percent of all firms. The Brooklyn Navy Yard SMIA was the leader in job growth between 2000 and 2008, and the Kill Van Kull SMIA also gained jobs during that period.

Despite these gains, significant stretches of

the SMIA and IBZs suffer from prolonged vacancy and considerable contamination. A sizable stock of factories and warehouses are more than 70 years old, in disrepair, and obsolete for modern industrial needs. Remediation of sites and renovation of facilities are expensive endeavors, the costs of which exceed rents industrial tenants can pay.

Yet these areas are attractive to many businesses. Growing sectors in the city look to manufacturing districts for potential expansions, but some of the sectors growing fastest—education, health care, and retail—are restricted from developing in certain manufacturing districts under current zoning.

For instance, the IKEA furniture store that opened in 2008 in Red Hook, Brooklyn, needed to rezone to an M1 district from an M3 district and obtain a special permit to operate. IKEA is representative of a current trend: large-format retail stores on the working waterfront and in other historically industrial areas taking

advantage of large, long-vacant sites. A furniture store of more than 300,000 square feet, IKEA needed approval from the City Planning Commission and the City Council, an action that was controversial because the site was located in the Red Hook SMIA and the development of the site resulted in the loss of an active graving dock and working piers. To help mitigate the effects of increased traffic into the neighborhood and the loss of a portion of the active maritime shoreline, approval for the special permit was contingent upon the provision of ferry service to the store and the dedication of areas along portions of existing piers within the property for use by a local barging operation.

Home Depot and Lowe's, on the other hand, were able to construct in the Sunset Park SMIA as-of-right. These two large-format retailers are hardware stores and therefore permitted uses under current zoning. They were not required to obtain a special permit to operate, nor were they required to provide maritime components along the water's edge.

In light of this recent history, the Department of City Planning and the Economic Development Corporation have sought to build on the potential for non-industrial development to complement maritime activity on the waterfront. The soon-to-be-released *Staten Island North Shore Land Use and Transportation Study* aims to support maritime uses by recruiting new uses from sectors of Staten Island's economy that are growing, such as education and health care, retail, cultural organizations, and tourism. The study identifies the former Bethlehem Ship Yard in Mariners Harbor, now partly vacant, as a site where multiple objectives—bolstering maritime and light industrial infrastructure, making adaptive reuse of a vacant building, and remediating brownfields—could be achieved. However, the redevelopment must be supported by more economically viable uses—such as an institution, commercial office, and/or retail uses—compatible with neighboring maritime uses.

More attention must be given to adapting the pre-war industrial buildings lining the waterfront for other viable businesses. The City's own Brooklyn Navy Yard represents one of the most promising examples of large-scale adaptive reuse. Built in 1801 by the U.S. government, the naval facility provided more than 150 years of job-generating activity. The closure of the Navy Yard in 1966 caused the sudden loss of approximately 9,000 jobs that have never

fully been recovered on site in the more than 40 years since. The City purchased the Navy Yard in 1970 for \$24 million and since 2001 has invested more than \$250 million in subsidy for rebuilding infrastructure. The Brooklyn Navy Yard Development Corporation has used the public subsidy to leverage more than \$400 million in private investment, and this combined funding has rebuilt streets, maintained the graving docks, and restored piers and more than 40 buildings in a historically sensitive fashion using sustainable design and practices. These investments have created more than 2,200 new jobs since 2001.

More projects are on the horizon at the Brooklyn Navy Yard. A LEED-certified development—providing 85,000 square feet of retail space, including a 55,000-square-foot supermarket, and 125,000 square feet of modern industrial space—is expected to break ground in 2012. This \$60 million investment is projected to add another 500 jobs. A visitors center and museum for exhibiting the Navy Yard's vast archives is expected to open in late 2011.

## ENVIRONMENTAL REMEDICATION AND PROTECTION

Widespread environmental degradation compounds the problems associated with dramatic losses in economic activity on the working waterfront. Maritime industries historically have had negative impacts on the land, water, and air. The primary impacts of the working waterfront are water pollution through runoff and discharges, loss of marine habitat and dispersal of contaminated sediments through landfill and development, and air pollution through emissions of gases and particulates.

Contamination has been a longstanding issue for New York's industrial shoreline. Back in 1896, the City of Brooklyn's Department of Health had already mapped 37 heavy manufacturing and industrial operations in Long Island City, Newtown, and Greenpoint along Newtown Creek that were known to generate high levels of contamination. These operations included fertilizer, paper, and glue manufacturers; dye and chemical works; petroleum and gas operations; and waste-removal companies. An oil leak from refineries and storage tanks along the banks of Newtown Creek's stagnant waters resulted in the largest petroleum spill in U.S. history before the Deepwater Horizon spill oc-



A concrete plant on Newtown Creek.

curred in the Gulf of Mexico in 2010. An estimated 17 to 30 million gallons of oil have seeped into the Creek and surrounding neighborhood from multiple sites on its banks occupied by former and existing oil companies. Oil seepage was spotted in 1978, and initial remediation began soon afterward but was not fully effective. In November 2010, Exxon Mobile agreed to pay \$25 million and to perform a faster, more thorough cleanup of the contaminated water and sediment on more than 50 acres in industrial and residential areas of Greenpoint. This legacy of contamination resulted in the designation of Newtown Creek as a Superfund site in 2010, the same year another industrial waterway, the Gowanus Canal, was also designated.

The Gowanus Canal dates to 1860 and is less than two miles long. Gas works, chemical plants, cement-batching facilities, machine shops, scrap yards, and oil refineries once flanked its shoreline, and today the Gowanus Canal is lined by parking lots, vacant sites, and former industrial buildings, though some recent development has occurred. The problem of pollution in the Gowanus is persistent, stemming from the Canal's industrial heyday through today.

Cleanup efforts for Newtown Creek and the Gowanus Canal are under way and go beyond the Superfund program. Polluted lands adjacent to the two waterways are part of sites that are under study through Brownfield Opportunity

Area (BOA) grants that local community-based organizations (CBOs) have received from the Mayor's Office of Environmental Remediation and the New York State Department of State. The BOA program provides municipalities and CBOs with grants for planning for areas with clusters of brownfield sites. In New York City, BOA grants have been awarded to various CBOs to conduct studies and develop strategies related to brownfield identification and revitalization. There are currently 17 BOAs citywide, including portions of five Significant Maritime and Industrial Areas, and the City is actively working to create 10 to 12 new BOA study areas.

New Jersey's Portfields Initiative is another approach to the legacy of pollution and disinvestment. The New Jersey Economic Development Authority and the Port Authority began this effort in 2006 to revitalize tracts of the Port district that were underutilized and/or contaminated. The Portfields Initiative earmarked \$1.7 billion in redevelopment funds to leverage private investment to transform polluted brownfields within the Port Authority's jurisdiction into 10 million square feet of warehousing and distribution facilities to strengthen the Port's efficiencies and inland access. The Portfields Initiative requires a minimum of 350,000 square feet, or approximately eight acres, for each approved site. The public support for the program consists of bonds, loans, loan guar-

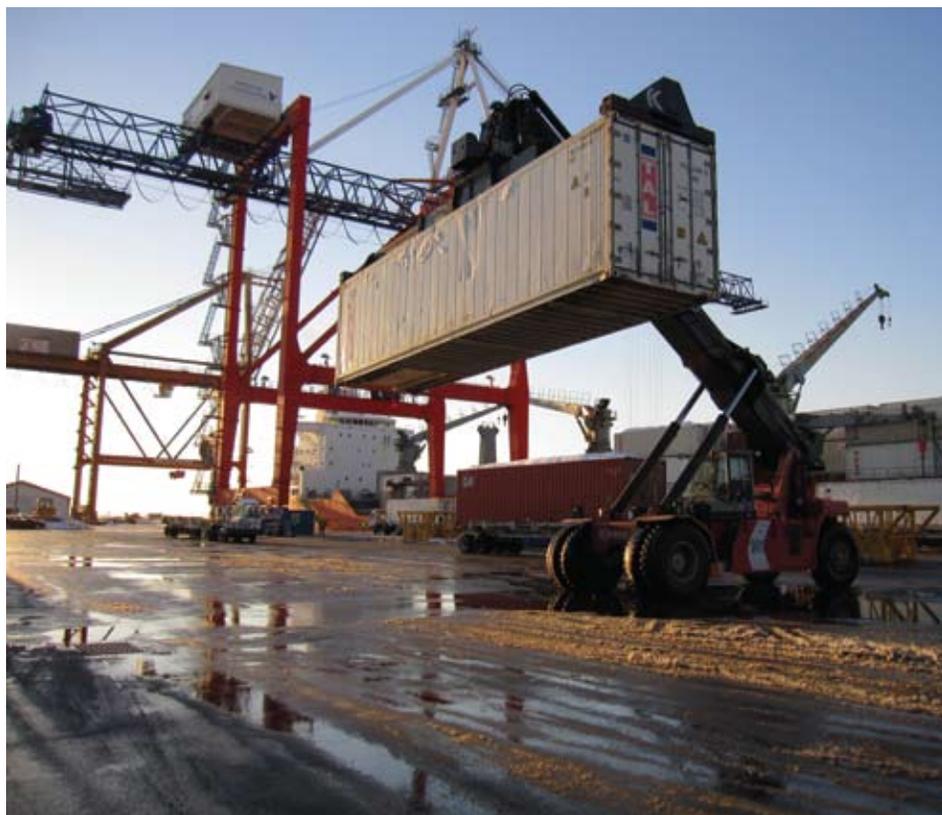
antees, and environmental assistance grants for planning, pre-development, site selection, and remediation; infrastructure improvements; and capital costs. In addition, by partnering with Public Service Electric and Gas, a publicly owned utility, applicants will receive technical assistance, and facilities will be constructed with energy-efficiency measures.

In New York City, the Mayor's Office of Environmental Remediation has already laid the groundwork for a similar initiative. OER has launched the first municipally run brownfield cleanup program in the U.S., a \$9 million grant program to encourage private investment in investigation and cleanup. It has also developed an environmental database with pertinent historic land-use information on more than 3,000 properties, enabling the public to identify vacant sites and possible brownfields. New York City has few sites on the scale of the Portfields sites in New Jersey, but they do exist, especially on Staten Island's West Shore and along the shoreline of the South Bronx and Northern Brooklyn.

## Protecting Harbor Water from Contamination

While increased regulation of chemical disposal, wastewater, and other sources of water pollution have greatly improved water quality within New York Harbor and its tributaries, pollutants remain as a result of historic activities, occasional accidents, and some ongoing practices. The federal laws of the 1970s improved New York waterways, but were not entirely effective in reversing earlier damage done. If additional steps are not taken, water pollution could increase with climate change. For instance, a rise in sea level and more frequent, intense storms could possibly cause more spills on sites with open industrial uses. Water pollution from industrial waterfront areas is still a prevalent problem and one that can be better addressed through a combination of tighter controls regulating sources of pollution and remediating contamination where it has already occurred.

There are several ways maritime industrial activities introduce pollutants into the city's waterways, including disposal of chemicals, stormwater runoff, and vessel discharges. Current sources of water contamination include barging of scrap metals, construction aggregate, demolition debris, and petroleum products. Pollution also stems from oil leakage, sewage overflow, and unabated releases of contaminants. Pollut-



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Cargo-handling equipment on Pier 10 at the Red Hook Container Terminal, Brooklyn.

ants include heavy metals, cadmium, mercury, solvents, and pesticides, and these pollutants limit the ability of the waters to support biodiversity and safe recreation.

Utilizing stormwater best management practices known as BMPs—such as bioswales, pervious pavement, and basins that detain and retain stormwater—can improve water quality by capturing and filtering contaminated stormwater. Regulation and enforcement of vessel greywater discharge standards and chemical disposal are other important means of addressing water pollution.

## Contaminated Sediment

Maintaining New York's shipping channels and waterways presents a range of environmental considerations. As in any estuary, sediment transported via harbor tributaries accretes throughout New York Harbor. The Port and its estuaries are naturally shallow, with the historic depths of the channels averaging approximately 19 feet. To keep shipping channels and waterways navigable, excavation of bottom sediment, or dredging, is necessary.

Dredging requires environmental oversight. It can dislodge chemicals that have accumulated

in the silt and sediment and release them into the water column where they can enter the food chain. In addition, excavation can lead to habitat loss, as the floor of the ocean, harbor, and rivers is reshaped. There are many practices that can minimize environmental impacts of dredging, such as dredging during certain times of the year, limiting the speed of dredging, and requiring environmental buckets that remain closed during dredging. Disposal of contaminated dredged material is the most expensive part of the dredging process because of requirements for the management of environmental risks. Remediating and reusing dredged material instead of disposing of it can greatly reduce the negative impacts of dredging. Beneficially using dredged materials could reduce the overall cost of a project while offering a useful source of material for other projects.

From the mid-1800s until the mid-1990s, dredged material from New York City was dumped offshore at what came to be known as the "Mud Dump Site," located about three miles into the ocean off Sandy Hook, NJ. This area was used to dispose of dredged materials containing sand, silt, clay, and stone, as well as many contaminants. In 1997, the site was



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A tugboat pulls away from a container ship after delivering fuel.

closed as a disposal site and reclassified as a remediation site. Now referred to as the “Historic Area Remediation Site” (HARS), this area is being remediated through the use of dredged material that meets criteria for acceptable levels of contamination.

However, the majority of the material that is dredged in New York Harbor does not meet those standards. While not hazardous in its untreated form, it needs to be treated so that it can be beneficially used. To allow for beneficial use, dredged sediment can be processed to reduce, separate, immobilize, or detoxify contaminants. Effective techniques vary greatly, depending on the nature and amount of contaminants.

Once processed, there are a variety of beneficial uses for dredged material. Freshkills Park on Staten Island, which will open to the public in phases beginning in 2011, used approximately 1 million cubic yards of dredged material mixed with cement for fill and contouring. A similar process is being used at the Brookfield Landfill on Staten Island, which also will be parkland in the future. In addition to capping landfills and brownfield sites, processed dredged material can be beneficially used as topsoil, storm barriers, and other construction material.

It is important to address the environmental concerns related to dredging, and find productive beneficial use for the dredged materials, as the need for dredging will likely increase. Over the next 60 years, it is estimated that nearly 200 million cubic yards (mcy) of dredged material must be managed, according to the *Dredged Material Management Plan*, produced in 2008 by a partnership of city, state, and federal agencies. Currently select shipping channels, including the Kill Van Kull and Arthur Kill Channels off the shores of Staten Island, are being deepened to up to 50 feet as part of the second phase of the Harbor Deepening Project. This project, combined with regular maintenance dredging of the navigational channels, may produce as much as 2.4 mcy of dredged material annually. Furthermore, an estimated 1 mcy of sediment annually is generated in the private berths of small maritime businesses—including marinas, shipyards, and tug and barge companies—which need to be dredged. Finding environmentally responsible and cost-effective methods for disposal is important for continuing to maintain operations that support both Port commerce and recreational activities.

## Controlling Air Emissions

Air emissions of diesel particulate matter and noxious gases pose numerous health risks, including asthma and cancer. The largest Port-related source of these emissions is the diesel engines of oceangoing vessels, followed by on-dock cargo-handling equipment such as cranes, tractors, and forklifts. Steps to reduce air pollution caused by ships include limiting speeds within the Harbor, reducing ship idling through terminal efficiency, and using shore power sources while at dock. The use of cleaner fuels (such as low and ultra-low sulfur diesel, biodiesel, and emulsified diesel) and the retrofitting of diesel engines with pollution-control technologies are other potential measures. There are also opportunities to repower pieces of equipment by, for instance, replacing diesel engines on cranes with electrical power sources.

The largest sources of greenhouse-gas emissions are the trucks that move cargo from marine terminals to distribution centers and regional markets. Currently, nearly 85 percent of all cargo leaving the Port of New York and New Jersey is moved via truck. These trucks contribute to climate change; wear on the city's



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The Queen Mary 2 cruise ship, as seen from the rooftops of Red Hook, Brooklyn.

roads; and create noise, traffic, and dust harmful to residential areas. Through a greater reliance on domestic oceanborne commerce, known as short-sea shipping, and rail transport, these impacts could be dramatically reduced. However, truck transport is more expedient and more cost-effective, except for when high-weight, low-value goods are being transported. There are strategies employed in New York and elsewhere to lessen the impacts of trucks, such as reducing idling time through optimizing terminal layout for efficiency and reduced congestion.

The Port Authority's 2009 Clean Air Strategy aims to achieve an annual 3 percent net decrease of criteria pollutants (air pollutants

particularly from diesel engines with negative effects on human health) and an annual 5 percent net decrease of greenhouse-gas emissions. The Clean Air Strategy includes a variety of programs that offer incentives to cargo vessel operators, trucking companies, and terminal operators to reduce greenhouse-gas and diesel emissions, and it also entails actions taken by the Port Authority itself. For instance, the Ocean Going Vessel Low Sulfur Program provides vessel operators with reimbursements for half the additional cost of low-sulfur fuels while ships are in the Harbor or at a terminal. The Clean Trucks program encourages the use of newer trucks that release fewer emissions by offering finan-

cial incentives and financing opportunities to replace older trucks. (The Port Authority plans to expand the Clean Trucks program by developing near-port truck parking areas with plug-in electrification technology to reduce idling emissions.) In addition, ultra-low sulfur diesel fuel and pollution-control technologies are used in all cargo-handling equipment at Port Authority terminals, including electrifying cranes; and other technologies are being explored, such as hydraulic and electric hybrid equipment and wind turbines to provide power.

The Port Authority and New York City Economic Development Corporation also plan to provide shore-based electrical power (a practice

known as “cold-ironing”) at the Brooklyn Cruise Terminal to eliminate emissions from idling engines. For wider application of this technology at other cruise and commercial marine terminals, new rate structures and off-the-grid options are being investigated.

While New York City has demonstrated that it is a leader in developing sustainable port practices, it is also worthwhile to look to ports throughout the country as potential sources of new ideas. The port in Long Beach, California, has worked with BP to install shore-side electrical power in one berth for use by BP oil tankers when in port. This project, which cost \$23.7 million, was the first oil tanker terminal with shore power in the world. The port plans to upgrade 10 more berths with such cold-ironing accommodations, which would result in a 70 percent reduction in emissions by oil tankers while at dock. In 2004, the Port of Los Angeles opened the world’s first container terminal utilizing alternative maritime power. Allowing container ships to plug in to shore electrical power eliminated the use of auxiliary engines while ships are docked, resulting in a 95 percent reduction of emissions of ships at dock.

### Habitat Loss on Industrial Shores

The interface between land and water is valuable to maritime industries. However, these landscapes are productive from an ecological standpoint as well. The development of wetlands and marshes for industrial uses can lead to the loss of biologically diverse areas. There are also potential indirect impacts on surrounding habitat areas such as changes to currents, air emissions, noise generation, increased turbidity of water, and sediment erosion or accretion.

In addition, ship hulls and ballast water are potential sources of aquatic invasive species, which can disrupt food chains and upset other systems. For instance, zebra mussels, which were most likely introduced to the United States via ballast water, have caused billions of dollars in damage to water-intake systems. Currently, ballast water exchange—where ballast water is replaced with water from the open water—is the only effective means to reduce the risk of introducing invasive species. However, the ability to conduct an exchange is highly dependent on weather and sea surface conditions, and the practice is only partially effective, with a residual amount of organisms remaining in tanks following exchange. Interest is growing in ballast water treatment, but this practice is still only in the research phase.



NYC Department of Parks & Recreation

Barretto Point Park provides much-desired public space and waterfront access in the predominantly industrial neighborhood of Hunts Point in the South Bronx.

### OPPORTUNITIES FOR PUBLIC ACCESS

As New York becomes more densely populated, residents are demanding greater access to the water’s edge. Increasing public access must be balanced with retaining and supporting the vital economic assets of maritime and industrial businesses. The 1993 waterfront public access requirements in the *Zoning Resolution* recognize that the daily operations of industrial and maritime businesses sometimes make the waterfront and waterways unsafe for recreation and other public access.

However, safe access points are possible in select places. The Newtown Creek Nature Walk, which opened in 2009 on the grounds of the Newtown Creek Wastewater Treatment Plant, was one such opportunity. Part of a larger effort to upgrade the facility, this quarter-mile-long walkway—affording views of the creek in a park designed by sculptor George Trakas—was a project of the New York City Department of Environmental Protection through the New York City Department of Cultural Affairs Percent for Art program.

Point access to the waterfront has also been provided at such locations as Barretto Point Park in Hunts Point in the Bronx. The nearby South Bronx Greenway provides public access along

the waterfront where feasible, but veers inland along public streets to avoid sites on which direct public access would directly conflict with industrial uses.

On portions of the waterfront where physical access to the water’s edge is not feasible, visual access may be possible. For example, along portions of the North Shore of Staten Island, the public is separated from the waterfront by active industrial and maritime uses. Current zoning regulations require that industrial uses install opaque fencing, but this prevents people from getting a glimpse of the waterfront. Modifying zoning to allow for transparent fences, or providing specific locations for overlooks offering views of the maritime uses and waterfront, would compensate for the lack of physical access. Creating visual access to such maritime sites would have the added benefit of educating the public about the importance of the working waterfront.

# Support the Working Waterfront: Strategies and Projects

This plan envisions a waterfront in 2020 that is a thriving home for maritime and industrial businesses, a healthy workplace for New York City residents, and a valuable resource for nearby communities.

To realize this goal, the City will pursue the following set of strategies over the next 10 years. In partnership with regional stakeholders, the City will promote the expansion of Port operations and the growth of maritime support services. And through educational programs,

the City will better connect new jobs with New York City residents. The City will address the waterfront's legacy of disinvestment and contamination through targeted policies that promote adaptive reuse and cleanup and incentivize investment in shoreline infrastructure. In addition, the City will improve waterfront industrial areas through stronger environmental standards and better practices.

*Vision 2020's* 10-year strategies are complemented by the *New York City Waterfront Action*

*Agenda*, a set of projects chosen for their ability to catalyze investment in waterfront enhancement. The City commits to initiating these projects over the next three years and will be tracking progress on an ongoing basis. For each project, the lead agency and implementation year are noted.

Together, these strategies and projects lay out a comprehensive vision for the waterfront and waterways and a plan of action to achieve that vision.

## I. Maintain the robust activity in the Port of New York and New Jersey and at the Brooklyn and Staten Island marine terminal facilities.

### VISION 2020 STRATEGIES

- Support expansion of container shipping within the Port of New York and New Jersey.
- Support expansion of non-containerized shipping including break bulk (fruit), liquid bulk (fuel, food), dry bulk (aggregates, cement), and neo-bulk (vehicles) within the Port of New York and New Jersey.
- Support the completion of the Final Environmental Impact Statement (FEIS) related to the *Cross Harbor Freight Movement Project*, assessing the costs and benefits of different alternatives for improving rail freight in the East-of-Hudson region. This can include expansion of new landing areas, larger-capacity barges, and upland rail improvements to increase rail's modal share of freight shipments within the city.
- Support the Port Authority's efforts to improve navigation for large container vessels, including addressing air draft restrictions at the Bayonne Bridge as well as completing the 50-foot deepening of the region's main federal shipping channels.
- In coordination with NYC Department of Transportation and NYS Department of Transportation, determine the feasibility of creating dedicated truck routes for servicing marine terminals that avoid residential areas and provide direct, efficient access to the national highway network.
- Examine opportunities to expand Foreign Trade Zones designations to existing international marine gateways.

### ACTION AGENDA PROJECTS

- New York Container Terminal, Staten Island: Complete environmental review for expanding container-handling capacity, which will create approximately 300 jobs upon completion. (EDC, 2012)
- 65th Street Rail Yard, Brooklyn: Improve rail infrastructure to increase the use of the cross harbor rail freight system by leveraging public and private investments. (EDC, 2013)
- Replace and lower Anchorage Channel tap water siphons to facilitate deepening of the shipping channel. (EDC/DEP, 2011)
- Red Hook, Brooklyn: Market the container terminal as a distribution hub for containerized cargo destined for East-of-Hudson businesses. (EDC, 2011)
- Sunset Park, Brooklyn: Coordinate with the Port Authority on its Cross Harbor Freight Movement Project Environmental Impact Statement to ensure that transportation improvement alternatives fully account for expansion of container shipping. (EDC, 2012)

## 2. Promote the region's marine highways to move domestic and international goods within the city and throughout the region.

### VISION 2020 STRATEGIES

- Collaborate with partners in the NY-NJ-CT region to seek and leverage federal funding opportunities.
- Identify funding resources to develop necessary infrastructure and facilities.
- Consider using vessels that are capable of handling both freight and passengers.
- Analyze opportunities to make operations more cost-competitive with other freight modes.
- Support the goals of the *Solid Waste Management Plan* to move solid waste via waterways.
- Explore opportunities to move express-air cargo by water, potentially coupled with airport passenger ferry service.
- Strengthen waterborne freight services and intermodal connections to provide shippers with expanded service choices.
- Develop strategies to increase and enhance distribution centers within the city and explore opportunities to strategically locate these facilities in a manner that will increase transportation and energy efficiencies.
- Explore opportunities to increase waterborne freight deliveries to major waterfront retail centers.
- Study opportunities to provide sites for the waterborne deliveries of large items, such as construction materials, and evaluate feasibility of creating oversized landing zones with heavy lift equipment.

### ACTION AGENDA PROJECTS

- Establish task force on marine highways. (EDC, 2011)

## 3. Pursue a long-term dredged material management strategy to make New York City's waterways navigable for all forms of transport.

### VISION 2020 STRATEGIES

- Clarify role of various agencies in managing dredged material and establish project coordination.
- Work with state regulators to reclassify dredge as non-hazardous material, based on chemical analysis.
- Ensure New York Harbor receives fair share of federal funding for dredging projects.
- Develop the means to reduce the cost of dredging to NYC maritime firms and government agencies.
- Support bi-state partnership with New Jersey to bundle dredging projects of maritime firms to make dredging more cost-effective.
- Prioritize dredging projects to support industrial uses in navigable and formerly navigable channels.
- Develop a long-term strategy for placement of significant volumes of dredged material generated from public and private navigation projects. This could include expanding New York's placement capacity and identifying new sites to beneficially place non-HARS suitable material.

### ACTION AGENDA PROJECTS

- Establish task force on dredged material management. (EDC, 2011)

## 4. Analyze and promote policies to strengthen maritime support services and spur reinvestment in waterfront industrial areas.

### VISION 2020 STRATEGIES

- Evaluate the feasibility of the expansion of waterborne freight movement on City-owned property and promote its use where appropriate. Some potential locations are the Rossville site on the West Shore of Staten Island and Pier 6 at Bush Terminal in Brooklyn.
- Consider establishing maritime easements for the sale or long-term lease of public property where and when appropriate.
- Explore opportunities for providing additional bulkhead or pier frontage for tie-up space, including incorporating workboat tie-up space in non-industrial developments.
- Assess the possibility of maritime “hubs” to support workboat operations in geographically strategic areas. These hubs could consolidate maritime support activities and amenities such as repair, pump-out stations, restocking supplies, and refreshment.
- Explore measures to maximize operational efficiency and utilization of all existing repair facilities.
- Review Significant Maritime and Industrial Areas individually to determine the best approach to promoting and enhancing maritime businesses through land use, zoning, business incentive programs, and other policies.
- Work proactively with maritime businesses to identify financial assistance programs and workforce development programs.
  - Explore options to support academic institutions that train residents for careers in the maritime industry (SUNY Maritime College, Kingsborough Community College, the Urban Assembly New York Harbor School, and Seaman’s Institute).
  - Promote vocational training to increase the labor pool of city residents who are able to work in the maritime trades, particularly for skills that are in demand such as welding, machining, carpentry, cargo handling, truck and heavy equipment operating (Commercial Driving Licenses), and forklift operating.
  - Link local residents with new jobs in the maritime industry through City employment programs and coordination with local development corporations.
- Pursue changes to the existing NY State fuel tax structure that results in regionally cost-competitive fueling opportunities while also remaining revenue-neutral. (Currently New York City has no fueling facilities for workboats. New York State assesses taxes on diesel to the equivalent of 28 cents per gallon, while New Jersey assesses 17 cents per gallon.)
- Assist maritime businesses in navigating the environmental permitting processes to reduce uncertainty.

### ACTION AGENDA PROJECTS

- Brooklyn Navy Yard, Brooklyn: Complete replacement of bulkheads and pier and complete dredging to ensure long-term viability of maritime uses. (BNYDC, 2013)
- Red Hook, Brooklyn: Provide additional berthing locations to commercial vessels along the north side of Atlantic Basin. (EDC, 2011)
- Sunset Park, Brooklyn: Complete rehabilitation of South Brooklyn Marine Terminal to receive ships and barges, creating 400 new jobs. (EDC, 2012)
- Develop maritime skills apprentice program in partnership with SUNY Maritime College (EDC/SBS, 2011)
- Assist the Urban Assembly New York Harbor School’s efforts to have its Career and Technical Education program formally designated by the New York State Board of Regents, which will secure ongoing funding for training the city’s future maritime workforce. (DOE, 2011)
- Work with Brownfield Opportunity Area grant recipients, local communities, and elected officials in Significant Maritime and Industrial Areas (SMIAs) to examine existing conditions and strategies for remediation, redevelopment, and reuse. (DCP/OER, 2013)
- Establish task force to focus on mooring tie-ups, vessel repair capacity, and in-kind bulkhead replacement policies. (EDC, 2011)
- Revise zoning to encourage redevelopment and reuse of waterfront industrial sites by allowing greater flexibility to achieve certain goals, such as brownfield clean-up, adaptive reuse of outmoded buildings, expansion of maritime uses, and provision of in-water infrastructure. (DCP, 2013)

## 5. Promote environmentally sustainable practices, which will enhance not only waterfront industrial businesses but adjacent residential communities as well.

### VISION 2020 STRATEGIES

- Examine measures to better balance the needs of businesses and residents along the working waterfront, including:
  - Examine options to enact legal notice requirements for new residential developments near SMIA to protect maritime businesses from unwarranted lawsuits.
  - Establish building and urban design guidelines for new developments near SMIA to minimize impacts, such as noise, dust, and fumes, from nearby industrial activities.
  - Coordinate efforts among public agencies, nongovernmental organizations, and community groups to develop appropriate public access in working waterfront areas in a manner that does not compromise safety or operations. Such access can provide viewing and educational opportunities for the public, advertise job opportunities, and promote the importance of maritime industry.
  - Work with the Coast Guard and the Harbor Safety, Navigation, and Operations Committee to establish and enforce appropriate buffers adjacent to significant waterfront infrastructure for security and safety.
  - Undertake study of alternatives to current opaque fence zoning requirements in manufacturing districts.
- Establish a collaborative framework to identify contamination along the working waterfront and devise policies to improve environmental conditions in industrial areas and create cleaner maritime and industrial operations.
  - Work with public and private partners at the regional, state, and local level to assist maritime businesses in complying with regulation prohibiting direct discharge of grey-water, including finding locations for discharge, and investing in additional pump-out capacity.
  - Conduct study of existing zoning performance standards and enclosure regulations in manufacturing zones to establish regulations for open industrial uses, including the storage of chemicals and potentially hazardous materials, that are more protective of the environment and limit off-site impacts. This study should also examine performance standards and other measures to provide greater protections to nearby residential uses, recognizing the potential economic impact of such measures.
  - Create inventory and mapping of potentially hazardous materials based on available datasets and registries of particular industrial uses and storage of hazardous materials.
  - Work with state and federal partners to support and advance the Port Authority of NY & NJ's Clean Air Strategy.
  - Encourage the use of shore-based power sources for ships at dock—an operation known as "cold-ironing"—to reduce pollution from idling of diesel engines.
  - Seek federal funding to assist in the financing of port and infrastructure development projects that encourage environmentally sustainable operations.
- Pursue incentives for wider use of cleaner fuels. Align these programs with Environmental Protection Agency Emission Control Area regulations.

### ACTION AGENDA PROJECTS

- Study zoning and other regulations regarding open industrial uses to better control environmental impacts, particularly the discharge of pollutants into the city's waterways, odor, and airborne dust and debris. (DCP, 2013)
- Revise Waterfront Revitalization Program to clarify SMIA purpose and intent, review procedures, and strengthen water-dependent uses. (DCP, 2012)
- Establish task force on grey-water discharge prohibition. (EDC, 2011)



## GOAL 4

Improve water quality through measures that benefit natural habitats, support public recreation, and enhance waterfront and upland communities.

# IMPROVE WATER QUALITY

The waterways around New York sustain ecosystems and natural habitats for plants and animals. They provide for a range of recreational opportunities. They enhance the quality of life for New Yorkers and visitors alike. But the waterways can only continue to provide all of these benefits if advancements in water quality continue. Improved water quality is a desirable end in and of itself, as well as a means to many other objectives of *Vision 2020*.

Largely as a result of investment in public infrastructure, great progress has been made in water quality in New York Harbor. The 2009 *New York Harbor Water Quality Report* showed that the waterbodies surrounding the city are cleaner than they have been in 100 years. Of the 156 square miles on the New York side of the Harbor, 116 square miles, or approximately 75 percent of waters, are now clean enough for swimming. And nearly 30 square miles, or approximately 19 percent of the New York side of the Harbor, are classified for boating and recreational fishing. The city's smallest, most polluted tributaries—many of which support manufacturing and shipping—comprise less than 7 percent of the water area in the Harbor.

While advances in water quality have enhanced the health of the Harbor and led to an increase in public recreation, further improvements to water quality would provide even greater ecological value and additional public benefits. Continued improvements will require significant investment in cost-effective traditional infrastructure as well as new strategies for reducing pollution. These strategies, which the City has already begun to implement, include the use of green infrastructure to capture rainfall on typically impervious land areas—such as rooftops, parking lots, and streets—and efforts to restore natural systems that improve water quality, such as wetlands, submerged vegetation, and colonies of organisms that filter the water. As progress in water quality continues, the City will track improvements while increasing public awareness of conditions and suitable uses.

## SOURCES OF WATER POLLUTION

The pollution in New York City's waterways comes from a variety of sources. One source is contaminated stormwater runoff. Stormwater runoff occurs when rain or snowmelt flows over impervious surfaces rather than seeping into the ground. Runoff can pick up oils, grease, sediment, bacteria, debris, litter, and other pollutants and flow into a storm sewer, a combined sewer, or directly into coastal waters.

Another major source of pollution is combined sewer overflows (CSOs), the discharge of a mix of untreated sewage and stormwater runoff into the waterways. Two-thirds of New York City's sewerage areas have a combined sewer system that collects sewage and stormwater runoff from properties and streets together in the same lateral and interceptor sewers. When stormwater runoff enters the sewers during rainstorms, treatment plants can reach their capacity, and, as a result, mechanisms at interceptor sewers, called regulators, divert combined sewage and stormwater to the waterways. New York City's combined sewer system has 422 regulators that can discharge CSOs (see Figure 1, page 65).

Pollution in New York City's waterways also comes from chemical spills and leaching of chemicals from contaminated land within the city. Chemical spills—though now less prevalent than in the past because of better regulation—have over the years contaminated New York Harbor and its tributaries. Past industrial uses have left a legacy of contaminated sites along the waterfront, many of which have not yet been remediated.

Pollution can also reach New York City's waterways from sources beyond city boundaries. For example, contaminants from past industrial practices along the Hudson River and

other waterways are carried by currents into New York City's waterways. Air deposition of toxins from upwind coal-burning power plants has also compromised water quality here.

Water quality also depends on the strength of tidal flows and the mixing of surface and deep waters. Historic dredging, filling, or other changes to bathymetry (the shape of underwater terrain) have altered the hydrology within many of New York City's tributaries, in some cases limiting their ability to flush pollutants. For such areas, eliminating wastewater and CSO discharges alone would not result in significant improvements to water quality. These areas may require dredging and aeration to attain water quality goals.

## HISTORY OF WATER QUALITY IMPROVEMENT IN THE CITY

Before the City began building wastewater treatment plants (WWTPs) in the 1890s, untreated sewage was conveyed out of crowded neighborhoods and directly into the Harbor. As the near-shore waters became too polluted to use except by industrial and maritime enterprises—and as residents began to clamor for clean waterways—the City took action. It built the first wastewater treatment plants and a network of large pipes to intercept sewers at their former discharge points and to convey wastewater to the plants. The plants remove contaminants from wastewater and discharge treated effluent into the Harbor, leaving behind treated sludge that is disposed of or re-used elsewhere. Since the 1930s, New York City has been a national leader in the design and operation of wastewater treatment facilities, pioneering the use of modern treatment technology with the construction of the Coney Island Wastewater Treatment Plant in 1935. Three additional plants were constructed on

“What is water quality? Part of it is aesthetic—if you can see the bottom there's appeal to getting into the water. But from a public health standpoint, there's a question of whether you can use the water safely.”

—Rob Buchanan, long-time rower and cofounder of the New York City Water Trail Association

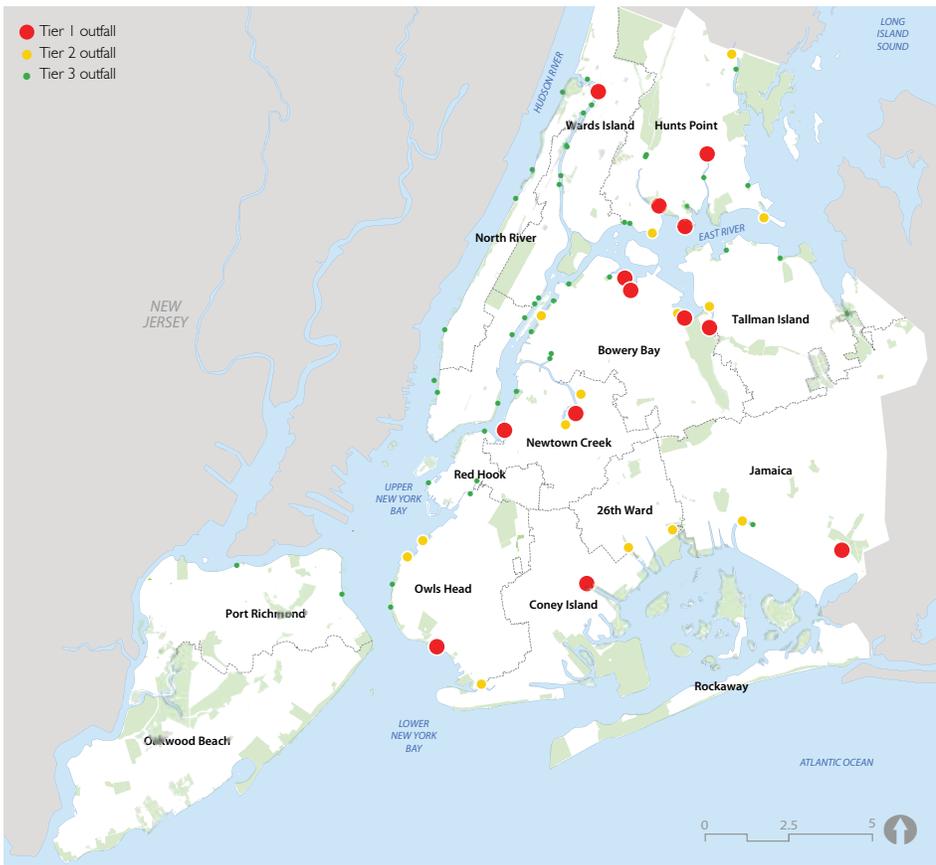


Figure 1: Wastewater Treatment Plant Drainage Areas and Combined Sewer Overflow Outfalls, classified by tiers depending on the volume of annual discharge.

the East River by 1938, and two plants near Jamaica Bay were operating by 1942. Five plants were completed during the next 10 years. In 1967, the Newtown Creek plant became the city's 12th and largest plant.

Spurred by passage of the Clean Water Act in 1972, federal funding, and growing environmental awareness, New York City continued to upgrade and expand its wastewater treatment system in the last quarter of the 20th century. Between 1979 and 1995, the Coney Island and Owl's Head plants were upgraded, and the City constructed the North River Wastewater Treatment Plant in Manhattan and the Red Hook plant in Brooklyn. Today New York produces, and its 14 WWTPs treat, more than 1.3 billion gallons of wastewater daily. The wastewater is collected through 7,400 miles of lateral sewers that flow downhill into large interceptor sewers, which lead directly to the plants, most of which are located on the waterfront. These WWTPs have the capacity to handle the city's wastewater on any dry-weather day.

Investments in infrastructure have improved Harbor water quality not only by increasing

the system's capacity, but also decreasing pollution caused by combined sewer overflows. Upgrades to wastewater treatment plants and sewers have allowed for the capture of a greater amount of overall CSO volume, from 30 percent in the 1980s to 73 percent today, and overflows are more dilute, with the percentage of sanitary waste decreasing from 30 percent in 1980 to 12 percent today.

The loss of heavily polluting industries on the waterfront has also contributed to improved water quality in New York Harbor. And the industries that remain have less of an impact on water quality due to stricter regulations. The Clean Water Act brought about better regulation of chemical use, storage, and disposal. New York State prevents leaks and spills at petroleum and chemical storage facilities through the Bulk Storage Program operated by the NYS Department of Environmental Conservation. Though the program has likely limited the occurrence of chemical dumping and spills, additional protections may still be needed, particularly in light of the rise in sea level and increased storms expected with climate change.

## STRATEGIES TO IMPROVE WATER QUALITY

Making additional improvements to water quality requires a multifaceted approach. Continued investment in infrastructure must be coupled with new, innovative solutions to cleanse our waterways. To reduce levels of bacteria and nitrogen and to improve dissolved oxygen levels in the Harbor and its tributaries, the City will continue to build new infrastructure while optimizing the existing system to treat wastewater and reduce combined sewer overflows. In addition, the City proposes to maximize the use of green infrastructure and other source controls to capture rainfall on impervious areas. Providing green space, trees, and other amenities that capture stormwater will enhance communities and further the City's sustainability efforts. The City will also continue to restore natural systems, which capture and filter pollutants, cleaning water while also providing habitat, recreation, and climate-adaptation benefits.

### Improving the City's Wastewater Treatment Systems

Building new infrastructure and optimizing the performance of the existing system to treat wastewater and reduce combined sewer overflows make up the largest portion of the City's multi-billion-dollar annual capital expenditure on water quality. The City is completing a \$5 billion upgrade to the Newtown Creek WWTP, which has already met compliance with the Clean Water Act's monthly 85 percent pollutant-removal requirement. This is the first time that all 14 of the City's WWTPs are meeting this standard.

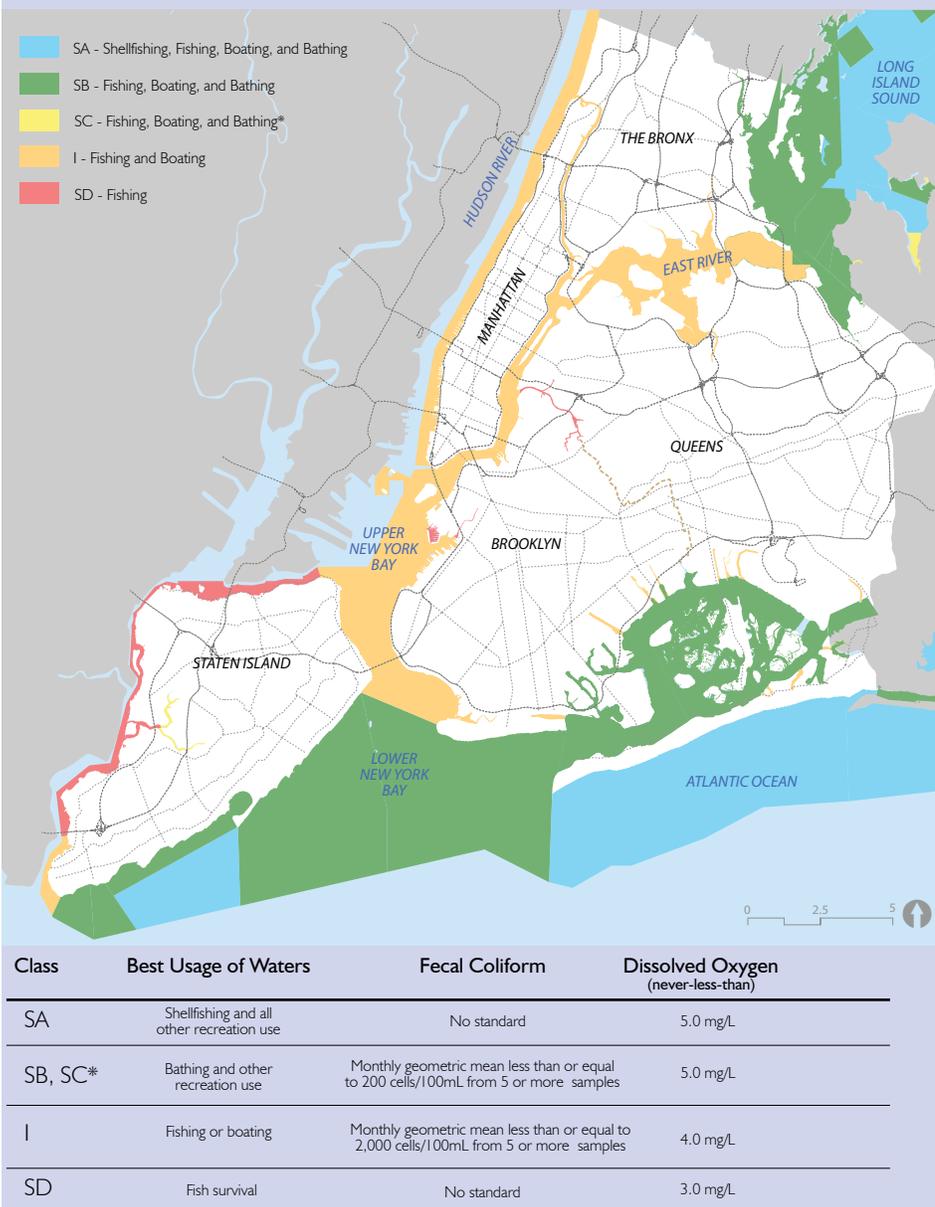
Over the next 10 years, the City will make significant improvements to wastewater treatment plants throughout the city to reduce nitrogen discharges. Upgrades at the 26th Ward, Coney Island, Jamaica, and Rockaway plants will reduce nitrogen discharges into Jamaica Bay by 50 percent, and improvements at the Bowery Bay, Tallman Island, Hunts Point, and Wards Island plants will reduce nitrogen discharges into the Upper East River by approximately 60 percent.

The City is also improving the ecology of waterbodies compromised by poor circulation and discharges from WWTPs, CSO outfalls, and storm sewers. These impaired tributaries include the Bronx River, Westchester Creek,

## Understanding Water Quality

Waterbodies in New York City are classified by the New York State Department of Environmental Conservation (DEC) according to their best uses (see Figure 2, below). Classifications indicate whether water is a source of drinking water or suitable for other uses, such as swimming, boating, fishing, and shellfishing. Best uses are identified by taking into consideration the physical, chemical, and biological characteristics of the water body and its use and value for wildlife protection and recreational, industrial, and navigational purposes. For each classification, DEC sets standards for levels of fecal coliform (a type of bacteria) and dissolved oxygen. Bacteria concentrations are most important for human health, and are measured in the Harbor as indicator organisms to show the presence of sewage wastes in water and the possible presence of pathogenic (disease-producing) bacteria. Their presence suggests that swimming and eating shellfish might be a health risk. Dissolved oxygen concentration is a universal indicator of overall water quality. Dissolved oxygen is critical for respiration of most aquatic life forms; its presence in the water is most important for determining habitat and ecosystem conditions.

Figure 2: New York City Waterbody Classifications and Standards



\* Other factors may limit the use of these waters for boating or bathing.

and Hutchinson River in the Bronx; Flushing Bay and Creek, Bergen Basin, and Thurston Basin in Queens; Newtown Creek along the Queens/Brooklyn border; and the Gowanus Canal, Coney Island Creek, Paerdegat Basin, and Fresh Creek in Brooklyn.

In the Gowanus Canal, for instance, the City is addressing stagnant water, high nutrients, and odor through a multi-pronged improvement plan that includes reducing CSOs, repairing and upgrading the flushing tunnel that brings more oxygen-rich water from the Buttermilk Channel into the Canal, and installing a pumping station and interceptor sewer. High-level storm sewers within a 48-acre section of the Gowanus Canal drainage area are also being constructed to limit CSOs and alleviate street flooding. In addition, the City is dredging the head end of the Canal to remove sediments and improve tidal circulation. In total, these investments will lead to a 30 percent reduction in CSOs.

City efforts also focus on Newtown Creek. The City is developing the Newtown Creek Waterbody/Watershed Facility Plan and constructing an aeration system in the Lower English Kills section of Newtown Creek to improve dissolved oxygen levels on hot summer days. The aeration system will be extended to East Branch and Dutch Kills. In addition, separate sanitary and storm sewers within a 60-acre section of the Newtown Creek drainage area are being constructed. Finally, the City is cooperating with the Environmental Protection Agency and the NYS Department of Environmental Conservation in ongoing data collection and investigations for the Gowanus Canal and Newtown Creek Superfund cleanup efforts, which focus on contaminated sediments beneath these waterbodies.

## NYC Green Infrastructure Plan

While continuing to invest in traditional, or grey, infrastructure, the City is implementing measures to maximize the use of green infrastructure and other source controls to reduce stormwater runoff from new and existing development. Unveiled by Mayor Bloomberg and the Department of Environmental Protection (DEP) in September 2010 and subject to regulatory negotiations and approvals, the *NYC Green Infrastructure Plan* marks a departure from conventional and expensive approaches to stormwater management. Under the current grey infrastructure plan, the City would invest \$6.8 billion in infrastructure throughout

NYC Department of Environmental Protection



An enhanced tree pit, left, and swale, right, manage stormwater efficiently and also green neighborhoods.

## The Benefits of Green Infrastructure

Green infrastructure encompasses cost-effective measures that collect and treat stormwater using natural, passive systems. These measures include blue roofs and green roofs, which use mechanical devices or vegetation to prevent roof water from draining too quickly and overwhelming storm sewers; porous pavement for parking lots that allows water to seep through it and be absorbed into the ground rather than running off into the sewer system; tree pits and streetside swales (ditches) that allow water to pool in underground holding areas until it can dissipate in the ground or be absorbed by plants; wetlands and swales for parks; and rain barrels in some residential areas. In addition to being more cost-effective, many of these green infrastructure strategies provide benefits that traditional grey infrastructure does not, such as cooling the city, reducing energy use, cleaning the air, and increasing property values.

the city, paid for with New York City Municipal Water Finance Authority Bonds, which are repaid through residential and commercial water bills. The *NYC Green Infrastructure Plan*, on the other hand, proposes investing \$2.9 billion in cost-effective grey infrastructure and \$2.4 billion in green infrastructure—a total of \$5.3 billion. Funding would include \$900 million from new private development, bringing the total savings for the city’s water customers to \$2.4 billion (see Figure 3). Enhanced regulations and standards for onsite stormwater detention and infiltration will be incorporated into the designs for new construction projects.

The *NYC Green Infrastructure Plan* proposes to capture the first inch of rainfall on 10 percent of the impervious areas in CSO watersheds over the next 20 years. It recommends doing this by replacing the existing approach to reducing CSOs—which relies solely on traditional investments like holding tanks and tunnels—with a mix of cost-effective traditional infrastructure and green infrastructure. The City is constructing major storage facilities to reduce CSOs at Paerdegat Basin, Alley Creek, and Flushing Creek. The City is also launching a comprehensive citywide program to increase optimization of the existing system. The program includes

drainage plans, the survey and rehabilitation of 149 miles of interceptor sewers, the inspection and repair of tide gates, and measures to prevent grease from obstructing the sewers.

Green infrastructure will be installed in the city’s combined sewer drainage areas, including in the South Bronx, Flushing, northeastern and southeastern Queens, and the area around the Gowanus Canal. A number of pilot projects are already under way and being monitored by DEP at the Bronx River Houses; P.S. 118 in St. Albans, Queens; and a large highway median on North and South Conduit Avenues in Queens. Other steps to begin early implementation of the *NYC Green Infrastructure Plan* include establishing a Green Infrastructure Fund (to supply capital and maintenance funds for the incorporation of green infrastructure in planned capital projects) and the Green Infrastructure Task Force (an interagency group charged with incorporating stormwater management into roadway, sidewalk, and other capital projects, and providing for the maintenance of green infrastructure).

### Bluebelts

The Staten Island Bluebelt is a leading example of how the City has been restoring natural ar-

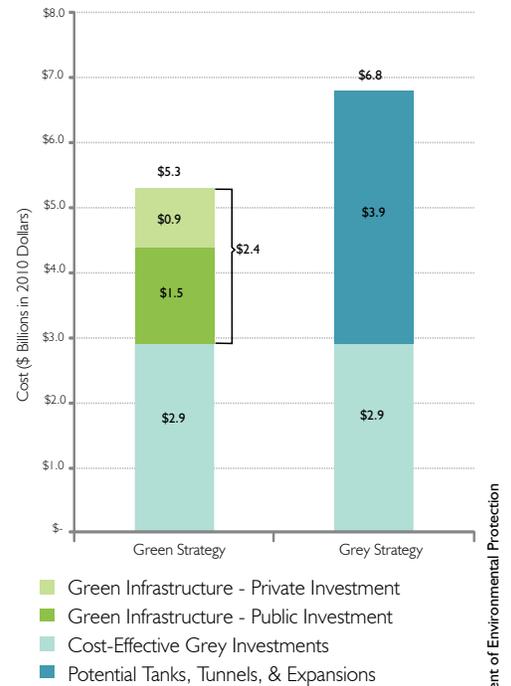


Figure 3: Comparison of the citywide cost of controlling CSOs through green and grey strategies (after 20 years).

reas to improve water quality. This program provides ecologically sound and cost-effective stormwater management for most of the South Shore of Staten Island by preserving and enhancing streams, ponds, and wetland areas so that they convey and store stormwater and filter pollutants from the water. At the same time, the Staten Island Bluebelt provides important community open spaces and diverse habitats. Since the inception of the program, the City has purchased approximately 325 acres of wetland and has spent more than \$300 million building sewers on the South Shore plus \$50 million for drainage improvements and wetland restoration. The current Bluebelt system drains 10,000 acres, comprised of 15 watersheds in southern Staten Island plus the Richmond Creek watershed. The Bluebelt system features special drainage facilities—52 of which are constructed and in operation—that protect natural wetland areas from uncontrolled storm sewer discharges. The Bluebelt strategy has saved the city tens of millions of dollars on traditional grey infrastructure.

The City is expanding the Staten Island Bluebelt into the mid-island area. The City is acquiring land for the New Creek Bluebelt, estimated to drain a watershed of 1,700 acres.



BioHabitats (3)

In pilot studies to improve water quality and create habitat in Jamaica Bay, eelgrass and mussels are being planted and monitored.

Land is also being acquired for two other mid-island Bluebelts—South Beach and Oakwood Beach. Together Bluebelt drainage systems will accept stormwater from a third of Staten Island's land area.

The City is also applying the Bluebelt concept in Queens and the Bronx. Wetlands and other natural features will be utilized for stormwater management at Baisley Pond Park and Springfield Park in Queens and at Van Cortlandt Lake in the Bronx. The Springfield Park project will direct stormwater through a system of stormwater management measures and open water in Springfield and Idlewild parks before discharging into Jamaica Bay.

### Jamaica Bay Watershed Protection Plan

Jamaica Bay, one of the greatest natural resources in the New York metropolitan area, has been another area of concerted effort by the City. Over the last 150 years, wetlands around the Bay have been lost as a result of extensive filling operations; shorelines have been hardened and bulkheaded to stabilize and protect existing communities and infrastructure; deep channels have been dredged for navigation and fill, altering bottom contours and affecting flows; and natural tributaries have essentially disappeared, leaving behind deposits of silt and particulates from urban runoff. Since 2002, the City has made upgrades at the four WWTPs and associated sewer systems that surround the Bay. In addition, the City has invested \$37.4

million to reclaim more than 440 acres of environmentally sensitive land adjoining Jamaica Bay, including the Pennsylvania and Fountain Avenue landfills. In 2007, the Department of Environmental Protection prepared the *Jamaica Bay Watershed Protection Plan*, which provides a comprehensive framework for improvements in water quality, ecological restoration, and the enhancement of valuable natural resources.

Under the plan, the City will continue to improve wastewater infrastructure in areas surrounding Jamaica Bay. In the Rockaways and other parts of Southeast Queens that are often subject to street flooding during heavy rains and high tides, the City is installing storm sewers to quickly convey stormwater runoff to points of discharge along the waterfront.

The *Jamaica Bay Watershed Protection Plan* laid the groundwork for restoration projects that are being piloted in and around the Bay to filter pollutants such as nitrogen, other nutrients, and particulate organic matter, and to provide shelter and habitat for fish and shellfish. Two oyster pilot studies are under way: the design and implementation of an oyster bed off Dubos Point, Queens, and the placement of oyster reef balls (man-made structures that create habitat) in Gerritsen Creek, Brooklyn. The oyster studies will evaluate whether climatic and environmental conditions in the Bay are suitable for oyster growth and reproduction. DEP is also undertaking a pilot study at Fresh Creek involving ribbed mussels. The study will monitor mussel growth to measure whether ribbed mussels

are effective at removing nutrients and particulate organic matter from the water. Eelgrass, a type of submerged aquatic vegetation important for a number of fish and shellfish species, is being reintroduced in a pilot study to evaluate the potential for widespread restoration of eelgrass in the Bay. In another pilot study, DEP skimmer boats were used to harvest sea lettuce to improve water quality and environmental conditions in selected areas of Jamaica Bay. Finally, an algal turf scrubber is being piloted at the Rockaway WWTP. This mechanical device is used to harness the natural abilities of algae to remove pollutants from water; the harvested algae is processed into butanol, a high-quality fuel that can be put right into a gas tank.

To continue to improve overall water quality and mitigate marshland loss in Jamaica Bay, the City will restore wetlands and implement projects to improve ecological productivity. These projects include dredging the Bay and its tributaries, additional ecological restoration pilot projects, and remediation of nearly 100 acres of environmentally sensitive land adjoining the Bay. In June 2010 DEP launched an enhanced water-testing program in Jamaica Bay, increasing the number of sampling sites from 13 to 20 and expanding the monitoring parameters to include biotic and ecosystem measures such as the number of bird and animal species and the rate of growth or decline of wetlands, eelgrass beds, and other key habitat.



NYC Department of Parks & Recreation

William T. Davis Wildlife Refuge adjacent to Freshkills Park on Staten Island.

## IMPLICATIONS OF WATER QUALITY FOR RECREATION

As water quality improves, recreational use of the waterways grows. Today, most areas in the Harbor are safe for recreation, and most of the time water quality is acceptable for recreation. However, recreational users must be aware that short-term spikes in bacteria levels may occur after heavy rains due to CSOs.

The City's 14 miles of designated bathing beaches are far from CSO outfalls or are in places with undisturbed shorelines and strong tidal flows. The City encourages people to use these beaches—which were able to accommodate 7.7 million visitors in 2009. The New York City Department of Health has a vigorous monitoring and advisory system to protect bathers at these beaches from pathogen infection, and this system is integrated with the City's 311 system and an email notification system to provide timely information to the public. The City does not recommend swimming or direct contact with the water outside those official areas.

### Increasing Public Awareness

The City aims to increase public awareness of water quality and the risks of exposure to polluted water. To provide the public with information on CSOs, DEP is installing signs on the water side and land side of all 422 outfalls, and has recently upgraded its signs. The new signs are easier to read from a distance, have clearer

warnings about CSOs, and have graphic images to clearly convey unambiguous warnings—understandable to English and non-English speakers alike. In addition, DEP is updating its website to provide timely information on water quality conditions.

Each year, with the publication of the *New York Harbor Water Quality Report*, commonly referred to as the Harbor Survey, the City routinely provides significantly more information on water quality (available to the public on DEP's website). In 1909 the Harbor Survey collected data on only five parameters and took samples from 12 sampling stations. Today, data is collected on more than 20 parameters and sampling is done at 85 stations. The Harbor Survey synthesizes the data collected from approximately 8,000 water samples. Going forward, the public will be able to obtain information on water conditions from an increased number of monitoring stations across the Harbor and sampling sites at the mouths of key tributaries.

In addition, data will be available from more robust monitoring in Jamaica Bay and the Hutchinson River. Finally, analysis of data and modeling of anticipated water quality improvements associated with *NYC Green Infrastructure Plan* projects will be forthcoming and made available in public reports associated with CSO Long Term Control Plans.

# Improve Water Quality: Strategies and Projects

Improving water quality is an essential goal in and of itself that will further many of the other goals of *Vision 2020*. It will enhance the Blue Network by encouraging biodiversity and allowing natural areas to flourish. It will provide for water recreation. And the use of innovative stormwater strategies will help create greener, more livable neighborhoods as well as increase climate resilience.

To realize this goal, the City will pursue the following set of strategies over the next 10

years. While continuing to make improvements to grey infrastructure (such as wastewater treatment plants and sewer systems), the City will also invest in green infrastructure and other projects that utilize the ability of natural systems to absorb and filter water. Finally, the City will work to promote the safe enjoyment of New York's waterways through improved monitoring, notification systems, and education.

*Vision 2020's* 10-year strategies are complemented by the *New York City Waterfront Action*

*Agenda*, a set of projects chosen for their ability to catalyze investment in waterfront enhancement. The City commits to initiating these projects over the next three years and will be tracking progress on an ongoing basis. For each project, the lead agency and implementation year are noted.

Together, these strategies and projects lay out a comprehensive vision for the waterfront and waterways and a plan of action to achieve that vision.

## 1. Build new cost-effective grey infrastructure and optimize existing systems to meet goals for water quality throughout the city.

### VISION 2020 STRATEGIES

- Reduce nitrogen discharges through improvements to wastewater treatment plants.
- Improve pathogen and dissolved oxygen levels by reducing combined sewer overflows and other discharges, and improving aeration and flushing of constrained waterbodies.
- Optimize the existing sewer systems through improvements to drainage, interceptors, and tide gates.

### ACTION AGENDA PROJECTS

- Continue major upgrades at wastewater treatment plants by investing \$1.6 billion (projects listed on facing page).
- Build cost-effective grey infrastructure to manage CSOs and improve waterfront areas (projects listed on facing page).
- Launch comprehensive program to build on improvements to existing wastewater systems, including surveying and improving 136 miles of inceptor sewers; inspecting and repairing tide gates; and developing programs to prevent grease from obstructing sewers. (DEP, 2012)

## 2. Maximize the use of green infrastructure and other source controls to capture rainfall on impervious surfaces, helping reduce combined sewer overflows and other discharges.

### VISION 2020 STRATEGIES

- Commence implementation of the *NYC Green Infrastructure Plan*, which provides an alternative approach to improving water quality through stormwater-management technologies, such as roadside swales and enhanced street tree pits, subject to regulatory approval.
- Build green-infrastructure demonstration projects on a variety of land uses.
- Develop a Green Infrastructure Fund to supply capital and maintenance funds for the incorporation of green infrastructure in planned capital projects.
- Establish the Green Infrastructure Task Force, an interagency partnership to incorporate stormwater management into roadway, sidewalk, and other capital projects and to provide for the maintenance of green infrastructure.
- Develop approved specifications for green infrastructure in commonly used applications.
- Streamline design and permitting processes for the incorporation of green infrastructure in public projects.
- Engage in watershed-level planning to develop annual spending plans for green infrastructure.

### ACTION AGENDA PROJECTS

- Complete construction of and monitor green-infrastructure pilot projects that promote more efficient rainwater capture (projects listed on facing page).
- Capture the first inch of rainfall on 10 percent of impervious areas in combined sewer watersheds over 20 years by implementing green infrastructure in capital projects. (DEP/SCA/DCAS/DDC/DOB/DOE/DOT/DPR/EDC/HPD/Law Department/NYCHA/Mayor's Office/OMB/SBS/ TGI, 2011 +)

### 3. Restore natural systems to improve ecological productivity, reduce pollution, and provide habitat, recreation, and climate-adaptation services.

#### VISION 2020 STRATEGIES

- Expand the Bluebelt in Staten Island, Queens, and the Bronx.
- Restore wetlands habitat in and around Jamaica Bay.
- Pilot additional ecological-restoration projects in Jamaica Bay.

#### ACTION AGENDA PROJECTS

- Mid-Island Bluebelt, Staten Island: Negotiate acquisition of 123 acres at New Creek, South Beach, and Oakwood Beach. (DEP, 2011)

### 4. Improve monitoring and public awareness of water quality.

#### VISION 2020 STRATEGIES

- Enhance water quality testing in Jamaica Bay, increasing the number of sampling sites, and monitoring combined sewer overflow (CSO) abatement measures in select tributaries.
- Refine DEP models to include new data on impervious cover and extending predictions to ambient water quality.
- Install signs on the water side and land side of all 422 CSO outfalls, using new signs that are clearer and easier to understand.
- Overhaul DEP's website notification system so that members of the public can check to see where CSOs are likely.

#### ACTION AGENDA PROJECTS

- Install new CSO outfall signs, enhance CSO website notification, and increase water quality sampling sites. (DEP, 2011)
- Develop comprehensive water use, navigation, and access policy. (Mayor's Office/ DEP/ DOHMH/ DPR/DCP/EDC, 2011)

## Waterfront Action Agenda Projects to Improve Water Quality

Continue major upgrades at wastewater treatment plants by investing \$1.6 billion:

- o Jamaica Bay, Brooklyn/Queens: Complete installation of nitrogen-control technologies at wastewater treatment plants, reducing nitrogen by 50% over next 10 years. (DEP, 2013)
- o Newtown Creek, Brooklyn/Queens: Upgrade Newtown Creek Wastewater Treatment Plant to attain Clean Water Act Secondary Treatment Standards and expand wet weather capacity to 700 million gallons. (DEP, 2013)
- o Tallman Island, Bowery Bay, Wards Island, and Hunts Point: Make improvements at wastewater treatment plants, reducing nitrogen discharge into the East River by approximately 40%. (DEP, 2013)

New cost-effective grey infrastructure to manage CSOs and improve waterfront areas:

- o Paerdegat Basin, Brooklyn and Alley Creek, Queens: Complete new CSO storage facilities. (DEP, 2011)
- o Willets Point, Queens: Break ground on sanitary sewers and outfall controls. (EDC, 2013)
- o Coney Island, Brooklyn: Complete design and begin construction of first phase of separate sanitary and storm sewer upgrades. (DEP, 2013)
- o Newtown Creek, Brooklyn/Queens: Design and construct aeration system in Lower English Kills to meet DEC water quality criteria. (DEP, 2013)
- o Newtown Creek, Brooklyn/Queens: Design and begin construction of separate sanitary and storm sewers within a 60-acre section of the drainage area. (DEP, 2013)
- o Gowanus Canal, Brooklyn and Avenue V/Coney Island Creek, Brooklyn: Complete pump station and force main. (DEP, 2013)
- o Gowanus Canal, Brooklyn: Complete the upgrade and reactivation of the flushing tunnel from Buttermilk Channel. (DEP, 2013)
- o Gowanus, Brooklyn: Design and begin construction of the first phase of high-level storm sewers within a 48-acre drainage area to reduce CSOs in Gowanus Canal as well as street flooding and sewer backups in adjacent neighborhoods. (DEP, 2013)
- o Gowanus, Brooklyn: Participate in ongoing reviews of remedial investigation results and feasibility study for EPA's cleanup of Gowanus Canal. (DEP, 2012)

Green infrastructure pilot projects (DEP, 2011):

- o Bronx, Brooklyn, and Queens: Monitor effectiveness of constructed "blue roof" pilot projects to minimize runoff impacts.
- o Brooklyn and Queens: Complete construction and install permeable pavement pilot projects at municipal parking lots.
- o Queens: Monitor stormwater capture tree pits and street design pilot projects.
- o Queens: Transform the North and South Conduit Avenues median into a natural water filter and bio-retention area.



## GOAL 5

Restore degraded natural waterfront areas, and protect wetlands and shorefront habitats.

# RESTORE THE NATURAL WATERFRONT

New York City today is a largely man-made environment of buildings, streets, and sidewalks. But it's also situated at the center of an important estuary. The Hudson-Raritan Estuary, which the U.S. Congress has recognized as an estuary of national significance, encompasses complex and diverse habitat assemblages that thrive at the interface of saltwater and freshwater. Ecosystems within the estuary provide stopover points for migratory birds and homes for creatures ranging from oysters to fiddler crabs.

Much of the city's natural waterfront consists of wetlands, the biologically rich area where water and land meet. Wetlands are foraging and breeding sites for shorebirds, fish, and invertebrates. They act as natural filtration systems, retaining stormwater runoff and trapping pollutants that would otherwise contaminate waterways. And they mitigate storm surges by absorbing the impact of waves. Other parts of the natural waterfront—beaches, bluffs and dunes—provide habitat for shorebirds and native plants and help protect buildings and infrastructure from wave action. Submerged lands in shallows and open water are also important foraging and breeding grounds for marine and avian species. All these landscapes are valuable assets, advancing biodiversity and performing services vital to New York City.

But many natural areas are in jeopardy. Wetland and associated habitat loss is a serious threat across the Estuary as a result of landfill, rising sea levels, introduction of non-native species, as well as altered sediment transport and tributary flow. Estimates of total tidal wetland loss range from 83 to 86 percent. Only 14 of the original 86 to 100 square miles of wetlands remain.

To improve degraded areas and create new

habitat, an active approach to managing ecological functions and values is necessary. The City must not only protect natural resources; it must actively restore them.

Significant restoration projects have been under way in New York City for some time. Restoration methods for some impaired waterfront ecosystems, including many types of tidal marsh, are well established and are being implemented on a large scale. Other types of restoration strategies need additional pilot studies, monitoring, and evaluation as the science and practice of ecological restoration evolves.

## SPECIAL PROTECTIONS FOR NATURAL AREAS

In New York City, there are three main regulatory programs that target the protection of natural areas: the Special Natural Waterfront Areas, the Significant Coastal Fish and Wildlife Habitats, and the Coastal Erosion Hazard Areas (see Figure 1, page 75). These programs protect natural resources within specified areas (which in some cases overlap) primarily through enhanced review of projects proposed in these areas.

The three Special Natural Waterfront Areas (SNWAs) are large areas of complex waterfront habitats and natural resources, established as a result of recommendations in the 1992 *Comprehensive Waterfront Plan*. The City designated and mapped the Jamaica Bay SNWA, the Northwest Staten Island SNWA, and the Upper East River-Long Island Sound SNWA as part of the Waterfront Revitalization Program, seeking to counteract fragmentation and loss of habitat through environmental protection and ecological restoration. When a project in the coastal zone requires a discretionary permit, the review

includes an assessment of the project's potential impact on the SNWA. However, despite the SNWA program, and despite extensive restoration projects since 1992, the health of these natural areas is still in the balance. Active management and intervention is necessary to help these areas flourish as diverse and healthy ecosystems.

The mapping of the SNWAs was largely based on the New York State Department of State Significant Coastal Fish and Wildlife Habitats, a designation indicating that a given area plays an important role in the lifecycle of wildlife species. There are 15 designated areas in New York City containing significant coastal fish and wildlife habitat. A project within a Significant Coastal Fish and Wildlife Habitat requires an assessment of its impacts on habitat.

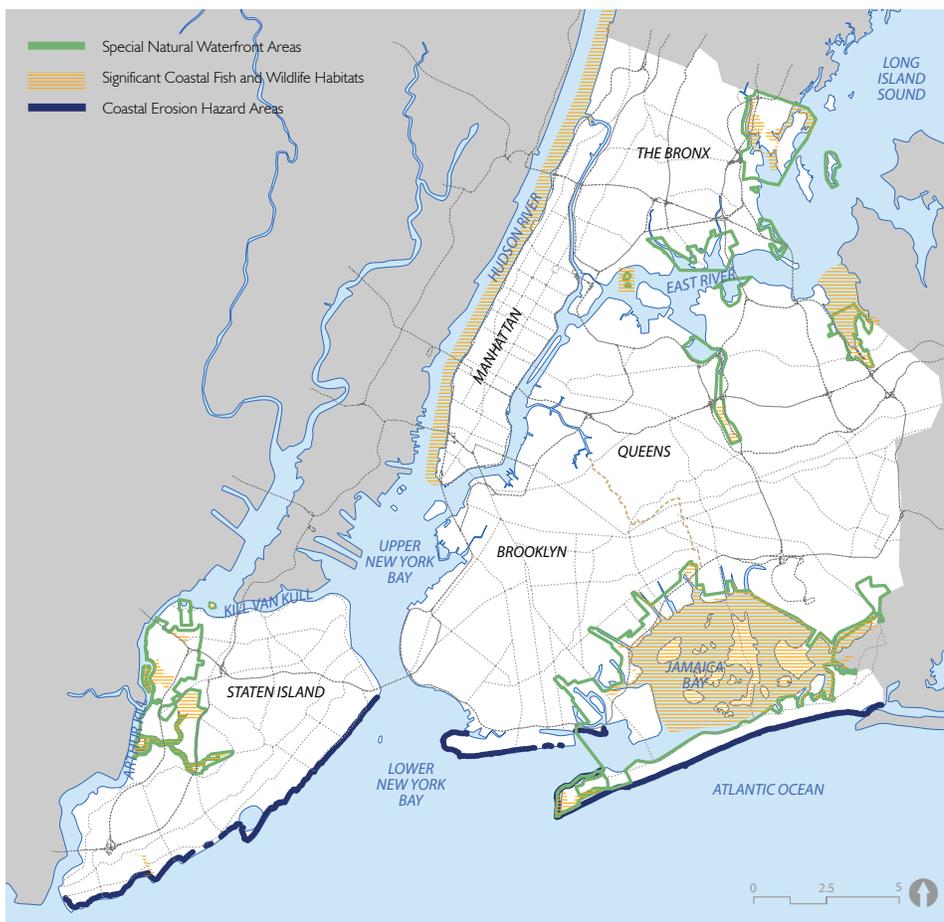
The Coastal Erosion Hazard Areas program of the New York State Department of Environmental Conservation maps shoreline stretches susceptible to erosion. Waterbodies can cause erosion of the coastline through wave action, currents, tides, and wind-driven water and ice; construction and shipping activities can also be factors. Erosion can result in extensive damage to publicly and privately owned property and to natural resources, and it can also endanger lives. Developments within the Coastal Erosion Hazard Areas are required to obtain permits to make certain that the projects are undertaken in ways that minimize property damage and prevent the exacerbation of erosion hazards.

## Status of the Jamaica Bay SNWA

Located in Brooklyn and Queens, Jamaica Bay is one of the most productive ecosystems in the northeastern United States and contains the largest tidal wetland complex in the New York metropolitan area. The Jamaica Bay SNWA, which covers all of the Bay, encompasses coastal woodlands, maritime shrublands, grasslands, freshwater wetlands, brackish marsh, salt marsh, and open water. A little over half of the Bay is in the Jamaica Bay unit of Gateway National Recreation Area, which includes the Jamaica Bay Wildlife Refuge—the only national wildlife refuge accessible by subway and bus.

"You look out at the Harbor and you see the flat surface. But just as there is a riot of activity on the streets of Manhattan, there's a swirl of activity beneath the surface of the water—from giant sturgeon all the way down to the tiniest little creatures that form the base of the food chain."

—Clay Hiles, Executive Director, Hudson River Foundation



NYC Department of City Planning, NYS Department of State, NYS Department of Environmental Conservation

**Figure 1: Special Natural Waterfront Areas, Significant Coastal Fish and Wildlife Habitats, and Coastal Erosion Hazard Areas.**

The Bay is an important habitat for wildlife, with more than 100 species of fish, a number of endangered species (including the peregrine falcon, piping plover, and the Atlantic Ridley sea turtle), and 214 “species of special concern.” More than 325 species of birds have been sighted in the Bay, which serves as an important stopover point on the Atlantic Flyway migration route for nearly 20 percent of the birds on the continent.

One of the most serious issues facing Jamaica Bay is the rapidly accelerating rate of marsh fragmentation and loss. The rapid decline of Jamaica Bay’s iconic marsh islands can be attributed to many factors. Hardening of the coastline, pollution, alterations due to dredging, sediment deprivation, tidal changes, sea level rise, and the loss of freshwater tributaries have all contributed to wetland degradation over the past 150 years, with marshland loss accelerating in the last 20 years.

The City and other partners are investing millions of dollars in actively restoring the wet-

lands of Jamaica Bay. Habitat restoration in and along Jamaica Bay has been part of a comprehensive strategy by the Department of Environmental Protection (DEP) to improve water quality while creating productive ecological areas (as put forth in the *Jamaica Bay Watershed Protection Plan*). DEP infrastructure improvement projects have incorporated restoration. The ecological restoration of Paerdegat Basin is part of DEP’s current efforts to treat and capture combined sewer overflows to improve water quality within the basin. This project entails the restoration of tidal wetlands and indigenous coastal vegetation and the construction of an Ecology Park. The Ecology Park will provide access to salt marsh, intertidal mudflats, grassland, and shrublands, and it will also offer educational exhibits about coastal habitats.

In addition, DEP has led several restoration projects on the perimeter of Jamaica Bay, including the closure and remediation of the Pennsylvania Avenue and Fountain Avenue landfills. These inactive hazardous waste sites are being

transformed into safe, productive, and usable open space. DEP’s ecological restoration plan for these properties is consistent with and will enhance the existing natural features of Jamaica Bay. This project, which involves the planting of 30,000 trees and shrubs and more than 400 acres of coastal grasslands, is the largest restoration of its type in the city. The former landfills will provide significant habitat improvements for the Bay and in time will become regional seed sources to disseminate plant species to other parts of the New York metropolitan area. In addition, the end-use design plan, developed with input from local community groups, may include opportunities for public access.

### Status of the Northwest Staten Island SNWA

The northwest shore of Staten Island is a diverse landscape of habitat assemblages interspersed with industrial areas. Because this SNWA is adjacent to the Kill Van Kull Significant Maritime Industrial Area, it poses tough challenges that require creative solutions.

The Northwest Staten Island SNWA is bounded by the Kill Van Kull and Newark Bay to the north, the Arthur Kill to the west, residential zones to the east, and Fresh Kills to the south. This area may boast the most diverse array of wetland types in the city, including salt and freshwater meadows, spring-fed ponds, forested swamps, creeks, and salt marshes. Wooded upland areas abut tidal complexes, supporting avian species, amphibians, reptiles, and mammals.

Northwest Staten Island became known as the Harbor Heron’s Complex in the 1990s when shorebird populations peaked in the area. “Harbor Herons” was a blanket term given to a group of avian species that captured public attention including the great egret, snowy egret, black-crowned night heron, and glossy ibis. After virtually disappearing from the New York Harbor area, these shorebirds began to appear again with the improvement in water quality brought about by the Clean Water Act. Three islands in the SNWA were prime nesting sites: Shooter’s Island, Prall’s Island, and the Isle of Meadows. However, in recent years, Harbor Herons have abandoned the three islands, according to monitoring by the New York City Audubon Society in cooperation with the Department of Parks & Recreation (DPR). Deforestation on Prall’s Island, due to infestation by the invasive Asian longhorned tree beetle, have



Arlington Marsh on Staten Island.

compromised this island as a nesting site.

Despite the decline of Harbor Herons in Northwest Staten Island, other vibrant avian populations still occupy this SNWA. Nearby wooded areas and swamps with tidal and freshwater wetlands are prime foraging sites for shorebirds. Surveys by DPR have shown Graniteville Swamp to be a resting site for migrating songbirds, and more than 100 bird species have been observed nesting or feeding in Arlington Marsh, though large portions of Arlington Marsh were contaminated by industry and the ecosystem is highly disturbed.

Fresh Kills was originally the largest tidal wetland complex in the region. However, this site became the Fresh Kills Landfill in the early 1950s. At the time of its closure in 2001, Fresh Kills was the biggest municipal landfill in the world—four mounds of refuse occupying 2,200 acres. The City is transforming the former landfill site into Freshkills Park. The first portion of the park will open in 2011, with full build-out occurring in phases over the next 30 years. The park is being designed to include natural corridors that connect to the Staten Island Greenbelt. Stormwater drainage basins within the site have already begun to take on the characteristics of freshwater wetlands.

Bordering the northeast edge of Freshkills Park, William T. Davis Wildlife Refuge is a diverse tidal wetland complex spanning 260 acres. It contains salt meadow, low marsh, swamp for-

est, and spring-fed ponds. More than 117 bird species have been observed on this site.

### Status of the Upper East River-Long Island Sound SNWA

This SNWA encompasses parts of the north shore of Queens and the southeastern shore of the Bronx, along the Upper East River and Long Island Sound. Pockets of salt marsh along inlets, coves, and islands dot a rocky intertidal coastline. Sections of armored riprap retain hundreds of acres of fill. On the south side of the Sound, in Queens, significant salt marshes exist at Alley Pond Park (the site of salt marsh restoration over the past 10 years) and Udalls Cove. Alley Pond Park and Udalls Cove are two of the six Significant Coastal Fish and Wildlife Habitats in this SNWA; Meadow and Willow Lakes, Little Neck Bay, Pelham Bay Park, and North/South Brother Islands are the others. The large expanse of freshwater at Willow and Meadow Lakes, the result of extensive landfill on former salt marsh, still has a tidal connection through the permeable tide gates on Flushing Creek.

Thousands of acres of salt marsh, tidal channels, and mud flats once characterized the Bronx shoreline, on the north side of the Upper East River. Most of these areas were filled in by the 1950s. Existing tidal wetlands are concentrated in Pelham Bay Park along Goose Creek Marsh on the Hutchinson River. There are thin fringes of low marsh vegetation at the southern end of

Soundview Park and Ferry Point Park, and to a greater extent at Castle Hill and Pugsley Creek Parks. Westchester Creek, once also bordered by salt marsh, has almost no remaining tidal vegetation, having been heavily developed for industrial uses. This and other tidal creeks on the south and north sides of the Sound and Upper East River receive combined sewer discharges.

The Harbor Heron population on South Brother Island has been steadily increasing. The 2007 Harbor Herons survey by the NYC Audubon Society and institutional partners found that South Brother had the largest number of shorebird nests in the city (592 nests). In contrast, nesting populations have been declining on North Brother Island.

### Additional Sites of Ecological Importance

Since the 1992 *Comprehensive Waterfront Plan*, the City has come to recognize the ecological importance of sites that are smaller than the Special Natural Waterfront Areas. Data suggests that these smaller dispersed sites perform valuable ecosystem services and provide habitat diversity. Many sites have been acquired as parkland or designated as natural areas, but warrant additional protective measures. Other sites remain in private ownership and should be acquired for conservation or placed under conservation easements. These sites are in areas such as the Upper Bronx River, the Arverne area of the Rockaways, Plumb Beach, the Southern portion of the Arthur Kill shoreline, portions of the Raritan Bay Shoreline (Conference House Park, Paw Paw Wood, Butler Manor, Mount Loretto-Lemon Creek Park, Wolfe's Pond Park, Blue Heron Park), the Staten Island Greenbelt, and the Staten Island South Shore Bluebelts. Adding these areas to the *Waterfront Revitalization Program* as sites of ecological importance would enhance their protection.

Many City-owned natural areas with habitat and ecological value are protected through DPR's Forever Wild program. DPR has designated 51 areas within the City's park system as Forever Wild preserves, including many natural waterfront sites. Improvements within a Forever Wild preserve receive enhanced internal review.

## HUDSON-RARITAN ESTUARY PLANNING

Another shift in thinking over the past 18 years has been an increasing recognition of the importance of regional planning for habitat protection and restoration. Municipal and state boundaries, of course, have no impact on the flow of water and the movement of species. Ecosystem protection and restoration benefit from regional cooperation and coordination.

There has been great momentum behind regional planning for the Hudson-Raritan Estuary. After the Estuary was recognized by Congress as an estuary of national importance in 1988, representatives from federal, state, and city governments and local civic organizations convened with the goal of improving the environmental quality of the Estuary. They set up the Harbor Estuary Program (HEP) to coordinate restoration activities in the region. Under the aegis of the HEP, the U.S. Army Corps of Engineers and the Port Authority of New York & New Jersey produced the draft *Hudson-Raritan Estuary Comprehensive Restoration Plan (CRP)*, a master plan for ecosystem restoration intended for use by all stakeholders.

The *CRP* identifies four principles: the Estuary is human-dominated, has been irreversibly changed, will continue to change, but can be altered beneficially through wise implementation of science and technology. The *CRP* also identifies 11 measurable restoration objectives, or Target Ecosystem Characteristics (TECs): coastal wetlands; islands for waterbirds; coastal and maritime forests; oyster reefs; eelgrass beds; shorelines and shallows; habitat for fish, crabs, and lobsters; tributary connections; enclosed and confined waters; sediment contamination; and public access. For each TEC, quantifiable long- and short-term objectives are described and opportunity areas identified.

The *CRP* provides a useful Estuary-wide context for planning restoration and enhancement projects in New York City. Though many restoration projects in the city began prior to the drafting of the *CRP*, they advance the goals of the *CRP*. And future restoration projects planned by the City will further the objectives of the *CRP*. Implementing natural resource policies for the New York City waterfront in an Estuary-wide context offers the potential for enhanced synergy and coordination among project proponents, land managers, and funding agencies.



Mike Feller, NYC Department of Parks & Recreation

Salt marsh in Udalls Cove Park Preserve in Northern Queens.

## ECOLOGICAL RESTORATION PROJECTS

The City's efforts to restore the ecological health of New York's waterways and waterfront have benefited from advances in the science and practice of ecological restoration. Working with private groups and state and federal agencies, the City is engaged in many important projects that are intended to restore habitats and further understanding of how to best manage and improve natural resources.

### Coastal Wetlands

Coastal wetlands are vital habitats that have been severely impacted by urbanization and development. The creation, restoration, and enhancement of wetlands are central to the City's environmental protection efforts. Because wetlands take many years to develop, improving the health of existing wetland areas is key to improving overall estuarine health in a cost-effective and immediately beneficial way.

The majority of the city's tidal wetlands are salt marshes. Salt marsh restoration has been under way in Jamaica Bay for decades, as described in Chapter 2 of *Vision 2020*. Since 2006 a partnership of city, state, and federal agencies has been restoring wetlands by using dredged sediment to raise the elevation of the land and by planting cord grass. Approximately 60 acres of salt marsh have been created since the part-

nership began. In 2012 the partnership plans to restore 30 acres of salt marsh at Yellow Bar and several acres of salt marsh along the north shore of Floyd Bennett Field. In addition, the Department of Parks & Recreation (DPR) is partnering with the U.S. Army Corps of Engineers to restore more than 30 acres of salt marsh at Marine Park in Brooklyn. Marsh restoration projects are also being undertaken at Soundview Park and Pugley Creek Park in the Bronx.

### Shorebird Habitat

Shorebird habitat is important for the protection of the region's valuable keystone species. The City is actively pursuing improvements and enhanced protections for shorebird habitats. The Harbor Herons habitats have been incorporated into DPR's Forever Wild program. In recent years, reforestations and invasive vine control have taken place on a number of islands including North Brother. The power of the Harbor Herons as "charismatic megafauna" could be used to reengage the public and help raise funding for habitat restoration. Western Long Island Sound, Arthur Kill and Kill Van Kull, Jamaica Bay, and the East River are all waterbodies where the goal of improving shorebird habitat could be advanced.

### Maritime and Coastal Forests

Maritime and coastal forests are sensitive coastal upland areas characterized by hardy woody

shrubs and trees adapted to survive in areas subject to intense erosion and salt spray. Shoreline development, landfilling, and pollution have destroyed many of these areas, and tenacious invasive species have taken their toll. Trees have been cut for timber. Few original forests remain.

DPR is planning significant maritime forest restorations in Brooklyn and Queens. The agency has long-term plans to rejuvenate 86 acres of maritime forest and associated coastal shrub and grassland through an intensive restoration management plan, targeting invasive species and propagating native plants sourced locally from the Greenbelt Native Plant Center on Staten Island.

## Oysters

Large swaths of oyster reef once lined the bottom of the Estuary, cleaning the water and providing a source of food. Overfishing through the 19th century, the release of untreated sewage into waterways, and other ecological disturbances have virtually eliminated the habitat of this keystone species. Today there are no major naturally occurring oyster reefs in the region, though scattered oysters remain. “Oysterculture” has been gaining momentum in recent years as evidence suggests that oysters aid in the restoration of bottom-sea habitat and the filtering of the water column.

Many small-scale restoration projects have been undertaken in recent years. These projects include efforts by NY/NJ Baykeeper, which depend on citizen stewardship to seed and monitor oyster populations. The Bronx River Oyster Restoration Pilot Study by DPR was successful, and the Department of Environmental Protection (DEP) has placed an oyster bed and reef balls in Jamaica Bay to evaluate oyster growth, survival, and reproduction as well as water quality and ecological benefits. The findings of this pilot study will inform future attempts to restore oyster habitat in the Bay.

However, large-scale oyster reef creation has not been attempted in the region. Further pilot studies may be necessary to fully assess impacts on water quality. In addition, several regulatory bodies have expressed concern that oysters are “attractive nuisances” that may encourage illegal harvesting—a health concern due to the contamination in parts of the Estuary. Security and monitoring of restoration sites may be needed to limit poaching.



Sand dunes and beach on Coney Island Creek, Brooklyn.

## Eelgrass

Like oysters, eelgrass once thrived in the region. A slime mold infestation and poor water quality wiped out virtually all major eelgrass beds by the early 1930s. Today only a few disparate patches remain in the region, and none within the city. Eelgrass provides ecosystem functions and could potentially bolster many aquatic organisms.

Eelgrass restoration on a large scale has not been attempted in the region. A strategic pilot program might be more beneficial than a large-scale restoration effort at this time. DEP is currently monitoring pilot eelgrass installations in Jamaica Bay to test the plant’s ability to improve the Bay’s water quality and ecology.

## Sediment Contamination

Much of the sediment in the Estuary has been exposed to toxic environmental contamination in one form or another. In 2008, the Regional Sediment Management Work Group of the Harbor Estuary Program published its *Regional Sediment Management Plan*, which outlines specific objectives and measures to address sediment quality and quantity and dredged material management. The plan recommends the development of detailed sediment contamination maps of the Hudson-Raritan Estuary to better prioritize cleanup efforts. Remediating contaminated sediment is an important part of promoting the natural waterfront’s ability to support diverse plant and animal communities.

## Coastal Erosion

Coastal erosion threatens the sensitive ecology along the city’s shore. A number of beach nourishment and shoreline protection efforts have been undertaken in the past several years. Large-scale projects in Coney Island, the Rockaways, and Orchard Beach were authorized under the Water Resources Development Act and have required the partnership of federal, state, and city agencies.

Severe erosion at Plumb Beach in Brooklyn highlights the need to increase coastal hazard assessment and mapping. Plumb Beach is an important location for horseshoe crab breeding. Each year these creatures migrate great distances up and down the Atlantic coast, but return to their site of birth to mate on the beach during the highest tides of the full moon, typically late May to early June. An interagency workgroup has been formed to consider ways to protect Plumb Beach and will evaluate approaches ranging from sandbagging, rip rap, and revetments to beach replenishment. Other federal studies to reduce storm damage and protect shorelines are under way for the South Shore of Staten Island and Jamaica Bay.

## NATURAL WATERFRONT POLICY CHALLENGES

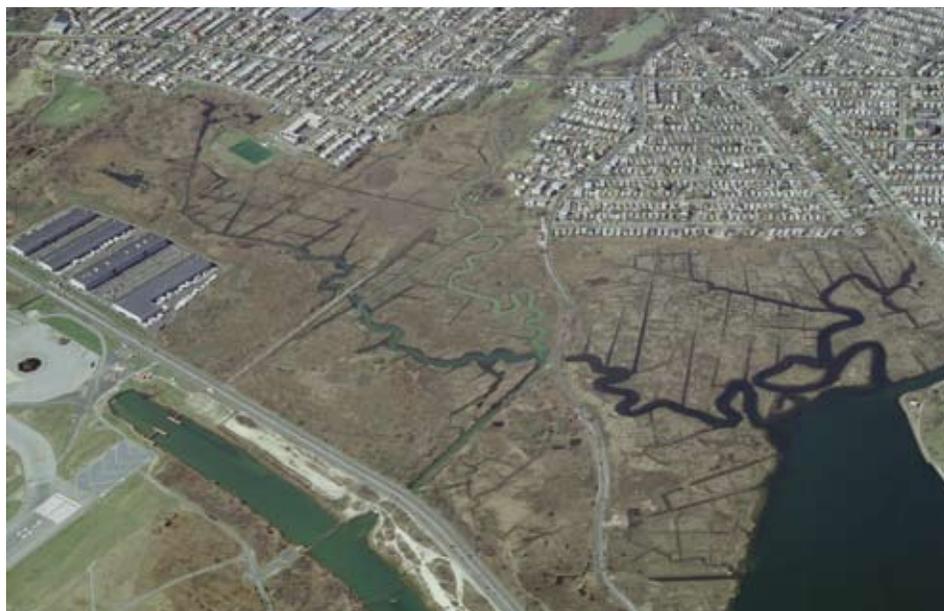
As the City moves forward with restoration projects, it is also addressing policy issues to improve the natural waterfront. These issues include the need for measures to better protect privately owned natural resources and better manage City-owned land.

### Regulatory Protection Gaps

As called for in *PlaNYC*, the City released a report in 2009 assessing the vulnerabilities of existing wetlands and identifying policies to protect and manage them. This report, *New York City Wetlands: Regulatory Gaps and Other Threats*, finds that existing federal and state regulations protect New York City's tidal wetlands and large freshwater wetlands from threats related to land use and development. However, the report also emphasizes that State law does not protect freshwater wetlands smaller than 12.4 acres and does not require a protective buffer. These wetlands may also be determined to be outside the scope of Federal protection.

The City will evaluate additional protection options, as well as address other important wetlands policy questions, by formulating a comprehensive wetlands strategy. In 2009 the City partnered with the City Council to pass Local Law 31, which authorizes the Mayor's Office of Long-Term Planning and Sustainability to create a wetlands strategy by March 1, 2012. The development of a comprehensive wetlands strategy will entail evaluating appropriate legal requirements, management mechanisms, funding mechanisms, enforcement mechanisms, and incentives to conserve, protect, enhance, restore, stabilize, and expand wetlands and associated buffer areas in the city. This process will also assess opportunities to improve wetlands mitigation and creation and seek to enhance coordination among the governmental entities that have jurisdiction over wetlands in New York City. Among the general policy options to consider: expanding the reach of State or Federal regulations to small freshwater wetlands; enacting a local law to create protections for small freshwater wetlands; and/or expanding acquisition and restoration programs.

Accurately quantifying threats posed by regulatory protection gaps will be aided by more updated maps of wetland areas. At this point, the available maps of regulated wetlands within



Wetlands in Idlewild Park, Queens.

New York City are based on outdated and incomplete information from the New York State Department of Environmental Conservation (DEC). The DEC tidal wetlands regulatory maps are based on aerial photograph interpretation from 1974 (though where possible, field surveys have been conducted), and the freshwater wetlands maps haven't been updated since 1995.

Another source of information on the location, size, distribution, and type of wetlands is provided by the U.S. Fish and Wildlife Service National Wetland Inventory (NWI) program. The most recent NWI mapping, in 1999 and 2004, occurred in Staten Island, Brooklyn, and Queens, the boroughs with the greatest number and acreage of wetlands. The NWI mapping for Manhattan and the Bronx was conducted in 1970. The NWI includes wetlands larger than 0.25 acres, and identifies hundreds of acres of freshwater wetlands and salt marsh in New York City that are not mapped or regulated by DEC. NWI wetland maps and inventories are used to determine if a proposed development project is located in or near a wetland and would therefore trigger a more detailed assessment. These wetland maps and inventories are not the definitive determinant of wetland size or location, however. In fact, no map or inventory created by remote sensing, regardless of the technology used, is sufficient for the purpose of wetlands regulatory protection; field delineation is still necessary to determine the

wetland boundary at the time of the review of a proposed project.

Any policy discussion must take into account existing wetlands data, the need to verify wetland boundaries and conditions in the field, and many other factors. These factors include whether there are enough unprotected wetlands to justify a local wetlands permitting program, the opportunity costs of protecting wetlands from development and fill, and flooding and erosion hazards. Additional consideration should be given to the services that wetlands provide, such as stormwater retention, water quality improvements, aesthetic benefits, and biodiversity.

### Management and Stewardship of Natural Resources

In 2005 the City set up a Wetlands Transfer Task Force to inventory City-owned wetlands in the metropolitan area and determine the technical, legal, environmental, and economic feasibility of transferring these wetlands to the jurisdiction of the NYC Department of Parks & Recreation for protection and management. By addressing the future of City-owned wetlands, as well as some broader questions of wetland management and policy, this initiative sought to ensure that these often under-appreciated sites become part of efforts to build a more sustainable future for both the city and region.

More than 1,000 City-owned properties totaling approximately 700 acres were identi-



Daniel Avila, NYC Department of Parks & Recreation

Pelham Bay Lagoon in the Bronx.

fied, and 82 properties were recommended for transfer. The challenge remains to identify resources that will allow DPR to incorporate these properties into the City's park system.

Some of the areas assessed during the Wetlands Transfer Task Force inventory were identified in recent reports from city, state and federal agencies as important wildlife habitat sites. The Harbor Estuary Program's Priority Acquisition and Restoration List identified Jamaica Bay and Breezy Point, the Arthur Kill Complex, the Narrows, and the Lower Hudson River Estuary as Significant Habitat Complexes. The New York State office of the National Audubon Society has identified North and South Brother islands, Pelham Bay Park, Van Cortland Park, Central Park, Prospect Park, the Jamaica Bay Complex, and the Harbor Herons Complex as critical habitat and important bird areas. Each of these designations highlights the importance of careful ecological management and active stewardship.

### Monitoring and Assessment

It is not only necessary to understand wetland quantity and location, but also wetland quality. The City recognizes the need to assess wetlands condition and function, vulnerability, and restoration potential and to monitor trends. DPR has programs that monitor bird populations at sites

throughout the five boroughs and monitor the performance of wetlands restoration projects. DPR has analyzed trends of salt marsh loss at several wetland complexes to determine potential vulnerability, and is working to help prioritize sites for protection and restoration.

To remain stable, salt marshes must accrete sediment and organic material at the same pace as sea level rise. Several tools are available to monitor accretion rates, including Sedimentation Erosion Tables (SETs) for measuring vertical accretion rates in tidal marshes. Using SETs and related techniques, detailed trends in wetland topography have been documented in Jamaica Bay for more than five years. SET stations have recently been installed in the Pelham Bay tidal marsh complex through the Department of Environmental Conservation in cooperation with DPR and the U.S. Geological Survey. Plans for additional installations are under way through several funding sources. Historic aerial mapping and preliminary data from SETs has shown significant and rapidly accelerating marsh loss in some tidal marshes. Monitoring wetland loss and tracking restoration projects are critical to understanding how to best restore degraded natural waterfronts.

Wetlands are by definition unstable entities. Remapping every few years may be ideal but

is neither affordable nor necessary for increasing protection of the city's smaller wetlands. Recently, the Department of Environmental Protection partnered with the Lamont-Doherty Earth Observatory at Columbia University to develop vegetation and wetland maps from imagery based on vegetation phenology of the five boroughs; these maps can be updated more readily than other remote sensing map products. The drafts of the maps are complete, and the City will determine the next steps in using the maps for wetlands management.

Also useful for wetlands mapping and assessment will be Light Detection and Ranging (LiDAR) elevation data. The City has acquired new LiDAR data to more accurately assess the physical characteristics of New York City's natural and built environment. The data was developed from flights in April 2010. This data will be particularly useful to determine where there are opportunities for migration of wetlands, and where natural or built impediments will require other strategies to help protect and conserve tidal wetlands.

### Funding

The maintenance, stewardship, and restoration of wetlands and natural areas require significant financial resources. Currently there is

no dedicated funding mechanism for restoration projects. The City has funded restoration efforts using general operating funds as part of mitigation for landfill closures or other capital projects. Otherwise most restoration projects are funded through grants from the federal and state governments and from non-profit groups. To continue and increase restoration efforts, the City must strengthen partnerships with other government and local entities. The City will also need to develop innovative funding mechanisms that can enhance natural areas while also providing other environmental or public benefits.

## INNOVATIVE ECOLOGICAL DESIGN

Innovative urban design and landscape practices have demonstrated that development does not have to be antithetical to environmental protection. In fact, practitioners, scientists, and policy makers have learned that with creative design and new technologies, development along the water's edge can benefit the natural environment. Whether creating parks, open spaces, or industrial areas, waterfront development offers opportunities for restoration of natural resources.

Many recent development projects have used environmentally sensitive construction methods and design standards, thereby limiting their impact on the environment. But projects can go even further, restoring habitat value and function to improve water quality and limit pollution in adjacent natural ecosystems. The reconstruction of the bulkhead at Harlem River Park is an example of development that benefits the natural environment. When faced with a crumbling bulkhead, the Department of Parks & Recreation did not simply reconstruct the bulkhead's sheer retaining wall but instead built a new wall that stepped down to the water and created a larger intertidal zone, an important breeding ground for marine life.

While the specific design for the Harlem River Park bulkhead may not apply to all waterfront locations, the principle of using development projects to further ecological restoration is certainly applicable. Naturalized shoreline edges, treatment wetlands, rain gardens, and green roofs all are features that can be used in environmentally proactive developments. Such examples of ecological design strategies have been prioritized through the Department of Parks & Recreation's *High Performance*



NYC Department of Parks & Recreation

The seawall at Harlem River Park features stepped gabions planted with salt marsh grasses.

*Landscape Guidelines* as well as the *Sustainable Stormwater Management Plan* and other *PlaNYC* initiatives. In September 2010, the Department of Environmental Protection released the *NYC Green Infrastructure Plan* which, subject to regulatory negotiations and approvals, will incorporate sustainable approaches to stormwater management into roadway, sidewalk, and other capital projects, discussed further in the section of *Vision 2020* devoted to improving water quality, beginning on page 62.

Designers and engineers continue to develop new designs and materials for in-water structures that promote the health and biodiversity of the waterfront. The City can foster innovation though seeking partnerships and funding for research.

# Restore the Natural Waterfront: Strategies and Projects

This plan envisions a waterfront in 2020 where wildlife flourishes and natural systems are healthy. Restoring the waterfront's ecological functions will not only advance biodiversity, it will also help clean waterbodies, make shorelines more resilient, and enhance the waterfront as a place for recreation and appreciation of nature.

To realize this goal, the City will pursue the following set of strategies over the next 10 years. To better protect natural areas, the City

will strengthen policies and improve coordination among government agencies at all levels. The City will continue to actively improve the region's ecology by restoring shorelines, wetlands, and coastal forests as well as creating habitat for key species. And it will pilot new restoration techniques and monitor results.

*Vision 2020's* 10-year strategies are complemented by the *New York City Waterfront Action Agenda*, a set of projects chosen for their ability

to catalyze investment in waterfront enhancement. The City commits to initiating these projects over the next three years and will be tracking progress on an ongoing basis. For each project, the lead agency and implementation year are noted.

Together, these strategies and projects lay out a comprehensive vision for the waterfront and waterways and a plan of action to achieve that vision.

## I. Acquire and augment protection of wetland and other shoreline habitat.

### VISION 2020 STRATEGIES

- Acquire privately owned wetlands and upland habitats where appropriate and where funding is available. Use plans such as the *NYS Open Space Conservation Plan* and the *Hudson-Raritan Estuary Comprehensive Restoration Plan* as the basis for site selection.
- Consider modification of the Waterfront Revitalization Program to include designation of additional sites of ecological importance. Evaluate areas identified by the New York City Audubon Society, New Yorkers for Parks, New York State Department of State, and the Harbor Estuary Program Habitat Workgroup.
- Pursue the recommendations of the Wetlands Transfer Task Force.
- Assess levels of degradation of currently mapped tidal wetlands and prioritize for protection and restoration by the New York City Department of Parks & Recreation (DPR), provided funding is available.

### ACTION AGENDA PROJECTS

- Consider revising the Waterfront Revitalization Program to designate 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. (DCP, 2012)
- Develop a citywide strategy for protection and restoration of wetlands and coastal ecosystems. (Mayor's Office, 2012)
- Complete transfer of 70-acre Arlington Marsh property on Staten Island to DPR (DPR/SBS/EDC/DCAS, 2013)
- Complete transfer of at least 5 additional City-owned wetland properties to DPR. (DPR/DCAS, 2012)

## 2. Increase scientific understanding, public awareness, and stewardship of the natural waterfront.

### VISION 2020 STRATEGIES

- Seek partnerships and funding to support scientific research assessing impacts of in-water construction and efficacy of restoration methods. Projects should be evaluated based on ecological services, biodiversity, and ecological productivity.
- Develop and test innovative designs and materials for in-water structures.
- Work with existing waterfront stakeholders to broaden the stewardship base and inform members of the public about what they can do to improve the health of the waterfront.
- Encourage locally based programs in partnership with community groups, schools, and other institutions that will play an important role in the maintenance and upkeep of the waterfront. Consider establishing an "adopt-a-waterfront" program similar to the adopt-a-highway programs.

### ACTION AGENDA PROJECTS

- Seek to identify and secure funding for the Hudson-Raritan Estuary by coordinating with federal and state partners. (Mayor's Office, 2013).
- Identify opportunities to increase public awareness and stewardship of specific waterfront reaches, modeling successful public/private partnerships and working with the Partnerships for Parks Catalyst Program to link new conservation, protection or enhancement efforts with existing organizations and programs. (DPR 2012)

### 3. Promote ecological restoration that enhances the robustness and resilience of local and regional ecosystems.

#### VISION 2020 STRATEGIES

- Using the draft *Hudson-Raritan Estuary Comprehensive Restoration Plan (CRP)* as a framework, pursue restoration of a mosaic of habitats that provide renewed and increased benefits from the Estuary. Restoration projects should strive to incorporate multiple Target Ecosystem Characteristics from the *CRP* to achieve the greatest ecological benefit at a single location.
- Concentrate habitat creation and enhancement in protected ecological complexes such as Special Natural Waterfront Areas.
- Seek opportunities to restore and create wetlands.
  - Partner with the U.S. Army Corps of Engineers and other city, state, and federal agencies to prioritize wetlands restoration efforts identified in the *CRP*.
  - Focus ecological restoration projects in regionally significant ecosystem areas, such as Jamaica Bay.
  - Target City-owned wetlands for restoration.
  - Work with all appropriate federal, state, and city stakeholders to create new wetlands in areas where fragmentation has decimated historic habitat complexes.
- Seek opportunities to promote local shorebird population.
  - Continue to monitor and enhance habitat at known nesting sites.
  - Create and expand smaller islands with clean dredged material.
  - Coordinate wetland restoration and preservation in proximity to known nesting sites.
  - Promote local stewardship and appreciation for NYC waterbirds.
- Seek opportunities to create and restore coastal and maritime forests.
  - Engage in coastal and maritime forest creation and restoration in protected coastal areas.
  - Restore upland forests associated with coastal and maritime forests.
  - Collaborate with federal and state authorities to locate and coordinate restoration opportunities.
  - Update citywide soils maps to better inform coastal and maritime forest restoration.
- Seek opportunities to improve habitat for oysters, fish, and other aquatic species.
  - Engage in large-scale oyster reef pilot project and encourage local oysterculture and stewardship. Consider the use of alternatives such as blue mussels.
  - Engage in small-scale eelgrass pilot projects with different site conditions and installation techniques. Continue monitoring pilot eelgrass program in Jamaica Bay and consider expansion.
  - Install in-water habitat structures, such as reef balls and textured bulkheads, outside navigable channels.
  - Remove derelict vessels and degraded bulkheads where feasible.
  - Identify opportunities to install riparian vegetation demonstration gardens as buffers along waterfront parklands and greenways.
  - Cluster complementary habitat creation efforts such as pairing shorebird islands with wetlands.
- Seek opportunities to create and expand shorelines, shallows, and intertidal areas. Recognize the important physical, chemical, and biological services of nearshore habitats and sloping or stepped shorelines.
- Evaluate opportunities to improve tributary connections for aquatic species.
  - Further analyze freshwater streams in New York City to identify potential new connections, such as at the impoundments on the lower Bronx River where barriers could be removed or passage provided.
- Evaluate opportunities to improve water quality in enclosed and confined waters by re-contouring bathymetric depressions using dredged materials.
- Remediate contaminated sediments.
  - Adopt initiatives outlined in the *Regional Sediment Management Plan*.
  - Prioritize contamination hotspots in New York City for remediation.
  - Develop standards for beneficial reuse of clean dredged sediment.

#### ACTION AGENDA PROJECTS

- Pugsley Creek Park, the Bronx: Complete restoration of tidal wetlands, including excavation work, sand placement, and planting salt marsh grasses. (DPR, 2012)
- Soundview Park, the Bronx: Complete restoration of tidal wetlands, including excavation work, sand placement, and planting salt marsh grasses. (DPR, 2013)
- Paerdegat Basin, Brooklyn: Create Ecology Park by restoring 12 acres of tidal wetland and 26 acres of adjacent upland habitat. (DEP, 2012)
- Marine Park, Brooklyn: Restore White Island, including sand placement, shoreline stabilization, removing invasives, and planting of maritime grasses. (DPR, 2013)
- Jamaica Bay, Brooklyn: Implement marshland restoration projects. Sponsor U.S. Army Corps of Engineers' restoration project at Yellow Bar Hassock. (DEP, 2013)
- Fresh Creek, Brooklyn: Pilot study of ribbed mussel beds, evaluating filtration of nutrients and pollutants. (DEP, 2011)
- Breezy Point, Queens: Study the feasibility of planting 3,000 eelgrass plants. If planting is successful, begin larger-scale project. (DEP, 2011)
- Determine opportunities for large-scale oyster restoration efforts after evaluating the ecological and water quality effects of oyster planting pilot projects undertaken in partnership with the U.S. Army Corps of Engineers, New York/New Jersey Baykeeper, Hudson River Foundation, the New York/New Jersey Harbor Estuary Program, and the Urban Assembly New York Harbor School. (DEP, 2013)
- Plumb Beach, Brooklyn: Complete a study to address long-term impacts of shoreline erosion and potentially execute a project partnership agreement with the U.S. Army Corps of Engineers, National Park Service, and New York State Department of Environmental Conservation. (DPR, 2012)



## GOAL 6

Enhance the public experience of the waterways that surround New York—our Blue Network.

# ENHANCE THE BLUE NETWORK

**Three major waterbodies—the Hudson River, the Long Island Sound, and the New York Bight of the Atlantic Ocean.** Four tidal straits. Two vast bays separated by narrows. Not to mention several other major rivers, streams, and canals. Together the waterways surrounding, and shaping, New York make up one of the most complex harbors in the world. Think of the waterways as a geographic entity in and of itself—a sixth borough, if you will, a space that unites rather than divides the various parts of New York. This Blue Network is not only a highly diverse and productive ecological system, it's also an incredible public resource for people who live and work in, as well as visit, New York City.

And it's one that hasn't been fully tapped yet. In the past few decades, huge advances have been made in our waterways: water quality is improved, and New York Harbor is healthier; waterfront access and water recreation have proliferated; and there's renewed interest in waterborne transportation as a more efficient and sustainable mode of transportation for passengers and freight, and in the potential use of tides and currents for renewable energy. Still, there are many unrealized opportunities to connect people with the waterways—physically, visually, and culturally—and to stitch the Blue Network into the city's urban fabric. Too many residents and visitors to New York do not get out on the water, whether because of lack of public programs, concern over water quality, or simply because they just aren't aware of all the Blue Network has to offer.

With this plan the City aims to change that. By giving planning for the waterways the same focus and attention given to planning for the land, New York can capitalize on the

Blue Network for recreational enjoyment, commerce, and beauty. To engage all residents and visitors with the Blue Network, the City is seeking to promote water recreation that is safe and accessible to all, expand waterborne transportation, and create the necessary waterfront infrastructure to maximize the use of the Harbor and its tributaries for cultural activities, historic events, educational programs, and energy generation.

These new uses present challenges. For instance, as the City increases recreational access, there is a need to prevent conflicts between recreational boaters and commercial ships. In addition, it is important to consider best usage standards for the water, along with short-term decreases in water quality after wet weather and other safety issues such as strong currents. Making the most of the Harbor and tributaries will improve quality of life for residents and increase the city's appeal to visitors. The Blue Network has the potential to enhance New York in infinite ways.

## PROVIDING FOR WATER RECREATION

With its diverse waterbodies, New York offers a variety of possibilities for water recreation. And the advances in water quality and access to the waterfront have spurred participation in, and demand for, water recreation.

New Yorkers are taking to water-based activities like never before. These activities include the following sports and activities:

- In-water: swimming, surfing, bodyboarding, windsurfing, wake boarding, jet skiing, paddle boarding, snorkeling, scuba diving

- Boating: human-powered boating (canoeing, kayaking, rowing), sailing, power boating
- Near-water: Fishing, bird-watching, hiking, biking
- Cruises: Tour boats, dinner cruises, concert cruises

Access points and facilities are essential to these activities (as seen in Figure 1, page 87). Such sites are dependent upon natural landforms to a certain extent, but public and private entities also create and manage them. These access points and facilities include:

- Beaches: 14 miles of swimmable beaches in New York City
- Marinas: 13 public marinas and more than 100 private marinas
- Mooring Fields: two public mooring fields, in Sheepshead Bay and Great Kills Harbor
- Kayak/Canoe Launches: More than 40 launch sites, most managed by the City
- Boat Storage: Ranging from shipping containers repurposed as kayak storage to larger facilities at marinas.

More and more residents, schoolchildren, and visitors are experiencing the city by boat, and community boating clubs have emerged throughout New York. One of the most successful programs in promoting the use of the waterways for recreation is the New York City Water Trail, run by the New York City Department of Parks & Recreation in conjunction with a newly established partner organization, the New York City Water Trail Association. Capitalizing on the surge in popularity of human-powered boating, this program established launch sites for kayaks, canoes, and rowboats and provides online maps for guidance on routes to take.

Despite great progress in utilizing the city's waterways for recreation, more progress can be made. While there are many areas where the public has access to the waterfront, only a limited number of these places provide direct access to the water itself, necessary for any sort of water recreation. Many piers and waterfront parks have railings or rip-rap shorelines, which preclude boat access. New boat launches could

“When New York City was created, there was no Central Park. The park for Manhattan was the water's edge—a pristine and beautiful place. We need to recognize the water as this great resource again.”

—Roland Lewis, Executive Director, Metropolitan Waterfront Alliance

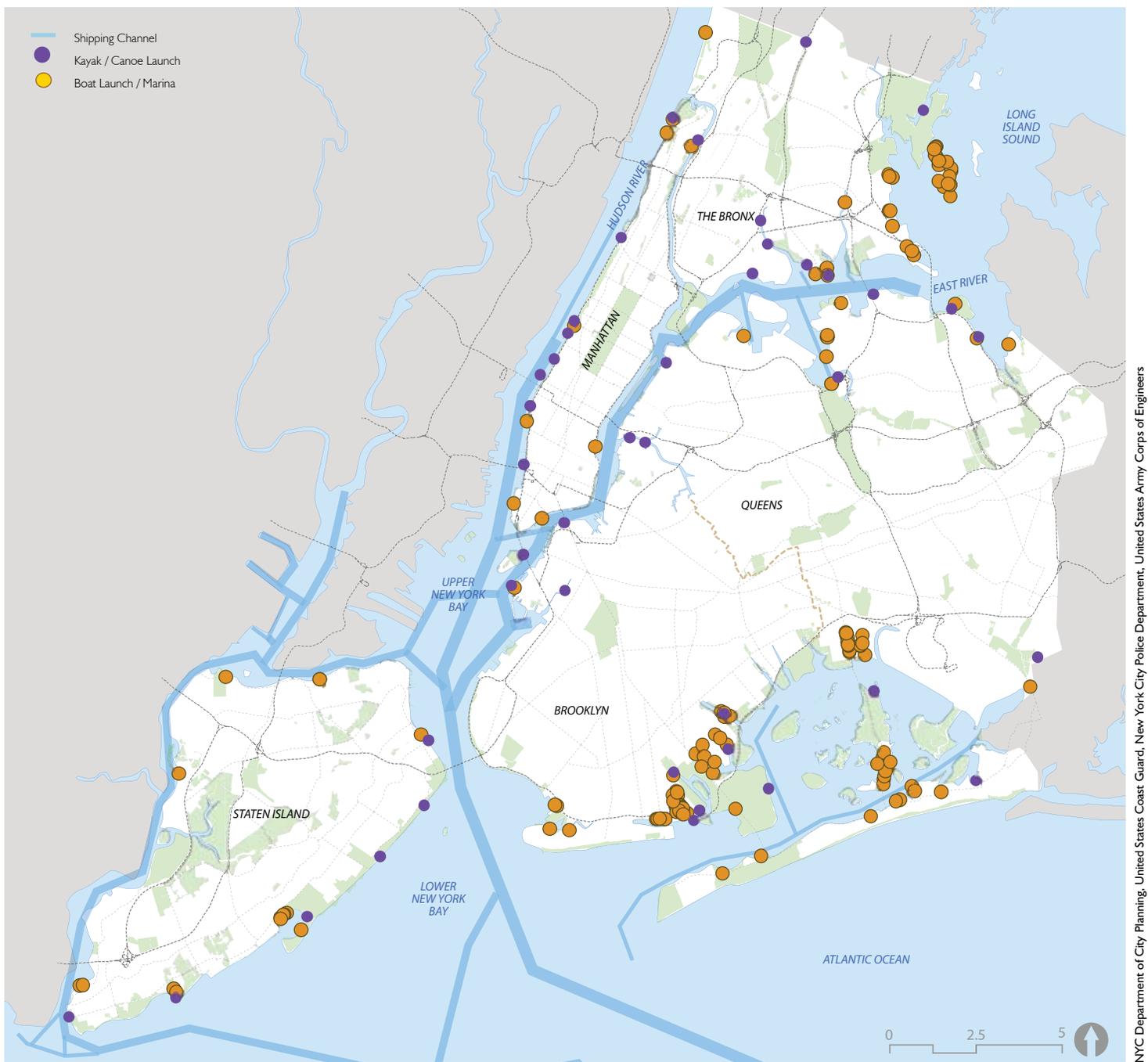


Figure 1: Boat launch points, marinas, and shipping channels, demonstrating the diversity of activities on the Blue Network and also the potential challenges in securing the safety and productivity of its many users.

be added to the New York City Water Trail, and design guidelines should be developed for boat launch types and features appropriate for different kinds of waterfront areas. More marina facilities are needed so that more people can get out into New York’s Blue Network.

There are challenges and constraints that must be taken into consideration when planning for the expansion of water recreation. While water recreation promotes health and

provides a unique vantage point from which to take in the urban environment, there are possible threats to safety and security associated with recreational use of the Harbor. Within New York State, waterways that are affected by tides are considered to be “navigable by law,” and the public has a right to these waters. However, government may impose restrictions on the use of the waterways to protect the health, safety, and welfare of the public.

New York Harbor is a commercial port—the third largest in the country and largest on the East Coast. Our waterways are home to busy shipping channels frequented by container ships, oil tankers, and significant tug and barge fleets. These large ships require great distances to slow or change course. In addition to waterborne freight carriers, there are also passenger ferries, excursion vessels, and water taxis providing commuter service and sightseeing trips.

The vessels and their wakes, as well as the Harbor's tidal movements, can pose challenges for recreational boaters. For even the most experienced, getting caught in the wrong place in a small craft can be incredibly dangerous.

In addition, although the vast majority of the city's waterways are appropriate for recreation there are sites throughout the Harbor that are not compatible with recreational use. These sites are critical to ports and transportation, or perform other functions requiring a high level of security.

Another potential safety hazard is poor water quality in some areas. Though water quality has improved substantially over the past several decades, there are still certain areas where the water is not safe for direct human contact. This risk is partially due to combined sewer overflows, which can contaminate the water after wet weather—exacerbated in constricted waterways with little water movement. Another major factor is the presence of contaminated sediment caused by industrial pollution. Unsafe water quality limits water recreation.

Most recreational boaters are aware of tides, currents, shipping channels, secure sites, and water quality concerns and know how to ensure their own safety and the safety of those around them. Community boathouses are effective at instructing new boaters and providing excursions with able guides. There is, however, relatively little regulation or enforcement for individual boaters who may unknowingly place themselves in danger.

With increased recreation and commercial traffic planned, wakes caused by boats is also a concern. Wakes caused by motorized boats can cause erosion; damage piers, bulkheads, and other vessels; and pose safety hazards. Limiting and enforcing speed and wake restrictions as well as employing wave attenuators may be appropriate means of reducing wakes.

Despite these concerns, recreational enjoyment of New York's waterways is a priority for the City. Creating new facilities in appropriate locations and configurations, and providing guidance and support to the boating community, will promote safe and healthy recreational use of the Blue Network.



NYC Economic Development Corporation

A New York Water Taxi on the East River.

## EXPANDING FERRY SERVICE

The New York metropolitan region has the largest ferry system in the U.S. in terms of ridership. The system is comprised of the Staten Island Ferry, the biggest municipally run ferry service in the country, linking the North Shore of Staten Island with Lower Manhattan, along with five private ferry operators. These private operators carry passengers between New Jersey and New York City, with limited private service within the City of New York. Together the Staten Island Ferry and the private services carry about 30 million people a year. By comparison, the Washington State ferry system, the second largest in the country in ridership, carries about 24 million passengers a year.

The ferries plying New York Harbor and the East and Hudson rivers provide an important transportation link for commuters throughout the region. Nearly 90,000 riders take to the rivers and Harbor as part of their daily commute, with approximately 60,000 riders on the Staten Island Ferry and 26,400 riders on the private ferries. Though the Staten Island Ferry has become one of the iconic images of New York City, it is also a vital mass-transit service. (Figure 2, page 89, shows the routes and daily ridership for the ferry services operating in the Harbor today.)

While ferry service in the metropolitan area is robust, ferry operations have not been uniformly successful. A 2006 study by the Regional Plan Association on behalf of the Port Authority of New York & New Jersey examined all the

routes that had been established since 1986. During that period 55 ferry routes were established. Of these, 24 routes remained at the time the report was published, and 31 had been discontinued, with most of the surviving routes focused on the trans-Hudson River market.

Ferries are an important alternative to New York's crowded roads and rails. Residents of New Jersey riverfront communities depend on the private ferries for frequent and fast transportation to New York City. Without these ferries, the PATH subway service would be overburdened, and additional stress would be placed on the tunnels and bridges connecting the two states. Ferry service provides an attractive alternative to other forms of transportation, but there are many challenges to maintaining and expanding ferry service.

### Study of Ferry Service Viability

Despite increased interest in ferry service, ferries remain a very small percentage of total regional transit ridership (approximately 1 percent). To examine how ferry ridership could be increased, the New York City Economic Development Corporation (EDC) initiated a study in 2010 in partnership with NYHarborWay, an initiative of NYC & Company, the City's official marketing and tourism organization.

The *Comprehensive Citywide Ferry Study* reviews ferry service in New York City and the potential for expansion of service. The study considers the market prospects for service from 41 sites; identifies four possible corridors for new service; looks at the potential for combined recreational and commuter services; and

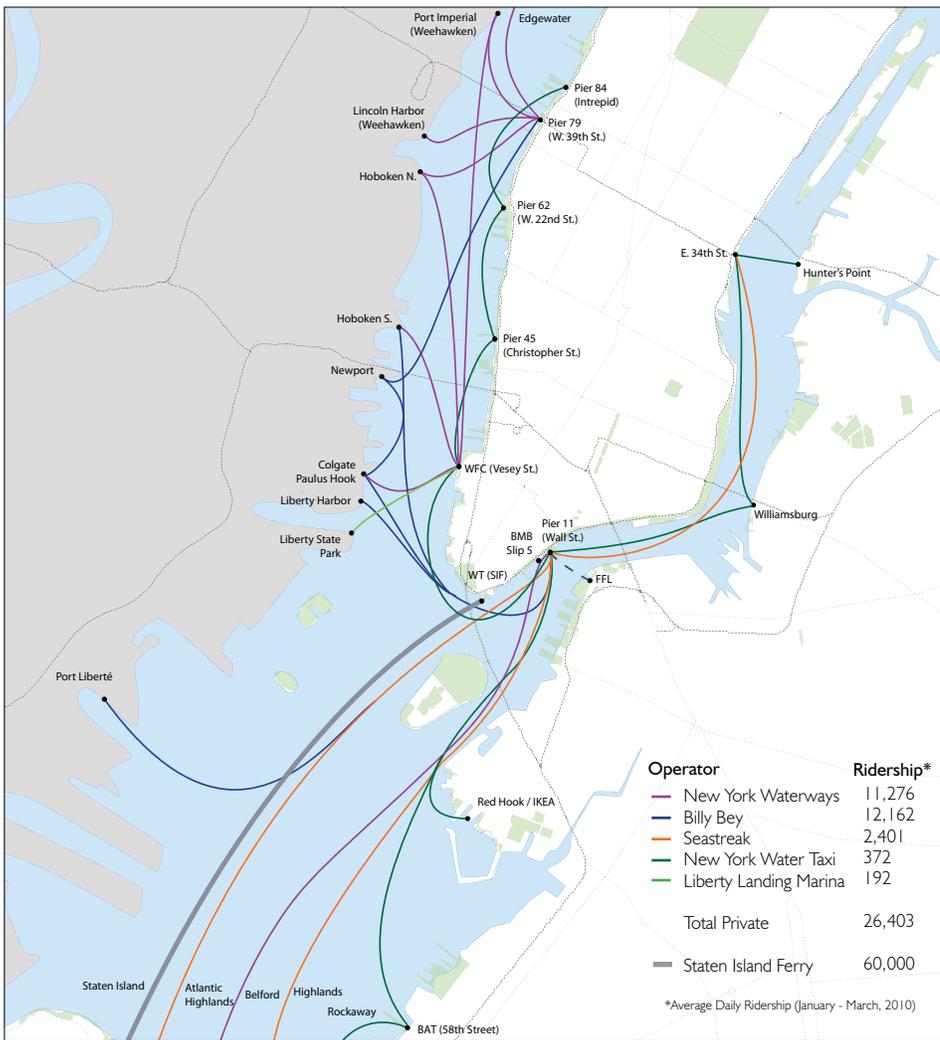


Figure 2: Current ferry routes and ridership in New York Harbor.

examines key policy issues including governing structure, funding, and integration into the larger transit network.

As part of the study, public meetings and discussions with local elected officials were held to identify 41 sites throughout the city for detailed examination (see Figure 3, page 90). Each site was assessed for its market size, its existing transit travel time to lower and midtown Manhattan, cost of operating the service, and other factors. Based on this analysis sites are ranked.

The study groups promising sites into four corridors and examines the ridership, cost, and public subsidy that would be required to run a service in these corridors. Corridors identified are along the Hudson River, both sides of the East River, and in southwest Brooklyn. The potential services are assumed to have frequencies of 20-25 minutes in peak commuter hours.

The analysis considers how adding off-peak

and weekend recreational service would affect ridership and cost. During off-peak hours, one of the boats that would otherwise sit idle would be used for recreational service to Harbor destinations such as Governors Island and Brooklyn Bridge Park. The analysis shows that during off-peak hours more riders could be attracted to recreational ferry sites than to commuter sites. And more riders could mean that the per-passenger subsidy would decline, reducing demands on public resources needed to operate the service while still maintaining necessary service levels during peak commuter hours.

To help determine whether it makes sense to initiate service in any of the corridors identified, the study asks a series of questions. The questions help establish criteria for evaluating ferry service potential and assessing whether a public subsidy should be considered:

1. Is the market underserved by other public-

transit options? Are the alternative transit services beyond a reasonable walking distance? Do the alternative transit services require more than one transfer to reach a final destination?

2. Are the transit alternatives overcrowded, and will the ferry service create new capacity in those corridors? Will that additional capacity help avoid the need for expensive capital investments in ground transit?
3. Will the riders of the ferry service save time by using the water?
4. Does the route provide needed emergency-evacuation capability?
5. Will the ferry service attract patrons who would otherwise drive to their destinations? Does the service promise the environmental benefits of reduced emissions?
6. Can the service be integrated into the existing transit network, both from service and fare perspectives?

## Governing Structure and Funding of Ferry Service

The study indicates that private funding and operation of ferries within the city is unlikely without public subsidy. Just as other transit services need public subsidies to operate, all four corridors identified in the study would require funding beyond the farebox. Existing ferry services from New Jersey require no public subsidies because the west bank of the Hudson River has robust development and limited transit options, both of which make ferry service more competitive. Services within New York City would require public subsidy, raising questions of governing structure and funding.

The *Comprehensive Citywide Ferry Study* looks at a number of governing options. These range from a bi-state entity like the Port Authority to a regional entity like the Metropolitan Transportation Authority to a City agency like the Department of Transportation. Also being examined are special districts devoted to the provision of ferry service. No recommendations are being made regarding governing structure, but if ferry services continue to be pursued the question will need to be addressed.

Hand in hand with the issue of governing structure is funding. If a public subsidy is required, where should the funding come from? While public authorities in San Francisco, Seattle, and Boston subsidize private ferry provid-



Figure 3: Sites evaluated in the Comprehensive Citywide Ferry Study.

ers, public-sector operating subsidies for private ferry services in the New York metropolitan region have been limited. The ferry study reviews a host of tax and revenue sources, including general tax sources such as the property tax, sales tax, and income tax; federal and state sources; and special district funding. No recommendations are specified, but decisions will need to be made with respect to long-term funding.

### Integration into the Regional Transit System

A key issue regarding development of future ferry service is whether the service can be integrated into the broader transit network. With the exception of Lower Manhattan and Jersey City, the densest employment centers in the New York City area are located inland. In many instances, commuters will have to transfer from the ferry service to some other transit mode before reaching a final destination. The more seamless that transfer can be, and the less costly it is, the more likely riders will use the ferry service. Connections between ferry service and bus or subway service are crucial. Ideally, trans-

fers should be offered at reduced or no cost. Achieving these goals will require agreements between transit providers to coordinate schedules, accept transfers, and share fare revenue.

### Upcoming East River Pilot Program

The New York City ferry study identifies the East River corridor as the corridor most independently financially viable, requiring the least City subsidy. As a result, EDC is working with private providers to establish a publicly subsidized pilot program linking Brooklyn and Queens with Manhattan. The East River pilot program, which is scheduled to start service in spring 2011, will connect several destinations along the waterfront. The service will include the following sites: Queens West, Greenpoint, North and South Williamsburg, and Fulton Ferry on the east side of the East River, and E. 34th St. and Wall St./Pier 11 in Manhattan. A recreational component also may be added.

The service will test ridership demand from developing residential areas along the East River. The new route will connect communities in Brooklyn and Queens that have grown

as the result of recent rezoning of underutilized industrial areas with major economic centers in Manhattan. Ferry service offers the potential for a faster, more comfortable ride to the central business districts of Manhattan.

Other features will be examined as part of this pilot program: integration of commuter and recreational service; ridership; effectiveness of marketing; ticketing infrastructure; customer satisfaction; fare levels; sustainable funding; and intermodal connectivity to buses and bikes. The pilot will test many of the assumptions of the ferry study and is likely to serve as a template for the development of future ferry services.

## PLANNING FOR MARITIME EMERGENCY EVACUATION

New York City's unique geography—a dense urban environment built on coastal islands—is a great asset. However, it carries certain risks: increased potential for hazards and increased vulnerability to their effects.

The Blue Network and maritime transportation are crucial to New York's ability to respond to emergency situations. The Nor'easter of 1992, the Northeast Blackout of 2003, the 2005 Transit Strike, and 9/11 caused major disruptions to the transportation system. Commuter ferry routes in New York Harbor played an important role helping the city during these incidents. Nearly 460,000 people evacuated lower Manhattan by ferries on 9/11, and during the Northeast Blackout of 2003 ferry service expanded to five times its normal capacity.

The New York City Office of Emergency Management (OEM) is responsible for helping the city prepare for emergencies. OEM works with public- and private-sector partners to develop plans that guide the city's response during these events. Many of these plans, including NYC's *Area Evacuation Plan* and *Disaster Logistics Plan*, rely on maritime operations.

Unfortunately, access to our waterways and the number of suitable maritime landing locations have steadily eroded over the past several decades. Furthermore, many of the existing landing sites cannot accommodate the wide range of vessels that operate in the Harbor today. Fewer and smaller landing sites diminish the capability of the City's emergency evacuation and disaster logistics operations. Increasing the number of ferry landings and expanding the capacity of existing locations will dramatically increase our resilience during and after disasters.

NYC Economic Development Corporation



© Carolina Salguero

The historic Dutch Flat Bottomed Fleet in Atlantic Basin, Brooklyn, during an event cosponsored by PortSide and the NYC Economic Development Corporation.

## USING THE WATERWAYS FOR EDUCATION

The Blue Network can play an important educational role. It can help us learn about New York City history and about environmental issues, climate change, and the aquatic habitat.

There are school programs throughout New York that utilize our waterways as a teaching tool. The Urban Assembly New York Harbor School, a public high school located on Governors Island, has designed its entire curriculum around the waterways. Students study the aquatic environment, marine vessels, fishing, and oyster gardening. They learn what New York's Harbor was once like and are challenged to consider what it can become. Many graduates go on to careers in the maritime industry or environmental sciences. The Harbor School could be a model for schools in waterfront locations elsewhere in New York.

Educational organizations also offer programs that provide learning opportunities. One example: Rocking the Boat, which engages schoolchildren in the South Bronx in building wooden boats, then learning to use the boats in the waterways near their community.

Higher-education institutions also use the waterways for teaching. The New York City College of Technology recently received a five-year \$3.1 million grant from the U.S. Department of Education to revise the general-education component of the college curriculum. As faculty design courses, they will integrate the study of the Brooklyn waterfront into all disciplines—from science to history, from literature to math—treating the waterfront as a living lab. As part of the grant, the school will receive matching funds of up to \$50,000 annually to endow a Brooklyn Waterfront Center that will sponsor research and public programs.

Boat tours, museums, and historic sites and vessels also highlight maritime history and aquatic ecology. Many boat tours, such as those offered by the Working Harbor Committee, provide a first-hand view of New York's maritime industry. The Waterfront Museum, located on a floating barge in Red Hook, Brooklyn, has educational programming for schoolchildren and adults. The museum's mission is to provide public waterfront access, promote historic preservation, and foster an understanding of the New York Harbor as a place for commerce and commuters, culture and recreation.

## INCREASING PUBLIC AWARENESS

Though New York is bounded by water, it has not been perceived as a waterfront city. For too long New York cut itself off from the waterfront. If it hadn't been for places like the Battery launch to the Statue of Liberty and Ellis Island, some visitors might never have even been aware of the waters around the city. It is only in recent years that public attention has shifted to the shoreline. Now it's important to make people aware not only of the waterfront but of the waters themselves, and the benefits that can be gained from engaging with the Blue Network. Reconnecting with the water will provide social, economic, and environmental advantages.

Water-focused events help bring attention to the Blue Network. These events include the City of Water Day, an annual celebration organized by the Metropolitan Waterfront Alliance held on multiple sites throughout the Harbor, and the Mayor's Cup, an annual 28-mile kayak race around the island of Manhattan. Such events also have economic benefits such as stimulating tourism. In 2008, the artist Olafur Eliasson's "New York City Waterfalls" temporary art installation at locations along the waterfront drew hundreds of thousands of people and generated millions of dollars in revenue for the city. Events like these ultimately cause the

shoreline to be viewed as an attractive location for businesses, which, in turn, provide jobs for residents and more financial investment in protecting the water for continued public use.

Branding initiatives, such as NYC & Company's NYHarborWay, are another way to heighten the Blue Network's visibility among New Yorkers and visitors. This program, launched in 2006, promotes a unified identity for the sites that make up the Upper Bay in Brooklyn and Manhattan, including Governors Island, the East River Esplanade South, and Brooklyn Bridge Park. This program presents a model of how to bring vibrancy to waterfront public spaces through marketing, wayfinding, and transportation connections.

The City's Department of Cultural Affairs has provided funding to many cultural institutions on the waterfront that promote the use of the Blue Network. Funding has gone towards Figment, a free annual participatory-arts festival on Governors Island, and the annual Hunts Point Fish Parade and Summer Festival presented by The Point Community Development Corporation in the South Bronx.

Private and nonprofit groups also play a role in promoting New York's waterways. Through its advocacy and programming—and use of a former tanker, Mary A. Whelan—the organization PortSide introduces people to the working waterfront as well as theatrical events that bring them in contact with the water.



New York Harbor Foundation

Students from the Harbor School ready oyster spat for placement on the Bay Ridge Flats oyster reef.

Through these programs and others, more and more people are engaging with the Blue Network and learning about the importance of our waterways in New York’s history, ecology, and economy. Despite these successes, there are barriers to expanding the scale of these activities, including liability concerns, the challenges of getting to the waterfront with a large group of schoolchildren, and the need to integrate these activities into an already full educational curriculum. With the growing interest in making sustainability a priority in K-12 education, there is a great opportunity right now to make waterfront issues part of what every New York City student learns. After all, the children coming up through the school system today will one day advance knowledge of the waterways and become the future stewards of our Blue Network.

## ADVANCING MARINE-BASED ALTERNATIVE ENERGY

Thanks to emerging technologies, the Blue Network can help supplement New York’s energy sources with clean, marine-based alternative modes of power generation. Along with other renewable sources—such as solar, geothermal, and biomass—marine-based energy is a potential tool for achieving the City’s goal of reducing greenhouse-gas emissions 30 percent by 2030, as articulated in *PlaNYC*.

### Tidal Energy

Tidal energy, a form of hydropower that uses a turbine to convert the energy of tides into electricity, has great potential as a source of energy that is carbon-neutral and emission-free, as well as predictable and reliable. New York is one of only a few states that possess sufficient free-flowing waters in tides, rivers, and waves to make kinetic hydropower a viable energy source. Turbines are completely underwater, silent, and invisible from shore. They do not require dams or other structures that redirect the natural flow of water, so they have little impact on sediment.

This technology is currently being tested in a pilot project in the East River near Roosevelt Island. Verdant Power’s Roosevelt Island Tidal Energy (RITE), which utilizes the tidal strait’s

strong flows and currents that switch direction with the tides throughout the day, is the world’s first grid-connected array of tidal turbines. During the current demonstration phase of the project, six full-scale turbines (five meters in diameter) are installed in the east channel at a depth of 25 to 30 feet. The turbines are connected to the city grid, providing 70 megawatts of energy. The project is currently being expanded, and Verdant is applying for a license from the Federal Energy Regulatory Commission to provide energy to consumers. At full build-out, RITE could power 8,000 to 10,000 homes.

Tidal energy is also being explored at the Ward’s Island Renewable Energy Park. Here tidal-energy turbines, combined with wind turbines, provide renewable energy for lighting the park, community center, and stadium.

There are concerns related to the use of tidal energy. Environmental concerns include the issue of whether turbines will affect river flow patterns, damage fish through turbine blades or noise, or affect birds that nest nearby (though in studies conducted by RITE, there were no detectable impacts on fish or birds in the project area). In addition, the maritime industry has raised concerns about potential impacts on channel navigability.

### Offshore Wind Power

Wind turbines offshore are another potential source of marine-related renewable energy. Ocean-based wind power is stronger and more consistent than power from land-based facilities. And due to the city’s geography and intensive use of land, it has more potential for New York City than onshore options. However, it is more expensive—about twice as expensive—to build offshore.

There currently are no offshore wind projects operating in New York (or elsewhere in the country, for that matter), but several have recently been proposed in our region. The New York City Offshore Wind Project, a partnership between the New York Power Authority and a private developer, is exploring the possibility of setting up a 64,500-acre wind farm 13 miles off the Rockaway Peninsula. Feasibility and wind studies are still ongoing, but the project is being designed to yield 350 megawatts of energy, with the ability to expand to 700 megawatts. A 350-megawatt facility operating at 30 percent capacity would generate energy for more than 250,000 homes.

There are environmental concerns associ-



Wind turbine at the Tides at Charleston, Staten Island.



Installation of Verdant Power tidal turbines in the east channel of the East River.

Kris Unger/Verdant Power, Inc.

ated with offshore wind power, including potential effects on bird and marine life and contribution to coastal erosion. These issues would need to be studied before any project could move forward. Another concern is the sight of wind turbines from the shore—the cause of opposition to offshore wind projects elsewhere in the country. In order for the wind farms not to be visible from the land, they would need to be located 12 to 15 miles offshore. Finally, the locations of off-shore wind turbines must be evaluated for impacts on shipping lanes and commercial fishing areas.

### Onshore Wind Power

Coastal winds are another potential source of power. While no significant large-scale projects within the city have been proposed, smaller demonstration projects are under way at several sites throughout New York. At the Brooklyn Navy Yard, a three-story building finished in 2009 includes six 6-foot wind turbines on its roof, which provide 10 percent of the building's

power. Brooklyn Navy Yard also has streetlights designed by Duggal Energy Solutions, a Navy Yard tenant, which use solar and wind power and are expected to save \$600,000 on installation and \$11,000 a year on energy costs. The Tides at Charleston, a residential development on the west shore of Staten Island, has 45-foot freestanding wind turbines along the Arthur Kill. While Con Edison had concerns about connecting the turbines to the city's grid for fear of power disruption, the turbines were eventually connected and now provide power to the development's streetlights and sewage system.

Like offshore wind power, onshore turbines raise aesthetic concerns. Another problem: inconsistent wind speeds within the city. Speeds average only six miles an hour, and are dispersed by densely packed buildings.

### Aqua-Thermal Heating and Cooling

A major energy demand in New York City is the heating and cooling of buildings. The Blue Network can play a role in providing these

services to buildings located directly on the waterfront through aqua-thermal systems that involve loops to coils submerged in the water. In the summer, the loops transfer heat away from buildings and into the water, where it is absorbed. In the winter, the loops draw on the latent warmth of the water to return heat. The Battery Park City Authority is proposing the development of a heat pump system to provide for the heating and cooling of the Pier A building, located on the Hudson River at the foot of Manhattan. The system would involve a closed loop installation utilizing the river water beneath the piers.

Aqua-thermal heating and cooling systems are considered more efficient than those based on ground or air sources because the loops are in water at a depth that maintains a consistent temperature. Since these systems would result in the discharge of heat to the surrounding water, they must meet state regulatory standards for potential heat load on the water.

# Enhance the Blue Network: Strategies and Projects

This plan envisions a waterfront in 2020 that is better integrated with the waterways. By capitalizing on New York's waterbodies for recreation, transportation, education, and energy generation, the City will make better use of this natural asset and enhance the role of the Blue Network in the city's daily life.

To realize this goal, the City will pursue the following set of strategies over the next 10 years. Through improved infrastructure, policies, and programs, the City will expand the use of the

waterways for activities as diverse as human-powered boating, ferry service, and renewable energy generation. The City will also increase public awareness of the Blue Network, both to promote the enjoyment of the waterways and to educate residents about potential safety concerns such as poor water quality, strong currents, and ship traffic.

*Vision 2020's* 10-year strategies are complemented by the *New York City Waterfront Action Agenda*, a set of projects chosen for their ability

to catalyze investment in waterfront enhancement. The City commits to initiating these projects over the next three years and will be tracking progress on an ongoing basis. For each project, the lead agency and implementation year are noted.

Together, these strategies and projects lay out a comprehensive vision for the waterfront and waterways and a plan of action to achieve that vision.

## 1. Promote water recreation in suitable locations with access points, docks, and on-shore facilities.

### VISION 2020 STRATEGIES

- Working with city, state, federal agencies and stakeholders, explore ways to promote recreational boating by building more or expanding existing marinas and facilities. This includes exploring opportunities to promote small marinas city-wide, such as town docks and eco-docks, and constructing one or more super marinas somewhere in the city with a mariner center for repairs, leasing, etc.
- Examine potential funding sources for construction and maintenance of public boating facilities.
- Encourage public boathouses and boat storage containers at launch sites on private and public property.
- Explore reducing or eliminating fees for historic vessels and educational and non-profit uses of public marinas, docks, etc. where feasible.
- Examine dredging needs for supporting recreational boat traffic.
- Expand and improve the New York City Water Trail for human-powered boating.
- Establish siting criteria and guidelines to expand opportunities for new human-powered boat launches, taking into account water quality and potential conflicts with commercial vessels and other recreational boats such as power and sail boats. Criteria must also be related to advisory and educational efforts to advise the public to avoid primary contact and ingestion with water that is not within a designated bathing beach for 48 hours after a storm event.
- Explore ways to create a centralized insurance program for boathouses.
- Explore opportunities to create a waterfront swimming area in Manhattan.
- Consider allowing human-powered boat launches on public beaches.
- Explore permitting or other appropriate mechanisms to allow ship crews, or ship keepers, to remain on board vessels overnight.
- Work with city, state, and federal agencies as well as stakeholders to examine and implement effective measures to limit the damages caused by wakes. This may include limiting and enforcing speed and wake restrictions as well as employing wave-attenuating devices, where appropriate.

### ACTION AGENDA PROJECTS

- Create design guidelines for best human-powered boat launch types and features. (DPR, 2013)
- Hunts Point, the Bronx: Complete expansion of launch platform for canoes and small boats for floating dock at Hunts Point-Riverside Park. (DPR, 2013)
- Manhattanville, Manhattan: Activate West Harlem Piers Park's excursion boat pier and ferry barge. (EDC, 2011)
- Inwood, Manhattan: Complete repair and replacement of floating docks, and construct restaurant, snack bar, and restrooms at Dyckman Street Marina. (DPR, 2012)

## 2. Clarify and enhance regulatory and organizational mechanisms to ensure safety of water recreation and reduce potential conflicts among various users of the waterways.

### VISION 2020 STRATEGIES

- Explore establishing a Harbor Management Plan (or plans for specific areas of the city's waterways) by working with the Coast Guard and other key partners, including the public. The Plan would guide water uses based on such criteria as water quality, locations of sensitive infrastructure, and adjacent uses.
- Consider creating a centralized data center for incident reporting, conflicts between users, and dangerous areas and conditions by working with the Coast Guard.
- Consider other mechanisms to increase boater safety and education including exploration of New York State certification and licensing for operators of motorized vessels and increasing the role of boathouses and marinas in providing boater safety education.

### ACTION AGENDA PROJECTS

- Develop comprehensive policy for water use, navigation, and access. (Mayor's Office/DEP/DOHMH/ DPR/DCP/EDC, 2012)
- Develop more detailed human health protection advisories to keep boaters safe from environmental and physical threats. (DEP/DOHMH/DPR, 2013)

### 3. Increase waterborne public transportation.

#### VISION 2020 STRATEGIES

- Examine long-term opportunities for increased ferry and water taxi service.
- Encourage potential ridership by creating more public destinations and residential populations at appropriate locations.
- Seek opportunities for improved intermodal connections to waterborne transportation, such as MetroCard integration and scheduling of connecting services.

#### ACTION AGENDA PROJECTS

- Test feasibility of commuter ferry service on the East River connecting Brooklyn and Queens with Manhattan. (EDC, 2011)
- Coney Island, Brooklyn: Complete Coney Island Ferry Study to determine feasibility of ferry service. (EDC, 2011)
- St. George, Staten Island and Whitehall, Manhattan ferry terminals: Develop recommendations for an enhanced docking system for the Staten Island Ferry fender racks. (DOT, 2012)
- Murray Hill: Construct E. 35th Street ferry landing that provides sheltered waiting area, ticketing, and pedestrian amenities. (EDC, 2012)

### 4. Increase New York City's preparedness for waterborne emergency evacuation.

#### VISION 2020 STRATEGIES

- Increase the number and size of ferry landings adequate for emergency evacuation.
- Modify waterfront infrastructure to allow for emergency ferry access, such as providing openings in railings, mooring features, and dual-docking capacity.
- Improve coordination between emergency-response administrators and private ferry operators.
- Work with partners to acquire essential resources for emergency ferry operations during times of crisis.

#### ACTION AGENDA PROJECTS

- Develop procedures to coordinate real-time support for maritime evacuation including ferry routes and landings, crowd control, enhanced mass transit service, and public information. (OEM, 2011)
- Identify waterfront infrastructure projects that increase capability for emergency evacuations and disaster logistics. (OEM, 2011)

### 5. Increase public knowledge and awareness of the waterfront and waterways.

#### VISION 2020 STRATEGIES

- Create website with information on public access locations, including type of access (launch, dock, esplanade etc.), water quality, depth, currents, and tides.
- Encourage growth of programs for water-related education for youth and schools, including swimming classes.
- Work with local and non-profit organizations to provide environmental education and training.

#### ACTION AGENDA PROJECTS

- Install new CSO outfall signs, enhance CSO website notification, and increase water quality sampling sites. (DEP, 2011)

### 6. Explore renewable energy opportunities on our waterfront and in our waterways.

#### VISION 2020 STRATEGIES

- Explore opportunities for renewable energy generation along the waterfront and in the waterways, such as the Roosevelt Island Tidal Energy project.
- Explore options for increasing City involvement in the review of off-shore wind projects.



## GOAL 7

Improve governmental regulation, coordination, and oversight of the waterfront and waterways.

# IMPROVE GOVERNMENT OVERSIGHT

**Realizing all the ambitious plans** New York City has for the waterfront and waterways—expanding public access, using the Blue Network to transport people and goods, redeveloping neglected waterfront sites, restoring ecosystems, and increasing the city’s resilience to climate change—will require action. And improving the efficiency with which New York can take action will be critical to achieving shared goals. The City must maximize what can be accomplished with every dollar, public or private, and with every hour spent by business owners, government agencies, and citizen volunteers.

There are three general ways the city can enhance its ability to take effective action on the waterfront and in the waterways. It can improve the environmental regulatory process to ensure that projects move forward in a timely manner while promoting the health of the city’s ecosystems. It can also improve management of public waterfront infrastructure. And it can achieve better coordination among stakeholders throughout the region to pursue funding and implementation of projects. Progress on these three fronts will help New York City make the most of the waterfront and waterways.

## ENVIRONMENTAL REGULATORY PROCESS

Environmental regulations and the permitting process are essential to protect the environment. It is through the permitting process that projects are assessed to ensure that they avoid, minimize, and mitigate environmental impacts. Environmental permits are needed for a wide assortment of projects that involve building in or on the water, and it is important that these projects obtain permits in a timely, transparent manner.

The City of New York generally has regulatory jurisdiction over land use within its boundaries, but authority over the waterfront and the waterways is quite complex. Currently 14 municipal, state, and federal agencies play a regulatory role in protecting the New York Harbor Estuary. Of those 14, three key agencies—the U.S. Army Corps of Engineers, the New York

State Department of State, and the New York State Department of Environmental Conservation—regulate and issue permits for construction and maintenance of in-water structures.

Permit applicants for in-water construction can be private or public owners of waterfront land. They range from an individual homeowner who must repair the seawall on his property to a marine services company that seeks to construct a pier to a City agency that must address erosion in a public park.

All these applicants may face challenges navigating the permitting process for in-water construction. Permit applicants encounter regulatory hurdles, time delays, and uncertain outcomes that can hinder their ability to maintain their properties or create new housing, businesses, or open space. The maritime industry, which relies on the waterfront and waterways and routinely needs to build and maintain structures in and at the edge of waterbodies, is particularly affected by challenges in the permitting process.

Improvements to the existing administrative process could address the following questions:

- What are simple, practical measures that can be undertaken to improve the permitting process to make it more transparent and predictable for all involved?
- Does New York City’s urban context call for an approach to environmental protection that is responsive to its density and unique land-use patterns?
- Should wetland mitigation practices now used by other states and regions—such as mitigation banking and in-lieu fee payments—be employed within New York City?

## Improving the Permit Administration Process

Reform of the permitting process for in-water construction is critical to ensure that the many projects described in *Vision 2020* can move forward. Reform does not mean lowering environmental standards or short-cutting public review. Rather, it entails improving the process to make it more transparent and efficient for both permit applicants and regulators. Ultimately, the permitting process should foster outcomes that protect and enhance the environment as well as promote cultural and economic development within New York City.

Several approaches could be pursued to help applicants who seek permits for in-water construction. A one-stop shop for permit applications could be established to provide applicants with a central information repository. Having a single place for application materials, regulations, and guidance for all relevant regulatory agencies would help applicants understand the permitting process and get the information they need. Washington, Massachusetts, and Connecticut all have repositories for federal and state permitting information that New York State could use as models. Another way to improve permitting administration would be to offer training for the engineers and environmental experts often hired to prepare permit applications. The training would better inform such consultants about requirements and standards. Pre-application meetings with standardized protocols and checklists could be offered as well. These meetings could be used to review which permits are applicable and to discuss initial environmental concerns and design considerations—important for complex projects that have potentially significant adverse environmental impacts.

Finally, design guidelines for waterfront in-

“It took years to get the floating swimming pool approved, and there were stumbling blocks at every step. There were times I was almost ready to throw out the baby with the bathwater.”

—Ann Bittenwieser, Founder, Neptune Foundation

infrastructure would help make the permitting process more transparent and predictable. Currently applicants can have difficulty understanding which environmental and design factors regulators will focus on when reviewing applications, as well as how and when different regulators interact during the review phase. Design guidelines for in-water infrastructure, such as piers, docks, and bulkheads, could be put forth in partnership with the regulatory agencies and based on preferred design standards.

## Applying Regulations in an Urban Context

Just as permitting administration could be improved, the regulatory review of permit applications from New York City could be revised to reflect the unique conditions here. Regulatory reviews of projects from New York City should recognize that the city's dense urban setting might call for a different approach to the protection and enhancement of natural resources than is used in less-developed areas.

In other parts of the state, the waterfront is generally characterized by a range of low-density uses and parks on large tracts of land. But New York City is highly urban, with land intensively used and divided into small parcels controlled by many owners. Furthermore, past industrial uses have contaminated many sites along the waterfront, and most wetlands have been lost. In this urban setting, it can be difficult to achieve the goals of development and environmental restoration on a single parcel. Rather, there is a need to look for multiple sites where these goals can be realized. Recent history has demonstrated that substantial improvements to water quality and habitat are possible within New York City, and realistic ecological goals can be achieved.

An appropriate approach for New York City is to recognize the ecological opportunities that do exist and to use the development process to improve environmental conditions. For example, portions of the Kill Van Kull waterfront on Staten Island are actively used by critical maritime activities, whereas other portions are significantly degraded and contaminated by past industrial uses. Arlington Marsh, a contaminated wetland area on the Kill Van Kull waterfront, could be restored to greater habitat value. Advancing projects of regional significance, such as the expansion of the New York Container Terminal, could provide the resources to restore Arlington Marsh or similar sites.



Building a public park on the shoreline, such as Hudson River Park (above), requires permits from city, state, and federal agencies.

## Mitigation

Federal, state, and local environmental policy seeks first to avoid impacts, then minimize impacts, and, where impacts are unavoidable, mitigate them. Compensatory mitigation is the practice of restoring, enhancing, or protecting wetland, stream, or other aquatic resource functions to offset their loss elsewhere as a result of construction projects. In 2008 the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency issued the Compensatory Mitigation for Losses of Aquatic Resources Final Rule, which establishes performance standards and criteria for mitigation for activities that require Army Corps permits. There are three primary classes of compensatory mitigation recognized in the Final Rule guidelines: permittee-responsible mitigation, in-lieu fee mitigation, and mitigation banking.

Permittee-responsible mitigation is habitat restoration and enhancement undertaken by the permittee either at the site of the disturbance (“on-site mitigation”) or at another location, typically within the same watershed (“off-site mitigation”). Because most permittees lack wetland experience, and because of the inherent difficulty of wetland restoration, creation, and enhancement, permittee-responsible programs are at the bottom of the preference hierarchy of the Army Corps mitigation guidelines. However, permittee-responsible mitigation is

the accepted practice in New York City, where the New York State Department of Environmental Conservation has not recognized in-lieu fee mitigation and mitigation banking.

In-lieu fee mitigation involves permit applicants designating an approved third-party organization to undertake wetland creation, restoration, and/or enhancement. The third-party organization—typically a governmental agency or non-profit—has an agreement with appropriate regulatory agencies to use fee payments from permit applicants to engage in compensatory mitigation. In-lieu fees have proven beneficial because they allow organizations with technical expertise to tackle complex wetland projects. In the past, federal regulators have favored in-lieu fee arrangements, but the Army Corps now lists them second in its preference hierarchy.

Mitigation banking, the Army Corps's preferred mitigation strategy, allows permit applicants for projects of all sizes to purchase “credits” from a restored, established, enhanced, or preserved wetland, stream, or other aquatic resource. Based on a wetland assessment, a mitigation bank assigns habitat/ecological value to those resources in the form of credits that can be sold by the bank to permit applicants to offset losses of natural resources due to dredge and fill activities. Bank credits can be disseminated for projects within a delineated geographic

region, or service area. Assigning credits and standardizing mitigation ratios (for example, one acre of wetland impact could require three acres of restoration) make the process more predictable.

The mitigation bank organization, which can either be a private or public entity, is responsible for restoring, enhancing, or preserving natural resources. A bank's mitigation requires a detailed plan prior to approval. The bank owners and regulators have a formal agreement, or bank instrument, to establish liability, performance standards, management/monitoring requirements, and terms of credit approval. An interagency review team, usually chaired by an Army Corps representative, provides regulatory review, approval, and oversight of the bank and its mitigation efforts. This built-in enforcement ensures that a project meets its restoration goals.

Mitigation banks are often more successful than individual attempts. This is in part because many projects have modest wetland impacts. Mitigating individually for such impacts often results in a mitigation project that provides little, if any, environmental benefit. In contrast, a mitigation banking plan can be implemented on behalf of multiple projects. By assembling and applying extensive financial resources, planning, and scientific expertise not always available to permittee-responsible mitigation projects, mitigation banks reduce uncertainty over whether the compensatory mitigation will be successful. Mitigation banks also reduce permit processing times, and thereby improve the cost-effectiveness of compensatory mitigation.

Mitigation banking can provide economies and ecologies of scale for wetland restoration. The consolidation of scientific expertise, financial resources, and regulatory oversight into large-scale mitigation activities can streamline the permitting process and ensure that mitigation is both professional and ecologically significant.

Mitigation banking or in-lieu fee mitigation, if established in New York City, could channel resources to larger ecological restoration projects. Instituting a policy on these methods of mitigation could provide important new tools to improve the permitting process—and improve the environment.



Repairing fendering and piles at Pier 9A North at the Red Hook Container Terminal.

## MANAGEMENT OF PUBLIC INFRASTRUCTURE

The bulkheads, piers, platforms, and other structures that make up the City's public infrastructure are essential to economic development and quality of life. Public and private infrastructure on the shoreline represents assets that today would have a replacement value in the billions of dollars.

Waterfront structures require routine maintenance and repairs. Exposure to the harsh marine environment causes deterioration of these assets, jeopardizing New York City's capacity to continue to grow and diversify its economy. To ensure a prosperous future, investment in and maintenance and management of this infrastructure are critical. Maintenance of these structures can prevent the need for substantial capital demands for major repair and reconstruction. Replacement of deteriorated structures often results in more extensive costs as well as delays due to regulatory obstacles.

Historically, the City's public waterfront infrastructure was under the stewardship of the Department of Ports and Terminals, which later became the Department of Ports, International Trade and Commerce. This agency was dissolved in 1991, and its responsibilities and infrastructure assets were divided among other City agencies, with the majority of the properties go-

ing to the New York City Department of Small Business Services (SBS) under the management of the New York City Economic Development Corporation (EDC). These two agencies maintain approximately 22 miles of waterfront infrastructure. Their program for managing waterfront maintenance could serve as a model for the rest of the more than 100 miles of publicly owned waterfront.

The division of responsibility for inspection and maintenance of waterfront infrastructure among dozens of agencies can create confusion about which agency has jurisdiction over particular waterfront assets. This is especially true when structures abut multiple uses such as parks and roadways. In addition, the inspections and maintenance necessary to preserve waterfront assets can be costly in the short term, and difficult to prioritize. Damage to substructures is often not readily apparent and may require verification by underwater inspections.

Effective maintenance of the City's piers, platforms, and bulkheads first requires current information about their condition, which is subject to change and affected by severe storms and other weather events. Much of this infrastructure has not been systematically catalogued and assessed.

EDC and SBS undertake routine inspection and maintenance of the waterfront infrastructure they are responsible for and have estab-



Without regular maintenance, piers will deteriorate until they collapse, as seen with this pier in Greenpoint, Brooklyn. It is difficult to obtain a permit to rebuild.

lished protocols to forecast future infrastructure repairs. The Waterfront Maintenance Management System (WFMMS) is a new comprehensive GIS-based database—commissioned by EDC and put into effect in 2010—that is designed to serve as a repository for all information pertinent to the maintenance of the City’s waterfront infrastructure. WFMMS has current mapping with geodetic information and maintains past inspection reports, past construction and repair information, past permits, and a variety of other data directly related to the maintenance of EDC’s and SBS’s waterfront infrastructure. Each catalogued site is broken down by sub-facilities and individual structures within those facilities—all the way down to individual structural elements. Using the inspection reports contained in WFMMS, users are able to catalog individual structural component assessments and ratings, along with recommendations for future inspection timing, repairs, and long-term capital rehabilitation projects.

WFMMS is also a planning tool to establish baselines from past projects, identify and manage inspection protocols in the present, and forecast future project needs and budgets. It is scalable so that in the future it can be expanded to provide the same capabilities to all City agencies. WFMMS has the capacity to centralize all property information, facility maintenance and capital project information, and detailed site histories for City-owned waterfront land. By expanding this program or similar programs to all City-owned waterfront facilities, current conditions could be better understood and future needs better anticipated.

## REGIONAL COORDINATION

Issues of regional significance—such as dredging, improvements to water quality, ecological restoration, and bridge replacement—require regional coordination. Several initiatives discussed in *Vision 2020* will necessitate coordination among numerous governments within the region. These initiatives include the implementation of the *Hudson-Raritan Estuary Comprehensive Restoration Plan* and the *Dredged Material Management Plan*, coordination of Harbor operations through the Harbor Safety, Navigations, and Operations Committee of the U.S. Coast Guard, planning for the future of the marine cargo terminals, and planning for climate resilience. Regional coordination will be required to seek federal funding for all these projects.

Many of the recommendations in *Vision 2020* have funding needs, large and small. The continued vitality of our waterfront depends on the availability of resources and revenues to support a wide range of public and private activities. Compared to other harbors and estuaries around the nation, New York Harbor is underfunded for environmental restoration and port activities and operations. New York City can seek to partner with New York State and New Jersey and other municipalities and institutions in the region (such as metropolitan planning organizations and the Port Authority of New York & New Jersey) to advocate for federal funds.

# Improve Government Oversight: Strategies and Projects

This plan envisions a waterfront in 2020 that is more productive, more active, and more accessible. But permitting difficulties, unclear oversight, and a lack of funding are all challenges to making progress on the waterfront.

To address these challenges, the City will pursue the following set of strategies over the next 10 years. The City will improve permitting predictability and efficiency by providing training and guidance to permit applicants, while

working with regulators to better synchronize permit decisions. The City will also improve maintenance and monitoring of City-owned infrastructure. And to address the need for funding for waterfront projects, the City will partner with stakeholders in the region to advocate for greater funding for the Harbor.

*Vision 2020's* 10-year strategies are complemented by the *New York City Waterfront Action Agenda*, a set of projects chosen for their ability

to catalyze investment in waterfront enhancement. The City commits to initiating these projects over the next three years and will be tracking progress on an ongoing basis. For each project, the lead agency and implementation year are noted.

Together, these strategies and projects lay out a comprehensive vision for the waterfront and waterways and a plan of action to achieve that vision.

## I. Improve predictability and efficiency of the permitting process for in-water construction.

### VISION 2020 STRATEGIES

- Establish a permitting liaison to assist applicants in filing applications.
- Create a coordinated process, or one-stop shop, for waterfront environmental permits.
- Support integration of coastal zone policies with Clean Water Act regulatory permit actions and clarify Waterfront Revitalization Program policies encouraging “water-enhanced” uses.
- Work with city and state agencies to expedite the review process and to give priority to bulkhead repair and replacement projects in Significant Maritime and Industrial Areas, while continuing to ensure that environmental concerns are addressed.
- Assist maritime businesses in navigating the environmental permitting process to reduce uncertainty.

### ACTION AGENDA PROJECTS

- Establish an in-water permitting task force to focus on developing permitting guidance documents, written mitigation policies and standards, a one-stop shop for in-water permitting, and a training program for applicants. (EDC, 2011)
- Develop a wetlands mitigation bank and/or in-lieu fee program to promote more effective mitigation projects. (Mayor’s Office, 2012)

## 2. With input from stakeholders, establish design guidelines for in-water infrastructure, such as piers, docks, and bulkheads.

### VISION 2020 STRATEGIES

- Establish design guidelines and location criteria for “soft” waterfront edges that create habitat for marine life, enhance ecological productivity, facilitate water access, manage stormwater, mitigate flooding, and control wakes.
- Develop new pier and bulkhead design guidelines that integrate ecosystem-enhancing features, such as oyster baskets.
- Design bulkheads and piers with accommodations for getting in and out of the water where appropriate.
- Create design guidelines for piers, docks, and bulkheads with hardware and structural standards that are functional for multiple types of vessels, including recreational boats and historic vessels. Guidelines should cover pier shape, strength, fendering, bollards, water depth, wake protection, railings and rail openings, floats, upland vehicle access, and water, electric, and sewer infrastructure needs. Incorporate the design standards into the Waterfront Revitalization Program and state coastal permitting, where appropriate.
- Support the creation of training, workshops, and courses on high-quality design of waterfront public space for designers, architects, landscape architects, engineers, and planners.

### ACTION AGENDA PROJECTS

- Establish a task force to develop design and construction guidelines for in-water structures that minimize negative environmental impacts, ensure structural resiliency, and accommodate vessel tie-up. (EDC, 2011)

### 3. Ensure that the City adequately maintains City-owned waterfront infrastructure.

#### VISION 2020 STRATEGIES

- Create a detailed assessment of the condition of all City-owned in-water infrastructure, subject to funding availability.
- Expand on the model of WFMMS to improve the inspection and maintenance of City-owned in-water infrastructure, subject to funding availability.

### 4. Pursue regional coordination and partnerships on issues of regional significance.

#### VISION 2020 STRATEGIES

- Cooperate with regional stakeholders where opportunities exist to share information, pursue projects, or jointly seek federal funding for a range of purposes, including transportation, climate resilience, dredging, and ecological restoration.
  - Cooperate with regional partners to utilize the framework of the draft *Hudson-Raritan Estuary Comprehensive Restoration Plan* to guide restoration projects within the region.
  - Collaborate with partners in the NJ-NY-CT region to enhance the use of the waterways for freight movement, passenger transportation, and emergency evacuation.
  - Collaborate with relevant state and local governments and the Coast Guard on managing boat traffic and other means to improve the safety of water recreation and navigation.

#### ACTION AGENDA PROJECTS

- Seek to identify and secure funding for the Hudson-Raritan Estuary by coordinating with federal and state partners. (Mayor's Office, 2013)

The seawall at Battery Park City, Manhattan.



## GOAL 8

Identify and pursue strategies to increase the city's resilience to climate change and sea level rise.

# INCREASE CLIMATE RESILIENCE

**New York's shoreline has been dramatically** altered over the centuries. From the moment the Dutch arrived in Nieuw Amsterdam, piers, wharves, docks, and bulkheads have been built. And landmass itself has been added, through the process of fill. While such modifications to the landscape have radically changed the shoreline ecology, they've also given rise to the region's economic engine and enabled more than eight—and soon nine—million people to inhabit the city. New York's ability to support a large population and substantial employment in a small area is one of its greatest contributions to the environment, resulting in per-capita carbon emissions that are one-third the national average and allowing the preservation of open space and natural resources elsewhere. In recent years substantial improvements to water quality and marine ecology have been made, even as the population of New York has continued to grow.

Now human activity is altering the waterfront in a new way. Climate change resulting from global greenhouse-gas emissions is expected to cause sea levels to rise, which will further transform our shoreline. The New York City Panel on Climate Change projects that by the 2050s, sea levels could be 12 inches higher than they are today or, in the event of rapid melting of land-based polar ice, as much as 29 inches higher than today. By the 2080s, increases of up to 23 to 55 inches are projected. And as the sea level rises, the risks from severe storms and flooding that New York has always faced as a coastal city exposed to the ocean are expected to increase, too.

New York is already taking steps to address climate change. The City is working to reduce

its contribution to climate change through the *PlaNYC* goal of reducing greenhouse-gas emissions 30 percent by 2030. Adaptations to our environment to increase the city's ability to withstand and recover quickly from weather-related events, or its climate resilience, are also being contemplated and made.

Building climate resilience requires recognition of the character of New York City's coastal areas as well as the risks they face. For instance, most portions of New York stand several feet or more above sea level, and therefore face different challenges from, say, New Orleans or the cities of the Netherlands, substantial portions of which are below sea level. In those cities, floodwaters do not naturally recede after a storm, exacerbating the potential for damage and disruption, as seen with Hurricane Katrina in New Orleans in 2005. Then, too, New York City's potential for flooding comes primarily from coastal waters, as opposed to the river flooding that cities such as London must address. For New York City, both temporary inundation from higher sea levels and damage from storm surges must be considered. The impacts of flooding and wave action may make sense to address separately or in combination, depending on circumstances.

Building resilience to coastal storms and flooding anticipated in the future does not lend itself to quick or simple solutions. Strategies that have historically been used to divide water from land will not make sense with climate change and sea level rise. To simply bulkhead the entire waterfront would not adequately address risks, would become increasingly costly, and would have negative ecological consequences for our waterways and coastal areas. To abandon dense

coastal neighborhoods would have enormous costs as well. A balanced approach to increasing climate resilience will require case-by-case analysis, drawing on a toolkit of strategies that the public and private sectors can consider and apply to address vulnerabilities. In deciding among a range of practical alternatives, it will be important to consider the costs and benefits of each option, as well as opportunities to address multiple goals. Any strategy must recognize the ecological benefits of wetlands, shallows, and intertidal zones, along with other public priorities such as waterfront access and economic development.

Because certain risks are unavoidable, a resilience strategy should not seek to eliminate all risks. Instead, the city must identify and manage risks; take steps to minimize danger to lives and damage from flooding and storms; and limit disruptions from storm events and the recovery time after such events. Implementing a resilience strategy will require actions not only by government, utilities, and other public entities, but also by private property owners, businesses, and communities. In some instances, more restrictive government regulations may facilitate increased resilience, while in others regulatory or other impediments may need to be modified to allow citizens and government the latitude to implement adaptation strategies.

Building resilience will be an ongoing process extending beyond the time frame of *Vision 2020*. Nevertheless, it is important to take action today. Since the most pronounced impacts for New York City are not projected to begin until mid-century, there is an opportunity for planning, with periodic re-evaluation of risks and strategies as climate science evolves and provides greater clarity on changing conditions.

"Sea level rise is unequivocal. It's happening. The only question is by how much. Construction around the waterfront and bay has to allow for unpredictable change. We can't just build a big wall and forget about it."

—Guy Nordenson, structural engineer and principal, Guy Nordenson and Associates

## IMPLICATIONS OF CLIMATE CHANGE

Climate change and rising sea level clearly have important ramifications for New York City, where there are nearly half a million people and almost 300,000 jobs within the Federal Emergency Management Agency (FEMA) 1- and 0.2-percent-annual-chance flood zones (see “Flood Risk in New York City,” page 109). Climate change raises important considerations for all five functional categories of the waterfront identified in *Vision 2020*.

### The Natural Waterfront

The specific effects of climate change on a particular natural shoreline are not easily identified. The shoreline is constantly subject to a range of forces and events, some induced by human activity and some not. For instance, erosion and siltation patterns vary throughout the harbor estuary. The rise in sea level and increased frequency and magnitude of coastal storms will likely cause more frequent coastal flooding and inundation of coastal wetlands as well as erosion of beaches, dunes, and bluffs. They may also result in accretion and siltation in other areas. Alterations in the landscape, along with increases in temperature and changes to precipitation patterns, will affect the many plant and animal species that inhabit New York’s diverse coastal ecosystems.

### The Public Waterfront

Today nearly half of the coastline is parkland or publicly accessible areas. In addition to providing valuable and productive habitat, these parks and public areas are treasured places for recreation and relaxation. Beaches and other naturalized shorelines provide access for surfing, swimming, kayaking, and other water sports. Waterfront greenways are hugely popular for recreation and transportation. All these spaces are valuable resources that enhance the city’s livability and the health of its population.

Coastal storms and temporary or more frequent inundation of low-lying areas could result in damage to or loss of parks, esplanades, piers, plazas, beaches, boat launches, and other facilities. These events are expected to accelerate the erosion of unstabilized shorelines and the degradation of bulkheads (vertical retaining structures of timber, steel, or reinforced concrete, used for shore protection) and piers.



Riverside Park South on the Hudson River, Manhattan.

## Approaches to Climate Change

There are two broad ways to address climate change. One is mitigation, which involves actions to limit further contributions to climate change. The continued growth of New York City itself is a mitigation strategy for climate change, enabling a large population to live in dense settlements in which per-capita carbon emissions are one-third of the national average. The City’s mitigation efforts revolve around *PlaNYC* initiatives to achieve a 30 percent reduction in greenhouse-gas emissions by 2030.

The other general approach to climate change is adaptation, and it entails making preparations for the effects of climate change that are already inevitable. *Vision 2020* focuses on adaptation strategies for our waterfront and waterways to build climate resilience in response to existing and projected climate hazards.

### The Redeveloping Waterfront

A substantial portion of the coast today is occupied by residential and commercial buildings that will be subject to the same risks from flooding and coastal storms as other waterfront uses are. Today several policies are used to manage these risks for new buildings, including flood insurance, zoning and building codes, and design of structural features such as ground floors raised above flood elevation. Existing buildings, though eligible for flood insurance, are of course generally more difficult to elevate or floodproof.

### The Working Waterfront

Much of the city’s critical infrastructure is located on the waterfront, including a wide range of transportation facilities—subway tunnels, rail yards, highways, streets, airports, heliports, bridges, vehicular tunnels, piers, and slips—as well as the power plants, sewer and wastewater treatment facilities, and waste transfer stations that keep the city running. Also on the waterfront are the city’s marine cargo ports and maritime enterprises such as tugboat and barge operators, ship repair facilities, cruise terminals, and a variety of other industrial and commercial businesses. Flooding and storm surges pose potential risks of structural damage, interruption of services and operations, and property loss. Hazardous materials improperly stored in

vulnerable areas could be subject to leakage, which could affect adjacent neighborhoods. Sea walls, bulkheads, and other shoreline structures are likely to experience more damage from additional wave action and sea level rise, requiring more frequent repairs and maintenance. The effects of climate change may pose navigational issues, too, such as accelerated silting of channels necessitating more frequent dredging. Higher temperatures will cause bridges to sag slightly more, and this, coupled with rising sea levels, will result in lowered bridge clearance for ships, with implications for port activity in the city and region.

### The Blue Network

Rising sea levels and increased storm activity will likely bring stronger wave action and choppy waters within the Harbor, potentially leading to greater damage along the shoreline. Recreational boating, waterborne transportation, and other water activities will also be affected. These activities will experience changes in our waterways on a gradual but daily basis, and their facilities and operations may need to be adapted. Public education about the waterfront and waterways presents an opportunity to communicate more widely the importance of both mitigation and adaptation (see “Approaches to Climate Change,” above).

## RESILIENCE PLANNING CURRENTLY UNDER WAY

Steps are already being taken to improve New York City's climate resilience. These include emergency preparedness planning, efforts to improve data on climate risks, and the exploration of strategies to prepare for the effects of climate change.

### Emergency Preparedness Planning

An important part of climate resilience is the ability to respond to and recover from adverse events. New York already orchestrates responses to weather-related events. Maintaining and improving the city's ability to bounce back from storms is crucial to building climate resilience.

The New York City Office of Emergency Management (OEM) maintains plans to deal with specific events. These plans include the *Citywide Debris Management Plan*, *Power Disruption Plan*, *Flash Flood Emergency Plan*, and *Coastal Storm Plan* (see Figure 1). These plans could be used to respond to events related to climate change. In 2009 OEM produced the City's first *Natural Hazard Mitigation Plan*, which is required by the Federal Emergency Management Agency for the city to be eligible for certain federal disaster mitigation funds.

Communities can increase their resilience by building preparedness among local residents and institutions. One of OEM's roles is educating New Yorkers about preparing for emergencies. Its Ready New York community-outreach program educates city residents about hazards such as coastal storms and flooding, and encourages the public to prepare for emergencies.

### Improving Data on Climate Risks

A number of coastal cities worldwide have initiated efforts to plan for long-term climate resilience, including London, Rotterdam, Sydney, and San Francisco. New York City is a pioneer in this emerging field. *PlaNYC*, released in 2007, recognized the importance of adapting to a changing climate, and contained a set of initiatives to begin the formulation of adaptation activities. As a critical first step, Mayor Bloomberg convened the New York City Panel on Climate Change (NPCC), a group comprised of scientists who study climate change and its impacts as well as legal, insurance, and risk-management experts. In 2009 the NPCC released *Climate*

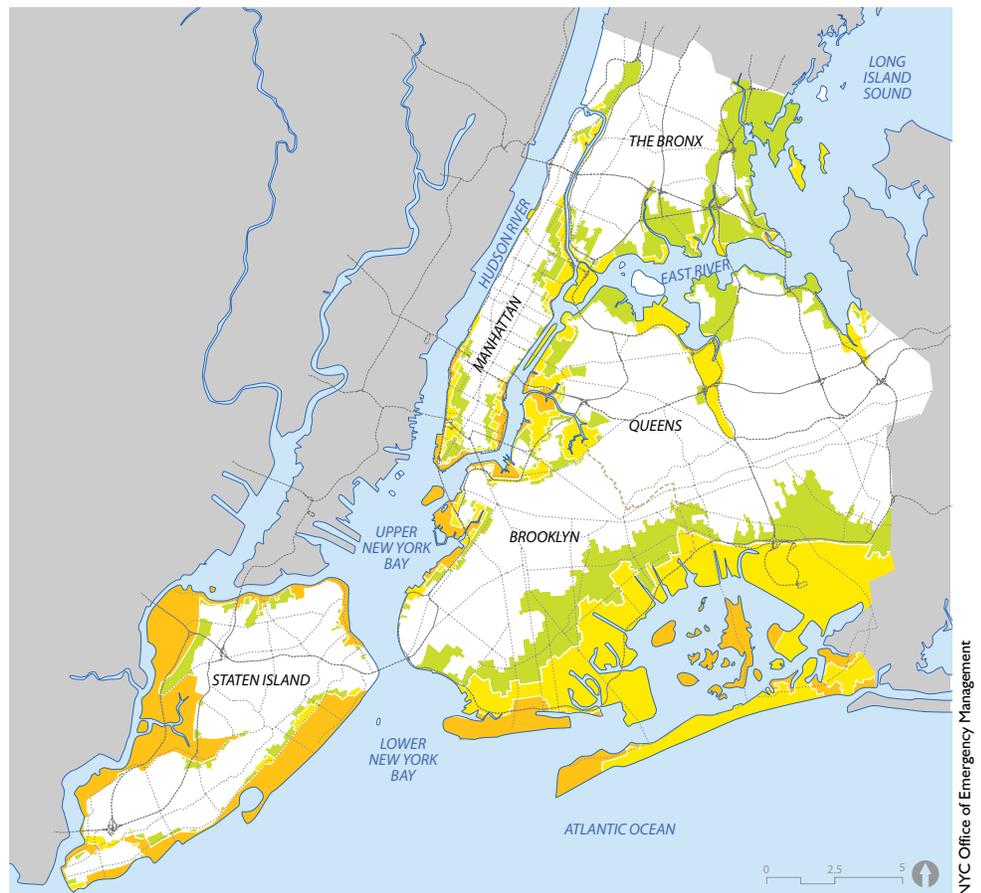


Figure 1: New York City Hurricane Evacuation Zones from the *Coastal Storm Plan*

- Zone A:** Encompasses all areas that will be inundated with storm surge in a Category 1 hurricane and all areas abutting the Atlantic coast, regardless of inundation. Faces the highest risk of life-threatening tidal inundation. The immediate beach areas in this zone are also vulnerable to destructive surf and coastal erosion.
- Zone B:** Encompasses all Category 2 inundation areas. These areas are at risk from damaging inland storm surge, but not from destructive surf.
- Zone C:** Encompasses all Category 3 and 4 inundation areas. These areas, though farthest from the pounding coastal surf, are still at risk.

*Risk Information*, which outlined a set of climate-change projections for New York City and described potential risks to critical infrastructure. (These projections have been adopted by the State of New York in its planning activities for climate change and sea level rise.) In 2010 the NPCC issued *Climate Change Adaptation in New York City: Building a Risk Management Response*, which presented an iterative, risk-management approach to climate-resilience planning for both the public and private sectors that involves near-term actions and periodic re-evaluation of long-term risks and strategies.

Another *PlaNYC* initiative was to convene the New York City Climate Change Adaptation Task Force to assess the vulnerabilities of the city's critical infrastructure. The Task Force, consisting of city, state, federal, and private in-

frastructure operators and regulators, used NPCC's projections to identify more than 100 types of infrastructure that climate change could affect, including water, energy, transportation, and communications. The Task Force explored strategies to reduce risk and increase resilience.

Building resilience in coastal communities requires an understanding of which areas are likely to be vulnerable to flooding and storm surge. Until recently, the data available on the elevation of land and buildings in the coast was insufficient for making an accurate assessment, with a margin of error of several feet. The City has acquired more accurate LiDAR (light detection and ranging) elevation data, which will have a substantially smaller margin of error and make improved risk assessment possible.

## STRATEGIES TO BUILD RESILIENCE

There are a variety of adaptation strategies that can be applied to build resilience, and these strategies can generally be divided into three general categories: retreat, accommodation, and protection. These categories are not mutually exclusive alternatives, but represent a range of possible solutions that can be applied where warranted. Potential strategies to build resilience include physical measures and policies at a variety of scales—for individual buildings, larger sites, and broader waterfront reaches—as well as other non-physical policies such as flood insurance.

### Retreat

Retreat is the practice of prohibiting, restricting, and/or removing development in or from the most vulnerable coastal areas to minimize hazards and environmental impacts. Retreat strategies include rolling easements, land purchases, and setback requirements. These strategies can reduce harm to ecosystems and provide a margin of safety by keeping homes and businesses from areas susceptible to flooding. However, such measures can have dramatic effects on property owners and communities, and have been explored mostly as a potential adaptive strategy for undeveloped areas, areas of low-density development, or open uses such as farming or habitat conservation. Retreat has also been adopted following severely damaging floods. It has never, however, been applied preemptively in an area as densely developed as New York City.

Retreat may be a viable strategy in less-developed portions of New York, such as in natural areas or open spaces, where it is compatible with other goals. For instance, it may be possible to allow wetlands to migrate inland in important natural areas to maintain species habitat and moderate the impact of storm surges.

However, it is unlikely that retreat from previously developed areas would be practical. In New York City, retreat from the shoreline, considered as a broad strategy, would not only be expensive to implement, but it would also have a wide range of other costs: It could displace residents and neighborhood institutions, disrupt transportation and business activity, and impede the city's achievement of its *PlaNYC* goals for sustainable, dense development to



Post-storm flooding in Brooklyn.

### Flood Risk in New York City

The Federal Emergency Management Agency (FEMA) establishes official geographical boundaries for areas that face different levels of flood risk. These boundaries, which are shown on FEMA's Flood Insurance Rate Maps, are used for administering the National Flood Insurance Program, and are also referenced in other regulations such as building codes. FEMA has designated the 1-percent-annual-chance flood zone, also known as the 1-in-100-year flood zone, as the area that has a 1 percent chance every year of experiencing a flood. In New York City, there are more than 215,000 people living within the FEMA 1-percent-annual-chance flood zone, and there are also more than 185,000 jobs. Farther inland, in the 0.2-percent-annual-chance flood zone, also known as the 1-in-500-year flood zone, the area where FEMA deems there to be a 0.2 percent chance each year of a flood, there are more than 475,000 people and more than 290,000 jobs.

accommodate a growing population. The city's vast infrastructure—including transit and sewer systems—cannot be moved to higher ground. Waterfront land that is not built out but is used for public open space also serves an important role in supporting New York City's population.

### Accommodation

A variety of actions can be employed to minimize damage from flooding and storm surges without completely shielding a facility or site. One example is requiring floodproofing for portions of buildings located below projected flood elevation in flood-prone areas. The lower levels of buildings can be designed to withstand controlled flooding, using breakaway walls, waterproof materials and sealants, or vents to allow floodwaters to advance and recede without causing structural damage. Buildings or other facilities can be designed with critical systems and equipment elevated above the projected flood level.

Existing building-code regulations, consistent with federal standards, require the flood-

proofing of all buildings located within the Federal Emergency Management Agency (FEMA) 1-percent-annual-chance flood zone. This entails measures such as raising habitable spaces and critical building systems above the FEMA base flood elevation. FEMA's National Flood Insurance Program encourages additional measures for safety by allowing substantial discounts to flood insurance premiums for buildings that exceed floodproofing standards by one or two feet in elevation, called "freeboard." However, zoning height limits are typically measured from the FEMA base flood elevation, which can discourage or prevent an owner from adding freeboard. Elevation is a solution most easily applied to new buildings; its application to existing buildings can be complicated and expensive. Because floodproof construction can limit active uses at street level, the freeboard elevation of buildings requires special attention to the quality of the streetscape.

Accommodation measures can go beyond individual buildings to the scale of a site. It is possible to configure streets and open spaces

to accommodate controlled flooding, designing such areas with salt water-tolerant plant species and elevated structures that can survive temporary inundation.

Although floodproofing and other accommodation measures can add costs to construction or rehabilitation of buildings and sites, they generally require less initial investment than flood barriers or levees, and carry less risk of potential large-scale failure. They can be implemented on a smaller scale, by private or public entities, and in an incremental manner. However, because of the many parties that may be involved, sites within a given area may have different levels of protection.

## Protection

Protection strategies involve the deployment of structures that protect a building or the shoreline from erosion, prevent flooding and inundation, or reduce wave and tidal action. These strategies often are applied at the building or site scale, though they could also be used to protect an entire neighborhood or reach. Examples include:

- **Retractable water-tight gates or barriers** to protect windows or other building openings can be employed to shield a single structure.

- **Seawalls, bulkheads, or revetments** are essentially walls that are commonly built at the edge of an individual parcel of land as shoreline infrastructure. The maintenance of these types of structures is already a continuous process requiring funding and periodic issuance of permits for maintenance or repair work. In the future, these needs will likely grow. Increased wear and tear on waterfront infrastructure will require more frequent maintenance and replacement of bulkheads, seawalls, and stabilized shorelines. These “hard” bulkheaded edges result in scouring of the channel in front of the wall and limit potential for habitat near the shoreline.

- **“Soft edges,”** or graduated edges, can be created where possible. The benefits of soft edges include the reduction of speed and force of tidal action and waves, thereby limiting erosion and damage; accommodation of shifting water levels; reduced long-term maintenance costs; and increased intertidal zone (the area that is sometimes underwater, depending on tides), which can provide enhanced habitat.

- **Raising the elevation of land** can restore eroded beaches, and the establishment of dunes can prevent the recurrence of beach



“Soft edges” deployed at Brooklyn Bridge Park are part of the site’s stormwater management system. The constructed wetland also dissipates wakes and provides habitat.

erosion. Elevating low-lying development sites and streets through the addition of fill can reduce their vulnerability.

- **Dikes and levees** are raised embankments designed to prevent flooding, and **flood-gates or storm-surge barriers** are gates used to restrict the flow of waves and floodwaters. These structures can provide substantial protection from floodwaters for a larger area but also bear a range of costs, can alter ecological functions, and still may be overtopped by a flood or storm surge exceeding their designed capacity.

- **Breakwaters, groins, and jetties** are structures located off shore or extending outward from the shore that are intended not to wall out floodwaters but to reduce the impact of waves, limiting erosion and potential damage. While they can disrupt tidal patterns, they can also provide habitat.

- **Restored or constructed wetlands, beaches, barrier islands, and reefs** can function as dynamic storm barriers that both protect and serve ecological functions.

## Other Resilience Considerations

While not an adaptation mechanism in and of itself, insurance is a tool for managing risk and encouraging strategies of retreat, accommodation, or protection where appropriate. When informed by accurate information on risk, insurance can make riskier developments

more costly and less risky developments comparatively less expensive. For example, reduced premiums are available through the National Flood Insurance Program for buildings that incorporate freeboard.

Current FEMA flood maps do not necessarily reflect current flood risks, however, and can be updated based on newly available high-resolution elevation data. In addition, sea-level-rise projections indicate that in the future a broader geography will be subject to coastal flooding. Representatives of the insurance industry participated as members of the New York City Panel on Climate Change and should continue to be engaged in future efforts to align industry practices with climate-resilience goals.

Climate risks do not, of course, end at New York City’s borders. Other coastal communities in the region face similar challenges. In addition, some adaptation strategies for New York City, particularly those that affect waterways or entire reaches of the shoreline, may raise regional issues that require coordination with other jurisdictions. Communicating and sharing knowledge with other governments in the region, including through partnerships like the New York-Connecticut Sustainable Communities Consortium (recipient of a grant from the U.S. Department of Housing and Urban Development), can facilitate resilience planning throughout the region.



Architecture Research Office

Rendering from *On the Water: Palisade Bay* of potential storm surge barrier islands in Upper New York Harbor.

## Research and Innovation

The challenges of climate change lead us to re-examine traditional approaches to coastal management and to seek new, creative solutions to supplement the range of available adaptation strategies. The *On the Water: Palisade Bay* project by Guy Nordenson, Catherine Seavitt, and Adam Yarinsky, which considered potential interventions to attenuate storm surge in Upper New York Harbor, was an important step in exploring alternative approaches. The subsequent "Rising Currents: Projects for New York's Waterfront" exhibition at the Museum of Modern Art further illustrated potential strategies.

Clearly, more information will be needed. This includes the creation of a comprehensive inventory of adaptation strategies—including innovative strategies—with possible applicability to New York City. It will be important to establish partnerships among practitioners of many disciplines—including planning, engineering, design, marine biology, and ecology—to develop and test new coastal interventions that have the potential to promote a safe city and sound ecology within a changing environment. Studies that provide information on the benefits and drawbacks of emerging strategies will be helpful as part of this effort. Pilot projects that gather empirical data on the effectiveness and ecological value of alternative strategies will also be valuable.

## Integrating Resilience into Planning

Everyone from government to homeowners to insurance companies will need to consider the implications of climate change and sea level rise and make decisions about resilience strategies. It will be important to integrate resilience considerations into planning on a continuing basis. This will provide opportunities for ongoing adaptation. For instance, much of the city's waterfront infrastructure—such as bulkheads, docks, roads, and bridges—will need to be rebuilt or renovated as a matter of course before the most pronounced effects of sea level rise are expected to be felt. Incorporating consideration of climate-change projections into the design specifications for such structures and into long-term capital plans will ensure that flood risks and sea level rise are taken into account when new facilities are built, and existing ones upgraded.

Whether it's piloting inventive solutions or simply replacing existing bulkheads, the maintenance and improvement of the waterfront will require a predictable process for the review and issuance of permits for in-water construction (for further discussion see section of *Vision 2020* on government oversight, beginning on page 96). Establishing guidelines and standards for the design of waterfront infrastructure can facilitate the protection of development areas while minimizing ecological damage and maximizing ecological benefits.

## EVALUATION OF STRATEGIES

With a waterfront as big and as diverse as New York's, there can be no one-size-fits-all solution for climate change. It is important to identify a range of potential strategies to increase the city's resilience. In very limited, less-developed portions of the city, controlled retreat from coastal land may be an option; in others, accommodation strategies may be sufficient; and in yet others, enhanced protection of shorelines will be necessary. In all these cases, decisions about shoreline management must consider the full range of costs and benefits and take into account both ecological and economic development goals. Opportunities to leverage other resources or provide co-benefits—such as augmenting a berm alongside a highway that could also serve as a levee—should be considered.

Evaluating these strategies is challenging. There is inherent unpredictability in storm events and the risks they present, as well as some uncertainty in climate projections. In addition, it is difficult to predict future changes that may result from storm events, or from erosion and accretion of shorelines, or the secondary effects of such changes. There are also many unknowns about the possible effects of many of the strategies mentioned above. In the future, scientific modeling, empirical research, and pilot projects can yield better information. Improved scientific understanding will be important in the evaluation of potential adaptive strategies.

There are, however, actions that can be explored now to build resilience. These include allowances and potential requirements for more stringent flood protection of buildings in flood-vulnerable areas; updating FEMA flood maps to accurately reflect current topography; the periodic updating of emergency-response plans; improvements to the coastal permitting processes necessary to undertake adaptation; and public education about climate-related risks and opportunities to address them.

Measures to increase the city's resilience must consider a number of goals, including economic development, public access, and ecological health. Strategies should be promoted that produce co-benefits or advance other desirable ends. Building resilience can be an impetus for transforming the waterfront in ways that can make the city not only more climate-resilient, but also more healthy, prosperous, and livable.

# Increase Climate Resilience: Strategies and Projects

Though the most severe effects of climate change are not expected to be felt by 2020, this plan considers steps to take within the next 10 years to prepare for rising sea levels and more intense storm activity associated with climate change.

Building on efforts already under way, the City will pursue the following set of strategies to develop a better understanding of future risks and identify means to reduce these risks. The City will work with communities, scientists, and policymakers to further research into physical

risk-reduction measures and evaluate the effectiveness of these measures to increase New York's resilience. In addition, the City will continue to examine regulations and programs currently in place to reduce flood damage—such as the building code, insurance, and emergency preparedness planning—and explore how to strengthen these tools to meet future climate risks. The City will also continue to engage communities in resilience planning, furthering local efforts by providing information and education.

*Vision 2020's 10-year strategies are comple-*

mented by the *New York City Waterfront Action Agenda*, a set of projects chosen for their ability to catalyze investment in waterfront enhancement. The City commits to initiating these projects over the next three years and will be tracking progress on an ongoing basis. For each project, the lead agency and implementation year are noted.

Together, these strategies and projects lay out a comprehensive vision for the waterfront and waterways and a plan of action to achieve that vision.

## 1. Conduct a citywide strategic planning process for climate resilience.

### VISION 2020 STRATEGIES

- This process would include outreach to a range of stakeholders; highlight efforts to assess the risks, costs, and potential solutions for building climate resilience; and outline an ongoing, dynamic, risk-based planning process that can take advantage of new information and projections as they become available.

### ACTION AGENDA PROJECTS

- Establish a strategic planning process for climate resilience by updating *PlaNYC*. (Mayor's Office, 2011)

## 2. Develop a better understanding of the city's vulnerability to flooding and storm surge and examine a range of physical strategies to increase the city's resilience.

### VISION 2020 STRATEGIES

- Identify resources to promote scientific research and micro- and macro-scale modeling of flood and storm surge risks and potential interventions to inform decisions about coastal management.
- Promote pilot projects to test potential strategies and evaluate their effectiveness in providing coastal protection as well as their beneficial and detrimental effects on aquatic life.
- Create an inventory of adaptation strategies with potential applicability for New York City and evaluate strategies based on a full range of costs and benefits. Options to be considered include the potential strategies identified in this plan as well as additional innovative strategies to be identified through engagement with practitioners.

### ACTION AGENDA PROJECTS

- Study best practices for increasing climate resilience to flooding and storm surge. (DCP, 2012)

## 3. Explore regulatory and policy changes to improve resilience of new and existing buildings to coastal flooding and storm surges.

### VISION 2020 STRATEGIES

- Consider changes to the Zoning Resolution to remove disincentives to enhanced flood protection of buildings through freeboard.
- Consider modifications to construction codes to require freeboard for a wider range of buildings.
- Incorporate consideration of projections for climate change and sea level rise into the design standards for infrastructure in waterfront areas.

### ACTION AGENDA PROJECTS

- Study urban design implications of enhanced flood protection, and explore zoning and building code changes to promote freeboard. (DCP, 2012)

#### 4. Work with the Federal Emergency Management Agency (FEMA) and the insurance industry to encourage the consideration of more accurate data on current and future risks of flooding and storm surges.

##### VISION 2020 STRATEGIES

- Explore measures to promote flood protection in areas that may become subject to flooding based on climate projections.

##### ACTION AGENDA PROJECTS

- Partner with FEMA to update FEMA Flood Insurance Rate Maps to more accurately reflect current flood risks. (Mayor's Office, 2012)

#### 5. Assist with local resiliency planning.

##### VISION 2020 STRATEGIES

- Provide training to residents in emergency preparedness and response in order to further community engagement.
- Educate residents and businesses about property protection, infrastructure technology, and public/private partnerships.

##### ACTION AGENDA PROJECTS

- Support coastal communities' efforts to undertake local resilience planning, and improve the dissemination of publicly-available data on the locations of hazardous material storage. (Mayor's Office, 2012)

#### 6. Integrate climate change projections into NYC's emergency planning and preparedness efforts.

##### VISION 2020 STRATEGIES

- Work with appropriate city, state, federal agencies and stakeholders to incorporate the potential effects of climate change into NYC's *Natural Hazard Mitigation Plan*.
- Analyze future flood and storm surge risks for NYC's *Coastal Storm Plan*.
- Assess how climate change and sea-level rise models may affect critical facilities.

##### ACTION AGENDA PROJECTS

- Revise NYC's *Natural Hazard Mitigation Plan* to reflect new information—for instance, updated Sea, Lake and Overland Surges from Hurricanes (SLOSH) data—as well as regulatory and policy changes. (OEM, 2013+)
- Revise NYC Coastal Storm Evacuation Zone maps based on updated SLOSH data to identify vulnerable populations. (OEM, 2013)