

Resilient Neighborhoods

Rockaway Park & Rockaway Beach



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Shoreline at Beach 85th Street, Rockaway Beach

Resilient Neighborhoods

Rockaway Park & Rockaway Beach

THE CITY OF NEW YORK
MAYOR BILL DE BLASIO

DEPARTMENT OF CITY PLANNING
MARISA LAGO, DIRECTOR

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www.nyc.gov/resilientneighborhoods

FOREWORD

Rockaway Park and Rockaway Beach are vibrant waterfront communities nestled between Jamaica Bay and the Atlantic Ocean in the middle of the Rockaway Peninsula. Generations of families have established their roots here and millions of tourists visit each year because of the waterfront setting. However, as Sandy starkly demonstrated, the prevalence of water also makes these neighborhoods vulnerable to flooding from coastal storms today, and to an even greater degree in the future.

The Resilient Neighborhoods initiative was launched by the Department of City Planning (DCP) shortly after Hurricane Sandy. This report is the culmination of over three years of research, outreach, and hard work by DCP, working closely with floodplain residents, businesses, and local leaders to identify strategies to reduce flood risk and build a more resilient and vibrant neighborhood.

This report includes recommendations for updating specific zoning and land use regulations, as well as investments in coastal infrastructure and other programs. The conclusions of this report will guide updates to the citywide flood resiliency text amendment that DCP is currently developing.

This plan is the beginning of a conversation and a commitment to work with Rockaway Park and Rockaway Beach to ensure the communities' ongoing vibrancy and resiliency.

A handwritten signature in cursive script, reading "Marisa Lago".

Marisa Lago, Director

Department of City Planning

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EXECUTIVE SUMMARY

Hurricane Sandy's devastating impacts on neighborhoods within New York City served as a vivid reminder of the city's vulnerability to coastal storms and flooding. With climate change, storms like Sandy are expected to increase in frequency and severity in the future, putting New Yorkers living and working near the waterfront at even greater risk. Yet, as Sandy also demonstrated, resilient building design can significantly reduce the damage caused by flooding and enable homes and businesses to be reoccupied sooner. By combining resilient building with thoughtful land use planning and strategic investment in infrastructure, the city can adapt to challenging environmental conditions over time and create neighborhoods that are both vibrant under ordinary conditions and able to withstand and recover quickly from future floods.

Resilient Neighborhoods is a place-based planning initiative, led by DCP in collaboration with communities and other agencies, to identify strategies to support the vitality and resiliency of ten neighborhoods in the city's floodplain. This report provides details on Rockaway Park and Rockaway Beach, Queens.

Rockaway Park and Rockaway Beach were selected for this study not only because they were severely impacted by Hurricane Sandy but also because with the expansion of the floodplain within these neighborhoods there is a need to ensure that the variety of building types within them can be designed and retrofitted in ways that help reduce their exposure to flooding. Despite these challenges, there are practical strategies, including zoning changes and infrastructure investments, that can bolster the long-term resiliency of Rockaway Park and Rockaway Beach.

Resilient Neighborhoods has been guided by three primary goals, each with a set of sub-goals and strategies designed to address resiliency-related issues in Rockaway Park and Rockaway Beach.

Reducing flood risk

Special zoning rules for the floodplain should be updated to provide flexibility to existing buildings to retrofit to new, resilient standards. The study area's multi-family buildings are particularly challenged by tight building envelopes in zoning that may limit the ability for residential floor area to be relocated above the design flood elevation. While post-Sandy zoning amendments have provided some flexibility on a temporary basis, a longer term solution is needed.

Planning for adaptation over time

The peninsula faces flood risks both from the Jamaica Bay and Atlantic Ocean coasts. Along the bay there is an area that could experience future daily tidal flooding from sea level rise, though it is possible that shoreline improvements could reduce this risk. Therefore, a coordinated approach is needed to identify short- and long-term actions to reduce flood hazards along the bay and oceanfront.

Creating resilient, vibrant neighborhoods

The Rockaways' commercial corridors face challenges to making retrofits to make buildings more resilient. The City should identify updates to zoning that provide flexibility for making these investments, and should also promote disaster preparedness among businesses. In addition, the Rockaways can be strengthened through enhanced transportation alternatives and a range of coastal protection projects.

In addition, this report provides a detailed description of the outreach, research, and analysis conducted, as well as an overview of the planning framework and regulatory context for these efforts. A glossary of key terms is provided following the conclusion.

The recommendations outlined in this report include specific actions to be undertaken in the short-term, as well as broader strategies that can guide an ongoing response to evolving risks and changing conditions, to promote equity, livability, and safety.



The neighborhoods of Rockaway Park and Rockaway Beach are at the narrowest portion of the Rockaway Peninsula, where only a small strip of land separates the ocean from the bay.

INTRODUCTION

Resiliency Planning in New York City

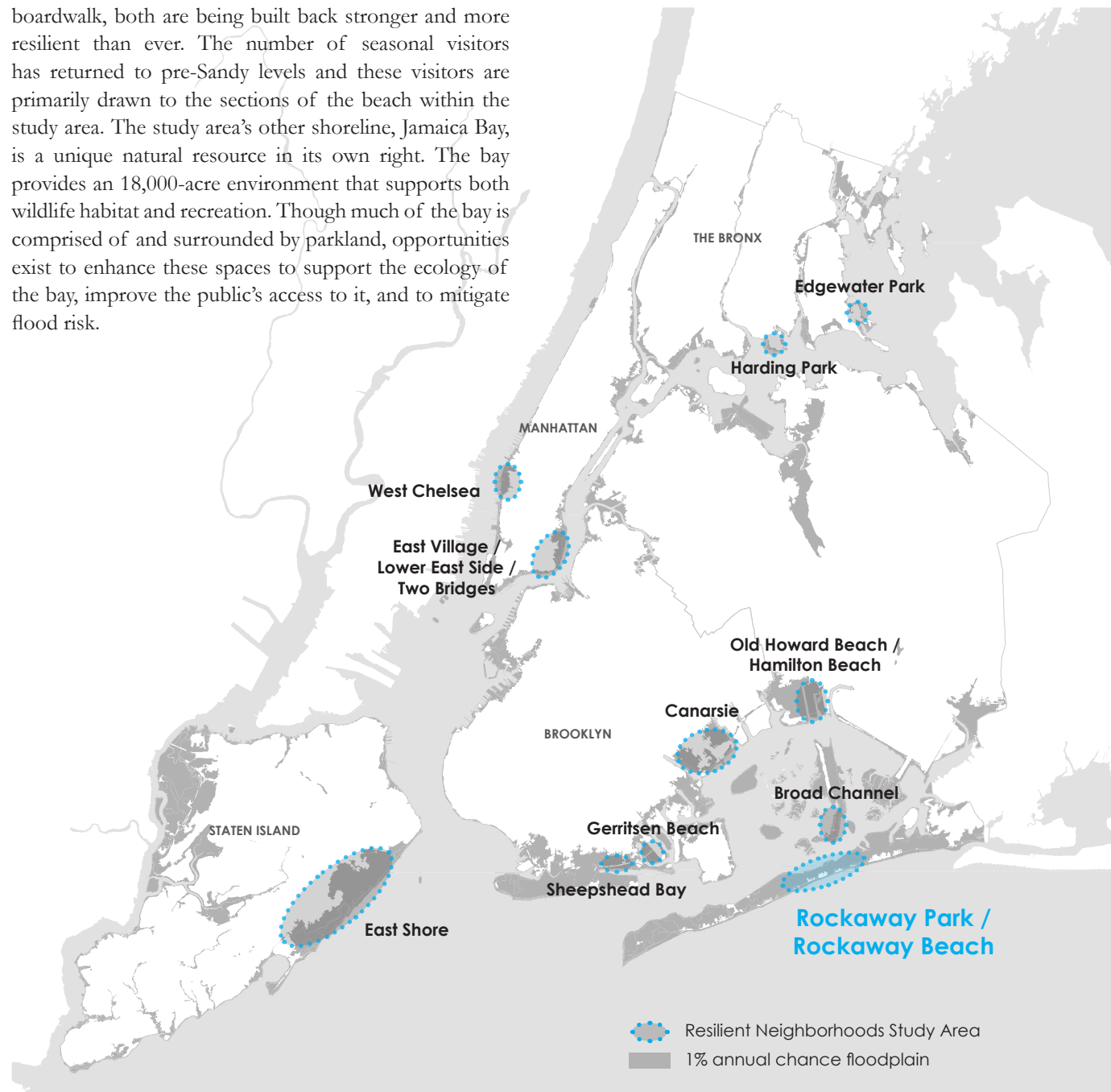
Following Hurricane Sandy in October 2012, the City developed *A Stronger, More Resilient New York*, which laid out a detailed action plan for rebuilding post-Sandy and making the city's coastal communities, buildings, and infrastructure more resilient in the long-term. The City has made significant progress implementing the plan, including funding a \$20 billion climate resiliency program, advancing housing recovery through the Build it Back program, and making long-term resiliency a reality by investing in infrastructure upgrades. Drawing on this work and earlier planning efforts, the City released in Spring 2015 *OneNYC: The Plan for a Strong and Just City*, a long-term strategy to address the city's most pressing challenges, including a rapidly growing population, rising inequality, aging infrastructure, and climate change.

Resilient Neighborhoods

One of the projects described in *OneNYC* is Resilient Neighborhoods, a place-based planning initiative to identify tailored strategies, including zoning and land use changes, to support the vitality and resiliency of communities in New York City's floodplain. Based on collaboration with residents, stakeholders, elected officials, and other City agencies, the initiative focuses on ten study areas located in all five boroughs that represent a variety of demographic and built conditions. The NYC Department of City Planning (DCP) identified these study areas because they present specific land use, zoning, and other resiliency issues that cannot be fully addressed by citywide zoning changes.

Rockaway Park and Rockaway Beach were selected for this study not only because they were among the city's hardest-hit neighborhoods during Hurricane Sandy but also because of the unique challenges they face. The very shorelines that put these neighborhoods at risk are also unmatched in terms of the recreational resources they provide to the local communities and New York City. While Sandy leveled the beach and Rockaways' famed

boardwalk, both are being built back stronger and more resilient than ever. The number of seasonal visitors has returned to pre-Sandy levels and these visitors are primarily drawn to the sections of the beach within the study area. The study area's other shoreline, Jamaica Bay, is a unique natural resource in its own right. The bay provides an 18,000-acre environment that supports both wildlife habitat and recreation. Though much of the bay is comprised of and surrounded by parkland, opportunities exist to enhance these spaces to support the ecology of the bay, improve the public's access to it, and to mitigate flood risk.



The Rockaway Park and Rockaway Beach study represents a collaboration between DCP, the Mayor's Office, and other City agencies and offices, including the Mayor's Offices of Recovery and Resiliency (ORR) and Housing Recovery Operations (HRO); the New York City Economic Development Corporation (EDC); and the Departments of Transportation (DOT), Parks and Recreation (DPR), and Small Business Services (SBS). In addition, the study built on public input previously generated through other initiatives, such as New York State's Community Reconstruction Program and the U.S. Department of Housing and Urban Development's Rebuild by Design. The Rockaway Park and Rockaway Beach study also carefully considered the recommendations from the "Getting Back to Business" report (produced by the American Planning Association and the Rockaway Development and Revitalization Corporation) the American Institute of Architects Regional and Urban Design Assistance Team's beach to bay corridor plan for Beach 116th Street, and the Strategies for Economic Growth report prepared by the JGSC Group for the Beach 116th Street Partnership.



The reconstructed boardwalk in Rockaway Beach

Daniel Avila / NYC Parks

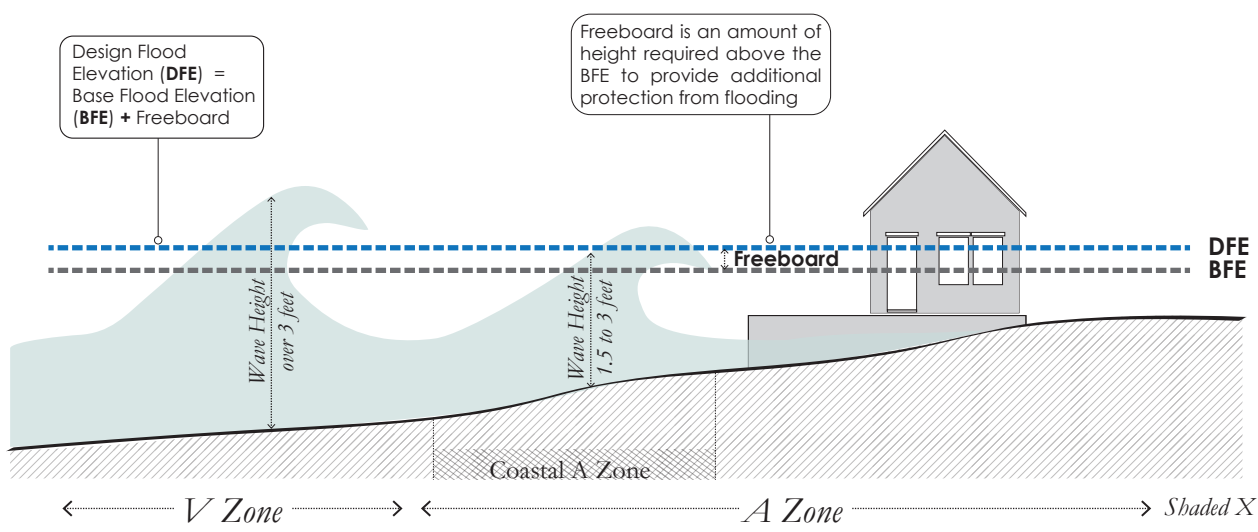
Regulatory Context

A wide array of programs and regulations at various levels of government shape the City’s approach to managing flood risk and promoting resilient development. In the United States, floodplain regulation begins with Flood Insurance Rate Maps (FIRMs), which the Federal Emergency Management Agency (FEMA) creates and maintains. The maps show the extent and elevation to which flood waters are expected to rise during a 100-year flood or a flood that has a 1% chance of occurring in any given year. The elevation of the expected 1% annual chance flood is called the Base Flood Elevation or BFE. FIRMs also show the 500-year or 0.2% annual chance floodplain, which is shown as the Shaded X Zone.

The 1% annual chance floodplain is divided into three areas—the V Zone, Coastal A Zone, and A Zone—each associated with a different degree of flood risk. The diagram to the right illustrates these zones and the types of flood risk in each.

The 1% annual chance floodplain is also the area where property owners with federally-regulated or federally-insured mortgages are required to carry flood insurance. For residential structures, flood insurance premiums under FEMA’s National Flood Insurance Program (NFIP) are determined by the relationship between the lowest occupied floor of the structure and the BFE shown on the FIRMs at the structure’s location, as well as other factors. Houses built before the FIRMs were established have historically been offered subsidized insurance rates. However, due to recent federal legislative changes, those subsidized rates are gradually increasing to come in line over time with actuarial rates more closely reflecting the flood risk a home faces.

For the past several years, FEMA has been in the process of updating the FIRMs for NYC, which were implemented in 1983 and most recently updated in 2007. As part of the mapping update, FEMA issued updated



	ELEVATE	WET FLOODPROOF	DRY FLOODPROOF
	Open structure Eg. Open lattice	Water to run in / run out Eg. Flood vents	Watertight structure Eg. Flood shields
Ground Floor Configuration	<p><i>Bottom of <u>lowest horizontal structural member</u> to be at or above Design Flood Elevation</i></p>	<p><i><u>Lowest occupiable floor</u> to be at or above Design Flood Elevation</i></p>	<p><i><u>Lowest occupiable floor</u> allowed to be excavated below grade. (Not permitted for residential buildings)</i></p>
Permitted Uses (BELOW DFE)	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Parking<input checked="" type="checkbox"/> Access<input checked="" type="checkbox"/> Storage<input checked="" type="checkbox"/> Non-Residential<input checked="" type="checkbox"/> Residential	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Parking<input checked="" type="checkbox"/> Access<input checked="" type="checkbox"/> Storage<input checked="" type="checkbox"/> Non-Residential<input checked="" type="checkbox"/> Residential	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Parking<input checked="" type="checkbox"/> Access<input checked="" type="checkbox"/> Storage<input checked="" type="checkbox"/> Non-Residential<input checked="" type="checkbox"/> Residential

Preliminary FIRMs (PFIRMs) in December 2013 with another revision in January 2015. In most places, the 2015 PFIRMs show an expanded 1% annual chance floodplain. The maps also increase BFEs for much of the city. The City found inaccuracies in FEMA's underlying analysis that resulted in overstating the size of the city's current 1% annual chance floodplain. Following a successful appeal of the PFIRMs, the City is working with FEMA to create a set of new flood maps for the city. There will be one map for insurance purposes based on current flood risk, and another for planning purposes that incorporates climate change. In the meantime, the 2015 PFIRMs remain in use for building code, planning, and zoning, as described below, while flood insurance still refers to the 2007 FIRMs.

Flood Resilient Construction and Building Design

The primary purpose of the FIRMs is to establish parameters for NFIP, based on present-day flood risk. However, the same maps also establish where federal minimum standards for flood resistant construction apply. These standards are enacted through the NYC Building Code's Appendix G on "Flood-Resistant Construction," which as of 2013 applies to the 1% annual chance floodplain shown on FEMA's 2015 PFIRMs or the 2007 FIRMs, whichever of the two is more restrictive. Appendix G includes different elevation and floodproofing requirements for each flood zone, as well as separate requirements for residential and non-residential structures. Appendix G also includes rules requiring that most residential and commercial developments be floodproofed an additional one or two feet of "freeboard" above the FEMA-designated BFE. The elevation of the BFE plus freeboard is called the Design Flood Elevation (DFE).

To fully comply with Appendix G requirements, residential buildings must elevate all living space to be at or above the DFE, and any enclosed space below the DFE must be

wet floodproofed. Non-residential buildings (any building that contains non-accessory, non-residential floor area) have the option of elevating and wet floodproofing, or dry floodproofing. Where there is a mix of residential and non-residential uses, dry floodproofing is allowed, but no dwelling units may be located below the DFE. Full compliance with Appendix G results in lower NFIP premiums.

Buildings that are neither new, "Substantially Damaged," nor "Substantially Improved" (see glossary of key terms on page 34) are not required to meet Appendix G requirements as long as any changes to the building do not increase the level of noncompliance, but owners may voluntarily choose to implement partial flood mitigation strategies including elevating or floodproofing a building's mechanical systems. These measures may not currently result in lower NFIP premiums, but will reduce a building's overall vulnerability to future floods and enable the building to be reoccupied more quickly after a flood.

Citywide Zoning for Flood Resiliency

The City has instituted a series of zoning changes that remove impediments to retrofitting residential and commercial properties and accommodate many of the aforementioned building regulations. The first of these changes was an emergency Executive Order, issued in January 2013, which suspended height and other restrictions to the extent necessary for property owners to rebuild after Sandy. Many of these provisions, plus additional regulation, were included in a subsequent zoning text amendment to make the emergency order part of the City's legislation. The 2013 Flood Resilience Zoning Text Amendment amendment created allowances for measuring building height from the latest FEMA flood elevations (including freeboard required by building code), providing access from grade to elevated buildings, locating mechanical systems above flood levels, accommodating off-street parking requirements, and

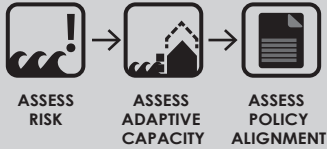
Regulatory Context Summary

- The Federal Emergency Management Agency (FEMA) creates Flood Insurance Rate Maps (FIRMs) that show the extent and elevation of the 1% and 0.2% annual chance floodplains.
- FEMA also administers the National Flood Insurance Program (NFIP).
- The New York City Building Code's Appendix G on Flood-Resistant Construction applies within the 1% annual chance floodplain.
- The Department of City Planning works to create zoning, which controls the size and use of buildings, to accommodate flood resilient building regulations and remove impediments to flood resilient construction.

allowing reallocation of floor space that is abandoned and wet floodproofed. It also incorporated provisions to mitigate adverse streetscape impacts. The rules, now part of the Zoning Resolution, remain in effect and apply to all buildings in the PFIRM 1% annual chance floodplain.

The 2013 text amendment was conducted as an emergency measure to facilitate ongoing rebuilding and retrofitting following Sandy, and included a sunset provision, so, in absence of further action, will expire a year after new flood maps are adopted by the City. DCP anticipates advancing another amendment that will make permanent the basic provisions set forth in the 2013 text, and potentially address resiliency challenges identified since then, to make it easier for property owners to make

RESILIENCY ASSESSMENT



The resiliency assessment evaluates coastal risks, the capacity of neighborhoods to adapt to these risks, and the potential to align adaptation options with other policy goals or community priorities. The objective is to determine which hazards and vulnerabilities are present within a neighborhood and evaluate the potential for adaptive strategies, such as retrofitting buildings or creating new coastal protection infrastructure, to reduce these vulnerabilities.

Ongoing community outreach

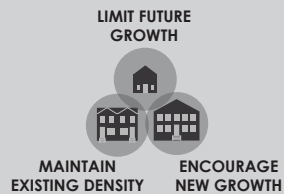
ESTABLISH RESILIENCY FRAMEWORK



The resiliency framework uses the results of the resiliency assessment to envision the range of changes necessary to make the neighborhood more resilient, which might include coastal protection, infrastructure investments, changes to regulations, and community education, among other strategies.

Ongoing community outreach

SELECT LOCAL RESILIENT LAND USE STRATEGIES



Across the city, there is a spectrum of potential land use strategies that can be used as appropriate to achieve the goals envisioned in the resiliency framework. In areas that are at significant risk from future frequent tidal flooding due to sea level rise, as well as more severe flooding from extreme events, it will often make sense to limit growth. In other areas where buildings are at risk of flood damage primarily from extreme events, there may be ways to alter regulations to promote retrofits. Where growth can be supported, increasing densities may promote investment in resilient buildings that will reduce risks of flood damage. More than one type of land use strategy may be appropriate in different parts of a neighborhood, based on flood risk and other planning considerations.

Ongoing community outreach

IMPLEMENT RESILIENCY STRATEGIES



Resiliency strategies can be implemented through a range of tools, including but not limited to zoning changes, changes to other City, State, or Federal regulations, operational measures, education and outreach, financial assistance, construction or upgrades of infrastructure, and emergency preparedness training. A combination of tools enacted at different scales and amongst different stakeholders is likely to be necessary to fully implement a set of resiliency strategies.

existing and new buildings resilient to current and future flood risks, while supporting the vibrancy and character of neighborhoods.

Coastal Zone Management

The Waterfront Revitalization Program (WRP) is the City's principal Coastal Zone Management tool. The WRP establishes the City's policies for development in the Coastal Zone, a geography defined by legislation that includes the floodplain, as well as other areas that have some relationship with the waterfront. City, State, or Federal discretionary actions within NYC's Coastal Zone must be reviewed for consistency with the WRP. This includes zoning changes, infrastructure projects, and funding. Revisions to the WRP approved in 2016 require that all projects take sea level rise projections into consideration.

Planning Approach for Resiliency

The ten Resilient Neighborhoods study areas each exhibit a variety of physical, environmental, social, and economic conditions, the combination of which creates a distinct set of resiliency challenges, and different potential strategies for addressing them. To account for this diversity of contexts and to ensure that a consistent planning approach underpins the City's resilient land use goals, DCP developed a four-step process for coordinated analysis to guide risk-based decision-making. The diagram shown to the left explains this approach and the latter half of this report details the strategies and recommendations generated for Rockaway Park and Rockaway Beach using this process.



An aerial view of the Rockaway peninsula looking west

Outreach Process

This plan is the result of a two-year long public outreach process. The Resilient Neighborhoods team engaged with area stakeholders and local elected officials to build on its extensive field work and analysis of the study area to identify resiliency challenges and develop strategies to address them.

A Community Advisory Committee of area stakeholders was assembled with local elected officials and convened to discuss the post-Sandy recovery process, the release of new flood maps, and updated building code requirements for building or retrofitting in the floodplain. Two meetings were held with the Beach 116th Street Partnership, a local merchants association that formed with the help of SBS in the aftermath of Hurricane Sandy to discuss how to promote the area's commercial corridors. Briefings with local elected officials were held at the kickoff of the study and as recommendations were developed.

Area stakeholders and local elected officials expressed interest in bolstering the resiliency and vibrancy of the community by providing flexibility for buildings to mitigate flood risk, promoting economic development through recreation, tourism, and business organization, improving transportation to and from the Rockaway peninsula, and expediting coastal projects including the U.S. Army Corps of Engineers' (USACE) East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Reformulation Study.

Through this input and a detailed flood risk and land use analysis, a planning framework was developed to identify recommendations to help address the resiliency issues in the study area. The planning framework and recommendations are presented in the second half of this report.

COMMUNITY RISK PROFILE

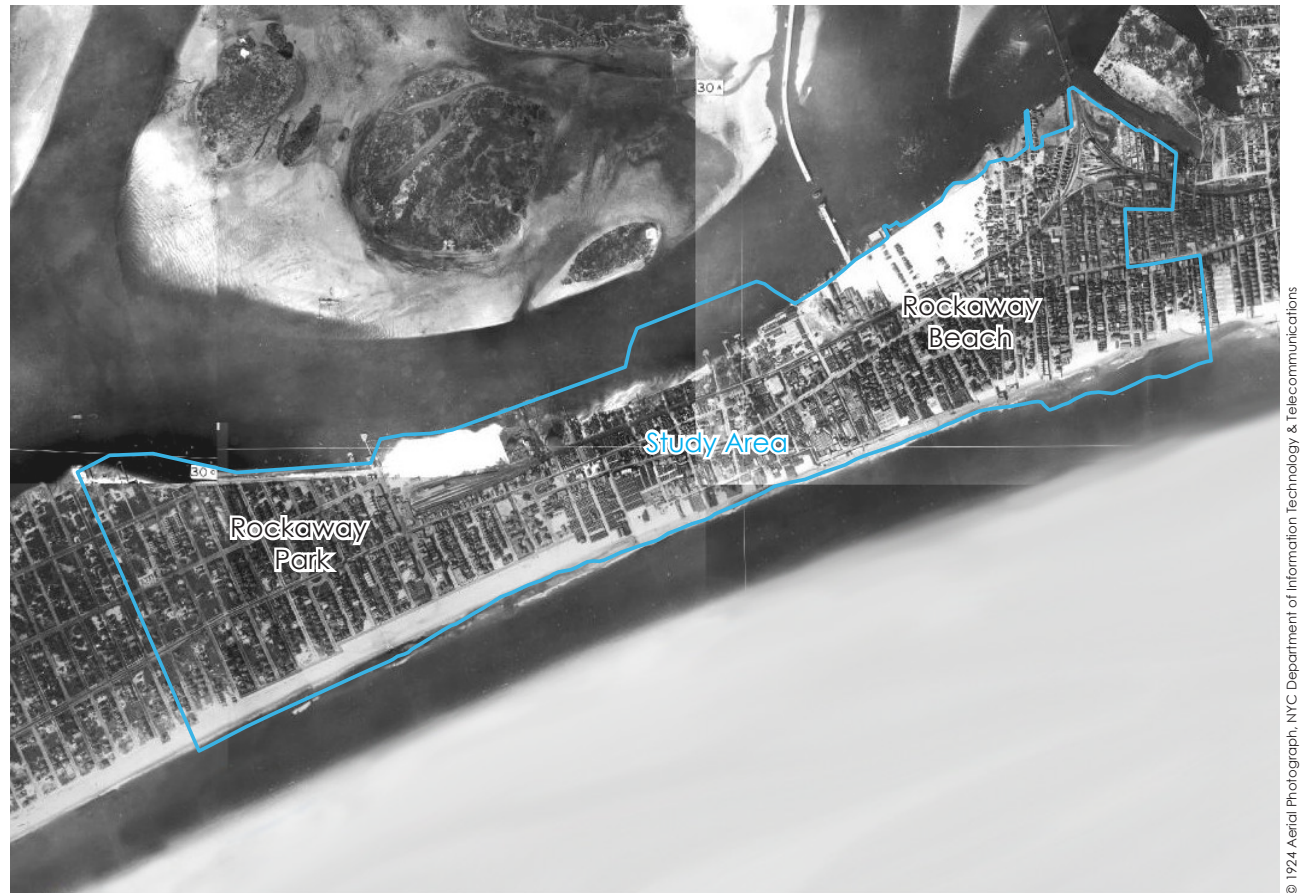
Community History and Character

Rockaway Park and Rockaway Beach were originally developed as beachfront recreation communities in the late 1800s, following residential and hotel development on the eastern end of the peninsula in the 1830s. The extension of the Long Island Railroad to the peninsula in 1877 brought additional development to Rockaway Park and Rockaway Beach, and by the early 1900s the study area accommodated large hotels, an amusement park, movie theaters, and other seaside attractions.

The study area made a transition from seasonal destination to a year-round community following the construction of the Marine Parkway Bridge further west on the peninsula in 1937, and the Cross Bay Bridge in Rockaway Beach in 1939. The easier access to and from the peninsula prompted a building boom, which led to the conversion of summer homes into year-round dwellings as well as rooming houses. During this time, property owners and government agencies began filling marshland, hardening shorelines with bulkheads, and building new houses, some of which were built on landfill. The construction of new year-round residences increased.

By the 1950s, the study area as well as areas to the east fell into economic decline and new construction activity halted as vacationers and many residents were lured to other destinations on Long Island via new parkways and highways.

Starting in the late 1950s, public housing and other affordable housing programs began to dramatically change the built environment in portions of the study area and on the eastern end of the Rockaway Peninsula. The Hammels and Seaside Urban Renewal Areas were designated in 1958 within the study area and the Arverne Urban Renewal Area was established in 1968 to the east of the study area for the purposes of eliminating blight and facilitating new housing development. The result was the razing of blocks of bungalows, many of which had



Historic 1924 aerial photograph of Rockaway Park and Rockaway Beach

been abandoned. Much of this cleared land remained vacant for decades and some it remains vacant today.

In recent years, the Rockaways has experienced a revival, with visitors and new residents once again drawn by the desirability of the waterfront. In 2004, construction commenced of a 115-acre mixed-use development called Arverne-by-the-Sea, on formerly vacant land within the Arverne Urban Renewal Area just to the east of the study area. To date, the development includes 1,396 units of housing (primarily in one-, two-, and three-family housing

types), a 55,000 square foot supermarket, a 44,000 square foot YMCA and a retail plaza at the Beach 67th Street station of the MTA's A train line. The success of Arverne-by-the-Sea was followed by an increase in new development in the Rockaways. Much of this development was out of context with the traditional built form of the area's neighborhoods. In response, DCP worked with communities across the Rockaway Peninsula to develop and implement recommendations for a comprehensive 280-block rezoning. The rezoning aimed to protect and reinforce established building form in areas primarily



Land uses within the study area

containing one- and two-family homes, and to facilitate a mix of residential and commercial activities in select locations to strengthen commercial corridors and support redevelopment along wide streets and in areas close to transit. The rezoning was adopted by City Council in 2008, and since then, new development has reinforced areas primarily containing one- and two-family homes, and areas where new commercial zones were established have seen private investment by entrepreneurs inspired by Rockaway's beach culture.

The Rockaway Park and Rockaway Beach study area is generally bounded by Jamaica Bay to the north, the Atlantic Ocean to the south, Beach 77th Street to the east and Beach 129th Street to the west. The study area contains a variety of residential building types and approximately 30,000 year-round residents. Bungalows and other single-family houses, attached rowhouses, and multifamily buildings are found throughout the study area. The study area also contains key commercial corridors that serve the area's year-round population and seasonal visitors.

Rockaway Beach Boulevard is a major east-west corridor that bisects the study area and connects Rockaway Park to Rockaway Beach. Much of the recent private investment and commercial activity is concentrated along this corridor in Rockaway Beach, with a number of new businesses opening up within the past five years. Rockaway Park is anchored by four commercial corridors: Beach 116th Street, Rockaway Beach Boulevard, Beach Channel Drive, and Beach 129th Street. Beach 116th Street is Rockaway Park's primary commercial corridor. It connects the bay to the ocean at the western terminus of the MTA's A and Shuttle subway lines. The northern portion of the corridor is bisected by Beach Channel Drive, an east-west corridor that generally contains a mix of automotive-related uses and single-story commercial buildings on properties along Jamaica Bay. The portion of Beach 116th Street south of Rockaway Beach Boulevard has seen some recent investment over the past five years with new businesses, storefront improvements, and plans moving forward to redevelop the former Rockaway Beach Club catering hall, which closed over 10 years ago, and the vacant lot across the street with mixed-income housing and ground floor retail. However, the southeastern and southwestern blocks adjacent to the beach remain largely underutilized. This portion of the Beach 116th Street corridor was also rezoned in 2008 to provide new opportunities for mixed residential and commercial development, but its revitalization has been hampered by the economic downturn and Hurricane Sandy. Beach 116th Street still presents opportunities for new development to anchor this key commercial corridor. Beach 129th Street consists of two block frontages that are primarily developed with year-round retail and service establishments that serve residents in Rockaway Park and in Belle Harbor and Neponsit, which are located to the west of the study area.

NYC Department of City Planning

Flood Risk Profile

Rockaway Park and Rockaway Beach are vulnerable to flooding from a 1% annual chance flood event, and because these neighborhoods are situated at the narrowest part of the Rockaway Peninsula, they face flood risks from both Jamaica Bay and the Atlantic Ocean. In FEMA's PFIRMs, shown in the graphic on the following page, the 1% annual chance floodplain—which includes the V Zone, the Coastal A Zone, and the A Zone—encompasses the vast majority of the study area and includes over 3,000 buildings. Under the 2007 FIRMs, approximately thirty-two percent of the buildings in the study area were in the 1% annual chance floodplain. Today, under the PFIRMs, approximately ninety-five percent of buildings are within the 1% annual chance floodplain. The remainder of the study area falls within the 0.2% annual chance floodplain, otherwise known as the Shaded X Zone. FEMA's PFIRMs also show new, higher BFEs that are generally three to four feet above grade for buildings within the study area.

The degree of flood risk within the study area differs on the bay and oceanfront of the study area because of varying ground elevations, shoreline conditions, and shoreline ownership. The study area faces a greater risk of flooding from large storm events from its Jamaica Bay shoreline because ground elevations are generally only a few feet above sea level. Within the study area, the bayfront generally between Beach 86th Street and Beach 129th Street is bulkheaded while the bayfront generally between Beach 80th Street and Beach 86th Street has a softer edge, comprised mainly of marsh and sand. The city, through EDC, is working to mitigate flood risk along the bayfront by repairing City-owned coastal infrastructure, but a mix of private and public property ownership poses a significant challenge to deploying a consistent line of protection along the bayfront.

The low-lying topography of the peninsula's bayside is also a contributing factor to the vulnerability of a small portion of the study area to daily tidal flooding in the future with sea level rise projections. Sea levels have risen by roughly a foot in the last century and, according to the New York City Panel on Climate Change (NPCC), a group of leading scientists and risk management experts, sea levels are likely to rise in the future at a higher rate. Middle range projections for sea level rise in New York City range from four to eight inches by the 2020s and eleven to twenty-one inches by the 2050s. Similarly, high end projections for those same periods are ten inches and thirty inches, respectively. With these projections, based on current land elevations, the northeastern portion of the study area, centered around Beach 84th Street, could be vulnerable to flooding at high tide by the 2050s. The flood projections for this area are shown in the inset map on the following page.

The oceanfront, in contrast, is generally ten feet or more above sea level and it is entirely within the jurisdiction of DPR. This consistent ownership has helped support beach sand nourishment and coastal armoring efforts proceed in a more comprehensive manner. Following Hurricane Sandy, USACE, working with DPR, replaced three and a half million cubic yards of sand on Rockaway Beach between the fall of 2013 and the fall of 2014. DPR also installed geotextile sandbags, baffle walls, and retaining walls to prevent sand migration and provide protection as an interim measure until the recommendations of the USACE East Rockaway Inlet and Jamaica Bay Reformulation Study are finalized and implemented. (See page 29 for additional information and a map of this project.)



Residential units within the expanded floodplain in Rockaway Beach

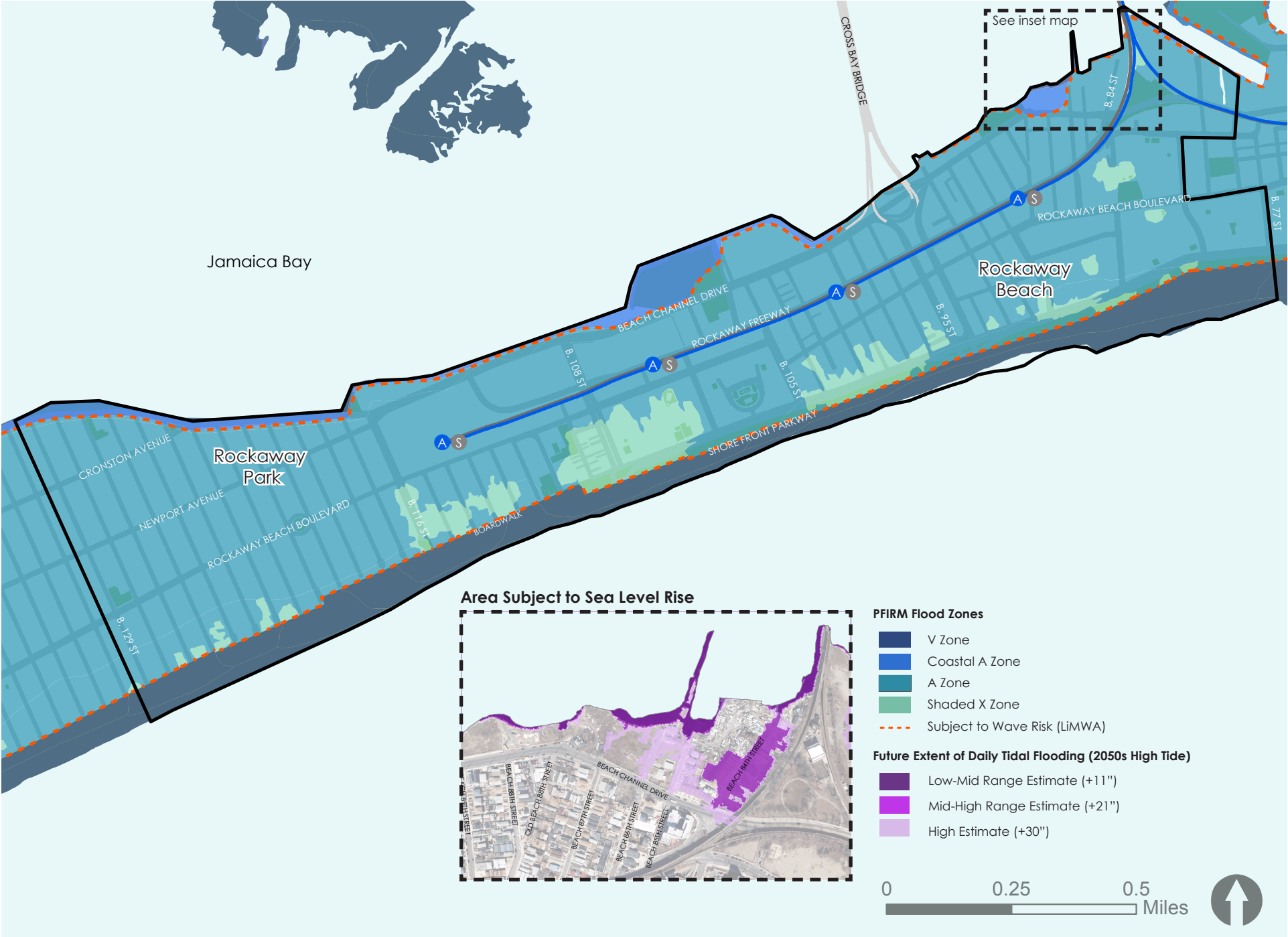


Repair work at the bay wall on Beach Channel Drive



Dune restoration along the oceanfront

Preliminary Flood Insurance Rate Map



Household Financial Vulnerability

Of the roughly 10,000 housing units in the study area, forty-three percent are owner-occupied. Though this is slightly lower than the homeownership rate in Queens, it is well above the rate for New York City as a whole. Similarly, the area median household income of \$56,580 is roughly equivalent to the Queens median of \$56,800, but greater than the median for New York City of \$51,900.

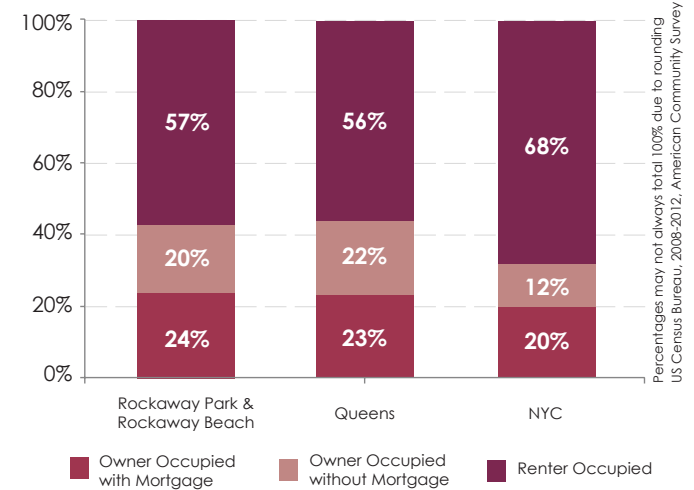
Approximately half of the study area's homeowners have purchased their property since 2000. The proportion of owners who have and do not have mortgages are relatively even. Newer homeowners with substantial mortgages may have less available equity in their homes to afford flood insurance and invest in flood mitigation strategies. Homeowners without government-backed mortgages are not required to purchase flood insurance, which removes an incentive to make costly retrofits and poses a threat to the resiliency of the community following a flood event.

Participation in the NFIP is relatively low, with less than fifty percent of homeowners having an active policy. However, the number of policies has grown by forty-seven percent between early 2013 and late 2015, which is in line with increases across many of the city's flood-prone neighborhoods following Hurricane Sandy.

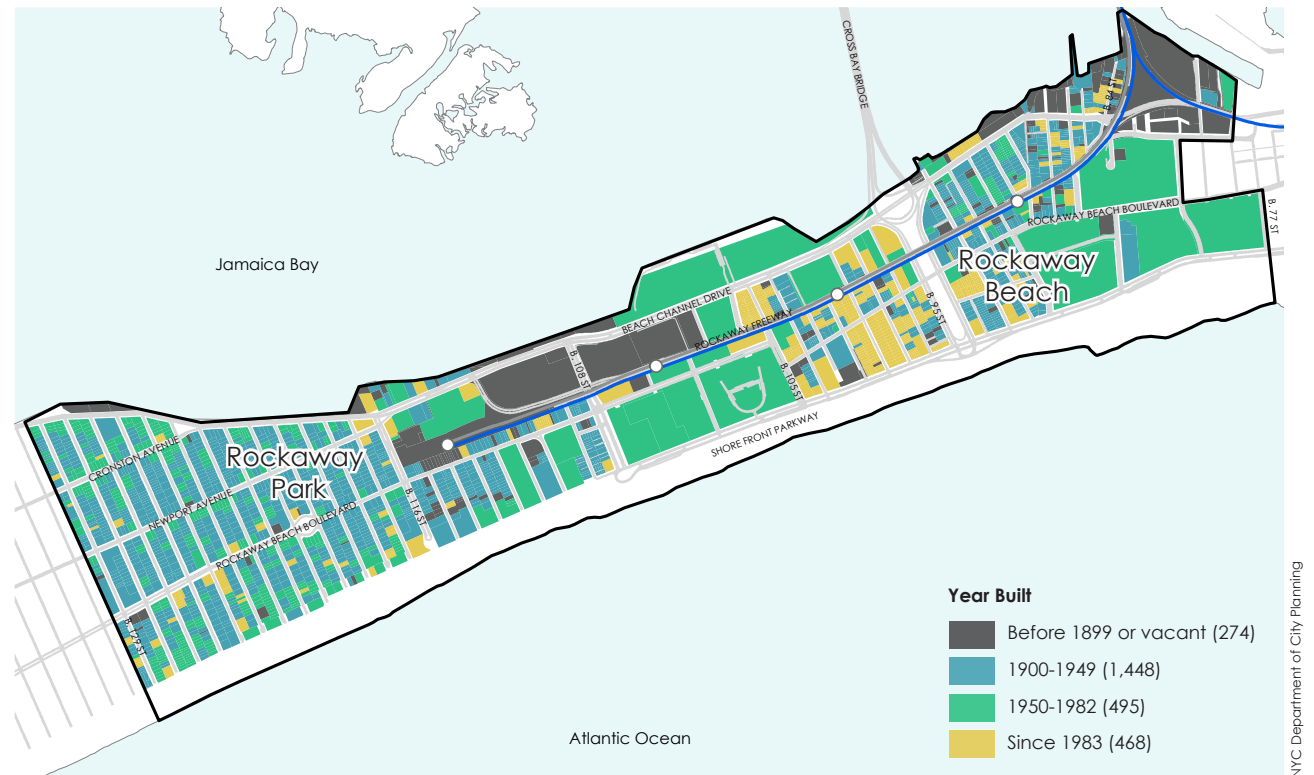
The potentially wide expansion of the 1% annual chance floodplain, as well as changes to NFIP, will result in higher insurance premiums for homeowners with mortgages and buildings not built to current floodplain standards. Homeowners may also find the value of their property at sale to be lower because of the higher costs of owning a home in the floodplain, and new owners may face greater difficulty obtaining mortgages. Approximately eighty-three percent of buildings in the study area were built pre-FIRM (prior to 1983). This indicates a substantial number of homes that are likely not built to current floodplain standards.

Tenants too are susceptible to flood risk. Within the study area, most renters live in larger multi-family buildings, but many also reside in ground floor units within two- or three- family buildings where flood risk is high. The loss of ground floor residential units to retrofits or flooding, or damage to critical building systems within taller buildings, may lead to temporary or permanent displacement of renting households.

Percentage of Owner-Occupied Homes with Mortgages



Age of Buildings



Commercial Vulnerability

The expansion of the floodplain in Rockaway Park and Rockaway Beach also presents new challenges to commercial properties. According to PLUTO data, the study area contains nearly 800,000 square feet of office and retail space, located primarily in standalone single-story buildings or on the ground floor of mixed residential and commercial buildings. Like the residential buildings in the study area, most commercial buildings were built pre-FIRM and will be subject to higher insurance premiums in coming years.

Businesses with cellars are common within the study area. These sub-grade spaces would need to be filled entirely or undergo costly dry floodproofing in order to comply with floodplain regulations. Losing this square footage would often mean sacrificing space used for storage, delivery space, offices, and critical mechanical systems.

In addition to regulatory challenges, much of the study area's commercial activity is seasonal, and the commercial corridors generally do not have merchant organizations that advocate on their behalf. However, since Hurricane Sandy, local businesses have expressed interest in joining together. One example of this is the Beach 116th Partnership. This organization was formed by local store owners and stakeholders with the support of the SBS to promote the shopping district and improve conditions along the corridor. The study area's other commercial corridors may also benefit from merchant organizing efforts to boost their profiles, coordinate resiliency awareness, and assist with implementing recovery programs.



Year-round businesses on Beach 129th Street in Rockaway Park



Seasonal businesses on Rockaway Beach Boulevard in Rockaway Beach

Sandy Storm Damage and Recovery

Hurricane Sandy brought a significant storm surge that inundated Rockaway Park and Rockaway Beach first from the ocean and then from the bay. Floodwaters surged in from the ocean and over-topped shorelines and bulkheads along the bay. Eighty-mile-per-hour winds propelled a massive storm surge into Rockaway Park and Rockaway Beach, slamming into buildings, wiping out large swaths of the boardwalk, and, by some estimates, displacing almost one million cubic yards of sand from the beach.

The impact to the area's buildings was significant, with fifty percent of households in the study area reporting damage during FEMA inspections. The most common flood depth reported was at the first floor level, where flood heights reached an average of four feet but, notably, thirty-one percent of the buildings inspected had flood heights at the first floor level over four feet. With floodwater reaching such heights, reported damages and NFIP claims were substantial. Within the study area, NFIP paid out \$49.2 million in damages for one- to four family buildings with an average pay out of \$58,285 (FEMA NFIP). Flood-related damage claims for multi-family buildings totaled \$8 million and \$10.2 million for non-residential buildings. Businesses within the study area on average reported between \$100,000 and \$500,000 in damages, according to NFIP. Current program guidelines for NFIP policies held by non-residential buildings, including all commercial buildings, limit compensation to \$500,000 each for structural damages to the building and for loss or damage to contents. For many residences and small businesses, the restrictions on the types of contents that can be covered also limited the ability of businesses to be compensated for all their losses.

Flood waters were also held responsible for sparking electrical fires on Rockaway Beach Boulevard near Beach 116th Street, on Beach 129th Street in Rockaway Park, and on Beach 130th Street, in Belle Harbor, destroying a total of forty-seven homes and businesses. Other critical infrastructure was also severely damaged by Sandy. All

four of the Long Island Power Authority's substations serving the Rockaway peninsula were knocked out of service by floodwaters, resulting in widespread power failures. Also impacted were some 34,000 MTA customers by damage to the A and Shuttle subway lines infrastructure that left riders without a direct subway link to the rest of the city for eight months.

Approximately 495 homeowners in the study area are enrolled in the City's Sandy recovery program, Build it Back—managed by the Mayor's Office of Housing Recovery Operations (HRO) in partnership with the Department of Housing Preservation and Development (HPD) and the Department of Design and Construction (DDC)—though some homeowners chose to finance their own repairs. Through Build it Back, owners of properties affected by the hurricane are offered one or more pathways for making improvements, depending on the level of damage and other factors: repair with elevation, rebuild with elevation, reimbursement, or acquisition. Of Build it Back applicants receiving construction assistance in Rockaway Park, eighty-nine percent have selected the rehabilitation pathway and eleven percent have selected elevation or reconstruction. In Rockaway Beach, sixty-six percent of applicants receiving construction assistance selected rehabilitation and thirty-four percent selected elevation or reconstruction.



House undergoing elevation through Build it Back in Rockaway Beach



Rebuilt and elevated house in Rockaway Park

Existing Zoning

Rockaway Park and Rockaway Beach were last rezoned in 2008 as a part of the DCP's Rockaway Neighborhoods rezoning, intended to protect and reinforce the established built character in lower-density residential areas. The rezoning also allowed moderate growth to spur reinvestment in targeted locations along major commercial corridors and at locations close to transit. The rezoning mapped twelve different zoning districts to reflect the diversity of land uses and building types in the area.

The diverse built environment and array of zoning districts in Rockaway Park and Rockaway Beach create a complex land use context that is further complicated by the need for flexibility to better enable building owners to mitigate their flood risk. The 2008 Rockaway Neighborhoods rezoning occurred before FEMA's PFIRMs mapped approximately ninety-five percent of the study area's buildings in the 1% annual chance floodplain. The significant expansion of the floodplain within the study area warrants an analysis to ensure that zoning provides sufficient flexibility for resilient retrofits and new buildings.

Low Density Residential Districts

R3A, R3X, R4, R4A, R4-1, R4B, R5A

Low density residential districts are located throughout the study area, though primarily concentrated in the western portion of Rockaway Park. The residential building types allowed in low density residential districts vary by the district. R3A, R3X, R4A and R5A districts allow one- and two- family detached residential buildings. R4-1 districts allow one- and two- family detached and semi-detached residential buildings. R4B and R4 districts allow all residential building types including attached row houses. The maximum permitted floor area ratio (FAR) ranges from 0.6 (including a 0.1 FAR attic allowance) in R3A and R3X districts to 1.1 in R5A districts. These districts all have a maximum building height of thirty-five feet, with the exception of R4B, which has a twenty-four

foot maximum building height limit. Within R3 districts, community facilities are permitted an FAR of 1.0; within R4 and R5A districts, community facilities are permitted an FAR of 2.0. All of these districts require one off-street parking space for each residential unit.

Moderate Density Residential Districts

R5, R5B, R5D

Moderate density residential districts are located primarily along the area's main commercial corridors: Beach 116th Street and Rockaway Beach Boulevard. They allow a range of residential building types, including multi-family buildings at FARs ranging from 1.25 to 2.0, depending on the district. R5B districts have a maximum building height of thirty-three feet, while R5 and R5D districts have a maximum building height of forty feet. Community facilities are permitted at an FAR of 2.0. R5 districts require off-street parking for eighty-five percent of dwelling units, while R5B and R5D districts require one off-street parking space for sixty-six percent of dwelling units.

Medium Density Residential Districts

R6, R6A, R7A

Medium density residential districts are primarily located on blocks closest to the ocean within the study area. Though smaller houses are also permitted, most buildings in these districts within the study area contain three or more residential units. The maximum permitted residential FAR in these districts ranges from 2.2 to 3.0 in R6 districts to 4.6 in R7A districts. Building heights typically range from five to eight stories. Community facilities are allowed at FARs ranging from 3.0 to 4.8 depending on the district. In Queens Community District 14, R6 and R7 districts are subject to the off-street parking requirements of R5 districts, which generally require parking for eighty-five percent of dwelling units.



One-, two- and three-family buildings in an R3X district in Rockaway Park

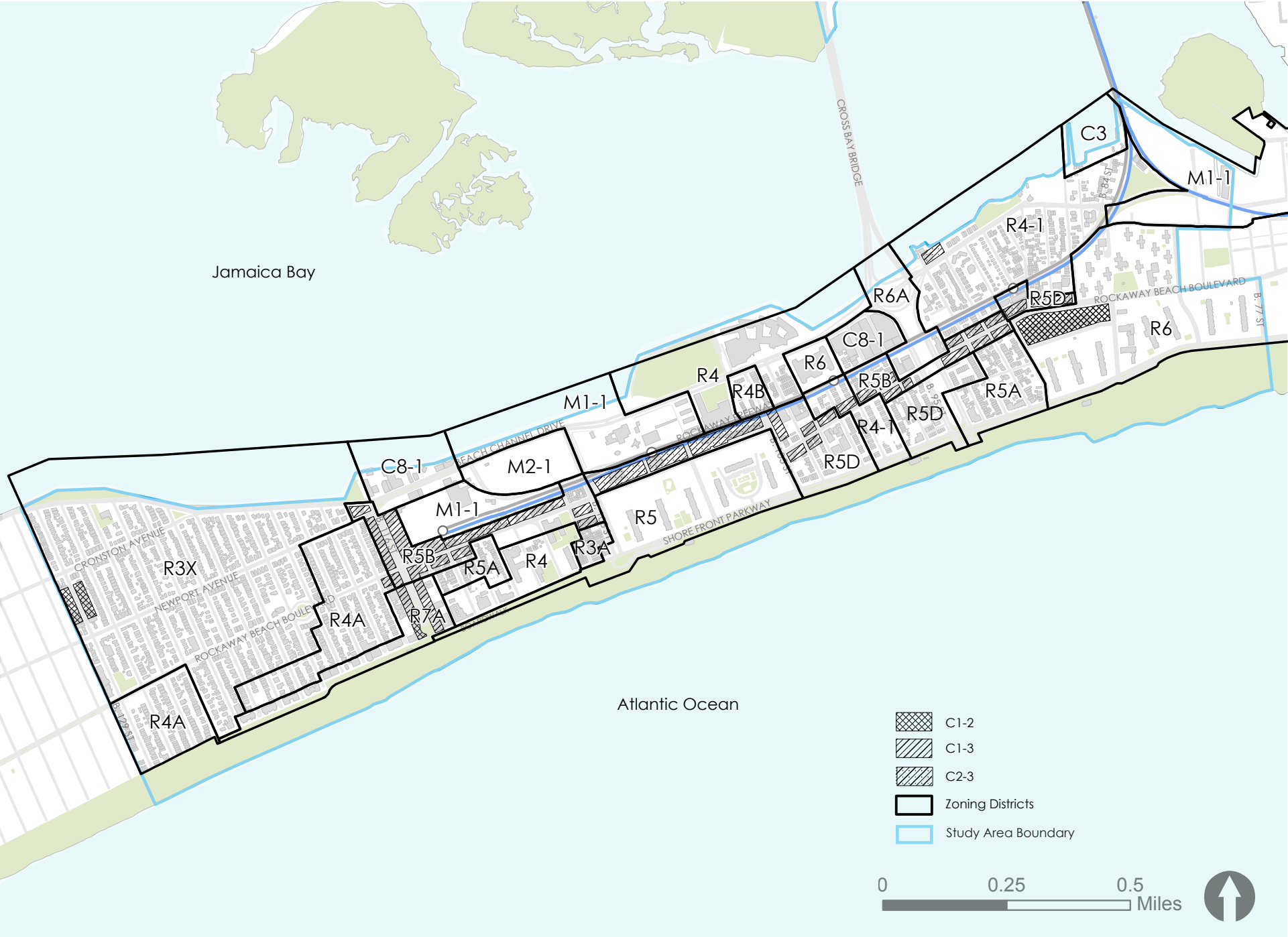


Attached residential building in an R5D district in Rockaway Beach



Multi-family building in an R7A district in Rockaway Park

Existing Zoning



Commercial Overlays

C1-2, C1-3, C2-3

C1 commercial overlays are generally mapped along the study area's main commercial corridors: Rockaway Beach Boulevard, Beach 116th Street, and Beach 129th Street. Stretches of Rockaway Beach Boulevard are also mapped with C2 commercial overlays in both neighborhoods.

C1 districts permit daily retail and personal service establishments. Typical commercial uses within C1 overlays include grocery stores, restaurants and beauty parlors. C2 overlays permit a wider range of retail uses that typically serve a larger area than C1 overlays, including repair shops, theaters, and banquet halls.

When mapped in R1 through R5 districts, the maximum commercial floor area is 1.0; when mapped in R6 through R10 districts, the maximum commercial floor area is 2.0.

Required parking varies depending on the overlay and the commercial use; C1-2 overlays generally require one off street parking space per 300 square feet of commercial floor area and C1-3 and C2-3 overlays generally require one off street parking space per 400 square feet of commercial floor area.



Businesses in a C2-3 District in Rockaway Beach

Waterfront Commercial and Recreation

C3

A C3 district is mapped in the northeastern portion of the study area to the north of Beach Channel Drive between Old Beach 88th Street and Beach 84th Street.

C3 districts allow waterfront recreation activities in Use Group 14, which are primarily boating and fishing related. Residential and community facility uses are also permitted. Residential development is governed by R3-2 regulations, which permit all types of housing at a maximum FAR of 0.6 (including a 0.1 FAR attic allowance). Commercial buildings in C3 districts are permitted an FAR of 0.5 and have a thirty foot or two-story height limit, whichever is less. Off-street parking requirements are high, but vary with the commercial use.

General Services

C8-1 Districts

Two C8-1 districts are located within the study area along Beach Channel Drive—one in Rockaway Beach between Beach 95th Street and Beach 98th Street and the other in Rockaway Park on Beach Channel Drive between Beach 116th Street and Rockaway Freeway.

C8 districts are general service districts typically comprised of automotive and other commercial uses. These districts bridge the gap between commercial and manufacturing districts, allowing automobile showrooms and repair shops but also warehouses and small machine shops as well as retail. Residential uses are not permitted. Commercial uses are permitted at a maximum FAR of 1.0. Off-street parking requirements are similar to the C1-2 and C2-2 commercial overlay requirements, and vary with the commercial use.

Manufacturing Districts

M1-1, M2-1

Three manufacturing zoning districts are located in the study area. An M1-1 district is located in Rockaway Beach between Beach 84th Street and extends east to Beach 72nd Street. There is also an M1-1 district in Rockaway Park along Beach Channel Drive between Beach 104th Street and Beach 108th Street. An M2-1 district is located in Rockaway Park to the south of Beach Channel Drive and west of Beach 108th Street.

Manufacturing districts allow a broad range of industrial and manufacturing activities. M1, M2, and M3 designations permit increasing levels of intensity with respect to industrial activity. M1-1 districts allow light manufacturing uses and some commercial uses at a maximum FAR of 1.0. M2-1 districts allow more intensive industrial uses than M1 districts, but permit fewer commercial uses. The maximum FAR for industrial and commercial uses in M2-1 districts is 2.0.

Certain community facility uses are permitted in M1 districts, but community facilities are not allowed in M2 districts. Residential uses are not permitted in manufacturing districts. Building heights in M1 and M2 districts are controlled by a sky exposure plane, which limits height at the street line to thirty feet within M1-1 districts and sixty feet within M2-1 district.

Building and Zoning Analysis

Residential Profile

Residential buildings within the study area run a spectrum of densities and typologies, from bungalow communities with small, single-family detached houses in close proximity to one another, to thirteen-story multi-family elevator buildings containing hundreds of units. Approximately eighty-one percent of residential buildings in the study area contain one or two units. Only four percent of residential buildings in the study area contain more than four units, but this small percentage of multi-family residential buildings houses sixty-one percent of residents in the study area.

With the adoption of the 2013 Flood Resilience Text Amendment, zoning today generally provides sufficient regulatory flexibility for the majority of the study area's one- and two-family building types to elevate to new,

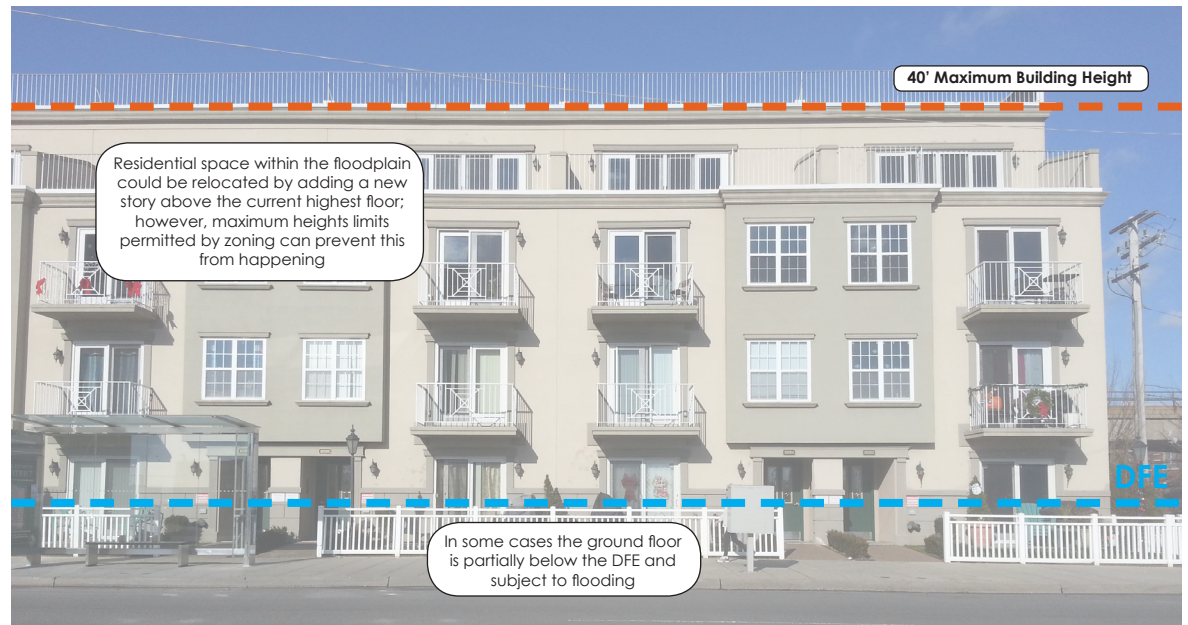
higher DFEs, to replace floor area currently located below the flood elevation, and to relocate mechanical equipment to mitigate its exposure to flooding. However, certain multi-family buildings may not have the regulatory flexibility to make these types of retrofits.

One such building type is a detached building with three or more units. Such buildings make up approximately ten percent of residential buildings within the study area. These buildings typically have the same form and bulk as neighboring one- and two-family detached buildings, but those with three or more units do not have the same flexibility under current zoning to elevate if they are already built up to, or near, the maximum height permitted by zoning, or to relocate mechanical equipment to a location within a year yard.

In addition, certain multi-family buildings in the study area's R5, R5B, and R5D zoning districts may have difficulty making resilient retrofits. These zoning districts have tight building envelopes that limit building heights to thirty-three feet in R5B districts and forty feet in R5 and R5D districts. These tight building envelopes do not provide enough room to vacate ground floor space that is located below the DFE, and replace the lost space above the DFE, if the building is already built up to or near the maximum height limit permitted by zoning. These buildings today face increasing insurance premiums because of the location of residential units below the DFE.



Three-family detached building in Rockaway Park



Four-story building in Rockaway Beach

Commercial Retrofitting Challenges

Raising the lowest occupied floor of a building to above the DFE can have a negative effect on the entire corridor due to the elimination of street-level activity. In addition, while raising the lowest occupied floor is a common best practice for residential buildings, it is not a practical solution for most of the study area's commercial retail structures, which typically share a wall with an adjacent structure. Two alternatives to the structural elevation of a building are dry floodproofing and non-structural elevation.

Dry floodproofing involves constructing building walls and foundations that are flood-resistant, and, during a storm event, sealing off entry points and installing flood barriers up to the BFE where water might inundate a building's interior. Dry floodproofing is a viable option for businesses intent on maintaining a presence at the ground floor, but it may not be a viable solution for most

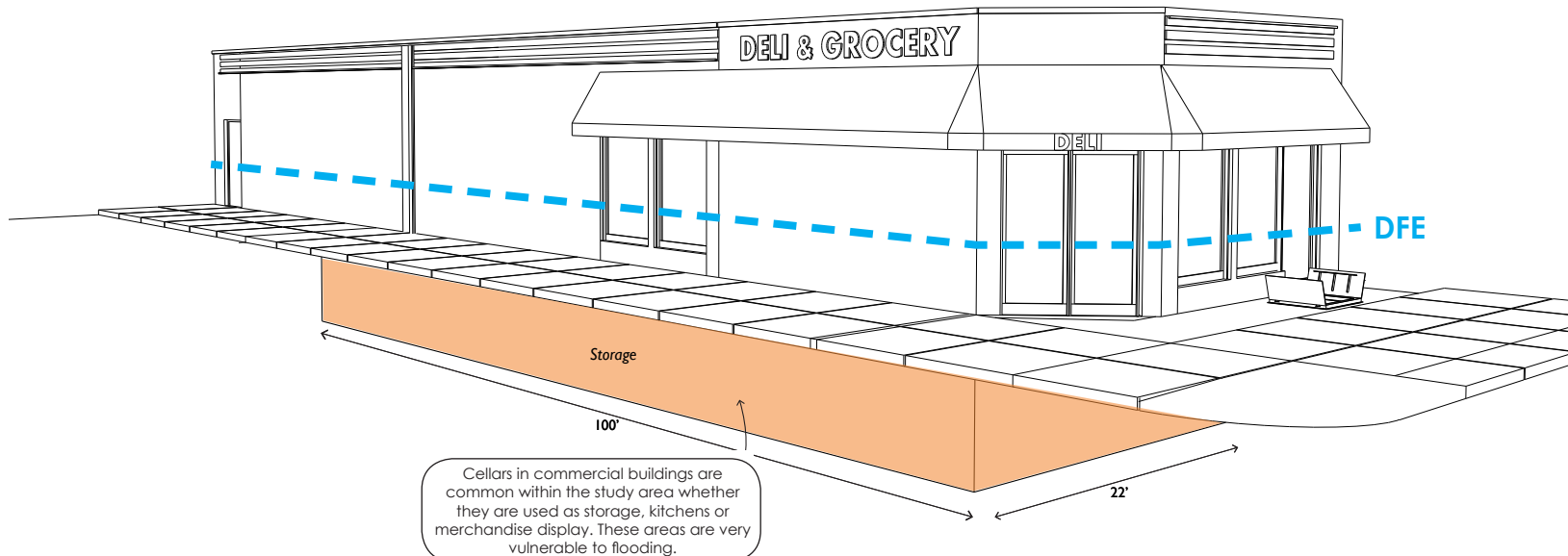
of the study area's small businesses, largely due to the significant expense of this approach.

Non-structural elevation involves the relocation of active uses to above the DFE rather than physically lifting the whole structure to an appropriate elevation. Non-structural elevation in commercial buildings may be achieved by filling the below grade space and abandoning the remaining occupiable floor(s) below the DFE. If this strategy is taken, all enclosed spaces below the DFE must be wet floodproofed and remain only as space for vehicular parking, building access, crawl space and storage.

The potential loss of cellar space due to restrictions on spaces located below grade is a challenge for the study area's commercial buildings, many of which contain such space. The potential loss of critical sub-grade floor space for food preparation and storage due to floodplain

regulations makes it important to identify potential ways to relocate this space elsewhere on a site to minimize negative impacts on businesses. Commercial cellars currently located below the DFE could more easily relocate the lost floor area to rear yards or above the current highest story of a building if existing conflicts with floor area regulations were addressed in a citywide update to zoning.

Both strategies, however, pose specific challenges to commercial viability during the majority of times where the risk of flood is not imminent, when business continuity depends on unencumbered access from the sidewalk to the business. In addition, both strategies are also extremely expensive and logistically challenging. More challenges and solutions are explored in the recommendations section, as well as in the *Coastal Climate Resiliency: Resilient Retail* report, available for download at: nyc.gov/resilientretail.



Existing condition: single-story commercial use with cellar storage



A mural on Beach 116th Street in Rockaway Park

Summary of Resiliency Challenges

1 The floodplain has significantly expanded within the study area.

FEMA's Preliminary Flood Insurance Rate Maps place ninety-five percent of the study area's buildings within the 1% annual chance floodplain. These maps, in combination with rising insurance premiums, could add significant new costs to property ownership.

2 The study area is vulnerable to flooding from Jamaica Bay and the Atlantic Ocean, but the flood risk profiles differ for each shoreline.

Along the oceanfront, Rockaway Park and Rockaway Beach are vulnerable to flooding from storm surge generated by coastal storms. Along the bayfront, these neighborhoods face the same flood risks, but also, in a limited area, may be impacted in the future by daily tidal flooding due to sea level rise.

3 Current zoning presents challenges to retrofitting and some residential buildings.

Three-family houses and other multi-family buildings in Rockaway Park and Rockaway Beach are constrained by zoning height limits from making retrofits that would help reduce flood risk and flood insurance premiums.

4 Strategies are needed to support the resiliency of the study area's commercial corridors.

There is a need to work with local business and property owners to develop zoning and other strategies to strengthen the area's commercial corridors.

RESILIENCY FRAMEWORK

Framework Map and Overview

Rockaway Park and Rockaway Beach are neighborhoods with a varied, though aging, building stock, active commercial areas, and a dramatic beachfront setting that draws visitors from across the region. This study seeks to build on the area's strengths and propose local strategies, including recommendations to update zoning, to help mitigate the area's vulnerability to coastal flooding. The framework map on the next page identifies five priority areas for the study area. These five priorities areas are highlighted because of the opportunities they provide to strengthen the area's long-term resiliency.

Support Residential Resiliency

Certain multi-family buildings are constrained by zoning height limits from making retrofits that meet new flood-resistant construction standards. As part of the process to update and refine existing special rules for the floodplain, DCP will explore updates to zoning to allow for the relocation of residential floor area above flood elevations. These zoning changes could be complemented by outreach efforts to inform residents about the benefits of resiliency improvements. In addition, the City will continue to work to identify opportunities to help homeowners offset the cost of retrofitting to make the housing stock more resilient.

Promote Vibrant Commercial Corridors

As part of a citywide process of identifying updates to zoning for the floodplain, DCP will explore updates to citywide zoning to promote the retrofitting of existing commercial buildings as part of a citywide. The City is also supporting efforts by existing businesses to organize to improve preparedness and strengthen commercial corridors.

Promote Coastal Access and Resiliency

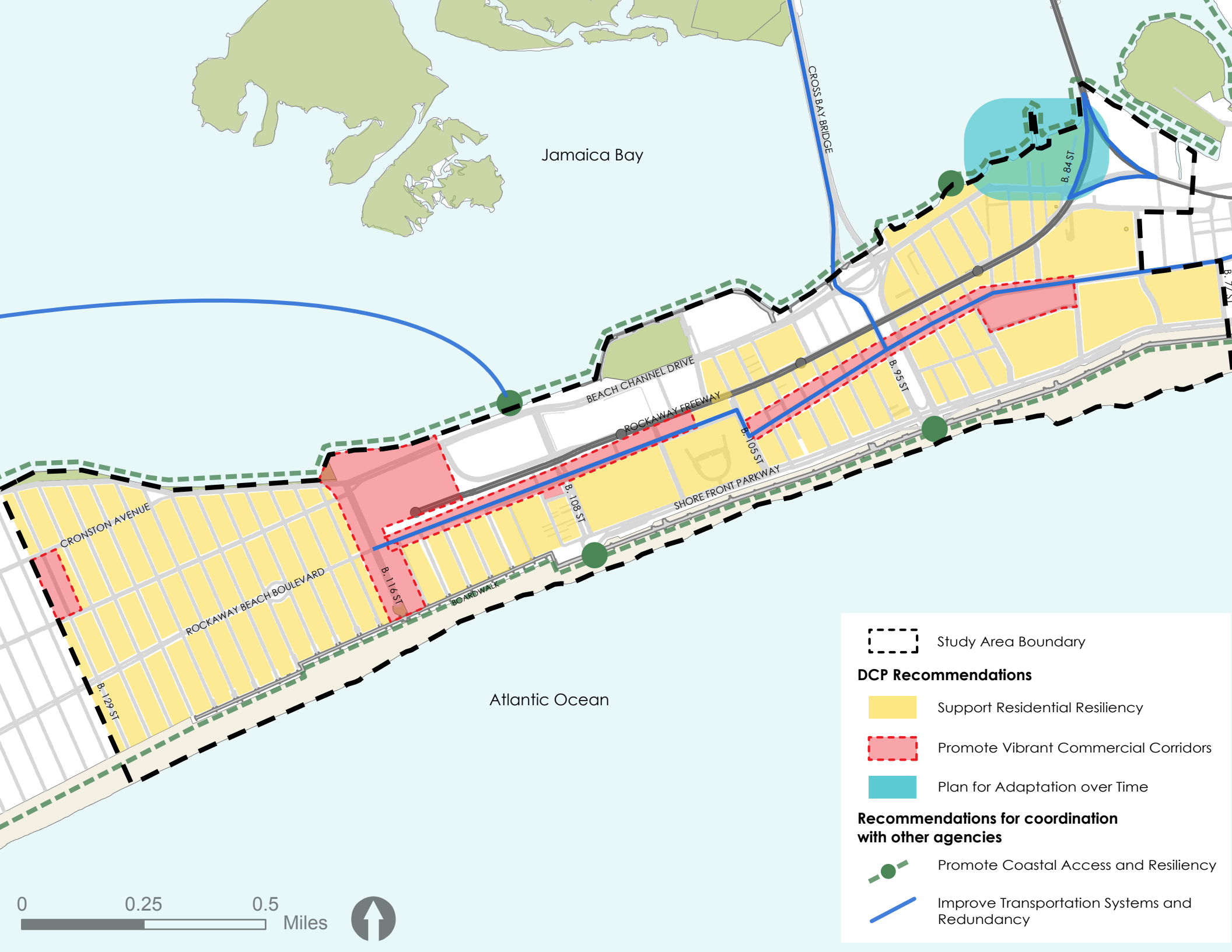
The shorelines of Rockaway Park and Rockaway Beach are lined with City-owned assets including bulkheads and parkland. The City is advancing a series of projects that activate the waterfront with a range of recreational activities, support habitat diversity, and provide coastal protection.

Improve Transportation Systems and Redundancy

The City is implementing strategies to increase transportation options and improve connectivity in the Rockaways and is working with the MTA to ensure the resiliency of critical transit infrastructure.

Plan for Adaptation over Time

Under current sea level rise projections, a portion of the study area is expected to be vulnerable to daily tidal flooding by the 2050s. DCP will work with other agencies to identify opportunities to invest in shoreline infrastructure to help mitigate flooding.



Support Residential Resiliency

In the fall of 2013, the Flood Resilience Zoning Text Amendment was adopted, modifying zoning regulations in the floodplain to better enable buildings to rebuild and retrofit according to FEMA and NYC Building Code standards. The text made the following changes to facilitate retrofitting and resilient redevelopment: measuring building height from the latest FEMA flood elevations, accommodating building access from grade, allowing flexibility for mechanical systems to be located above flood levels, and accommodating off-street parking above grade.

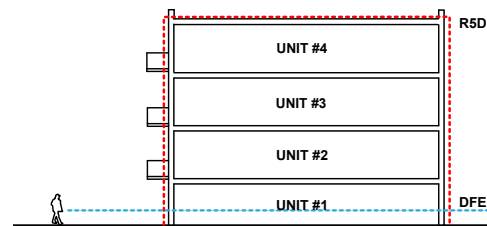
The Special Regulations for Neighborhood Recovery text amendment was developed by DCP in partnership with HRO and HPD and was adopted in the summer of 2015. The text amendment was made applicable in certain areas of the city, including Rockaway Park and Rockaway Beach, where a high concentration of damaged homes participating in the Build-it-Back program were hindered from advancing in the rebuilding and retrofitting pipeline by the absence of documentation of previous building conditions. The amendment expedited the rebuilding effort by simplifying the process for documenting the existence of older structures damaged during the storm. In addition, a new zoning envelope was created for narrow and shallow lots.

The 2013 Flood Resilience Zoning Text Amendment was passed as a temporary, emergency measure, and is set to expire a year after the PFIRMs are formerly adopted by FEMA. DCP is currently conducting analysis to inform a proposal for a permanent zoning text amendment that would make permanent provisions of the 2013 text amendment, and introduce new provisions where appropriate to reflect certain building and lot conditions found in the city's floodplain. These future citywide zoning changes would be intended to make it easier for

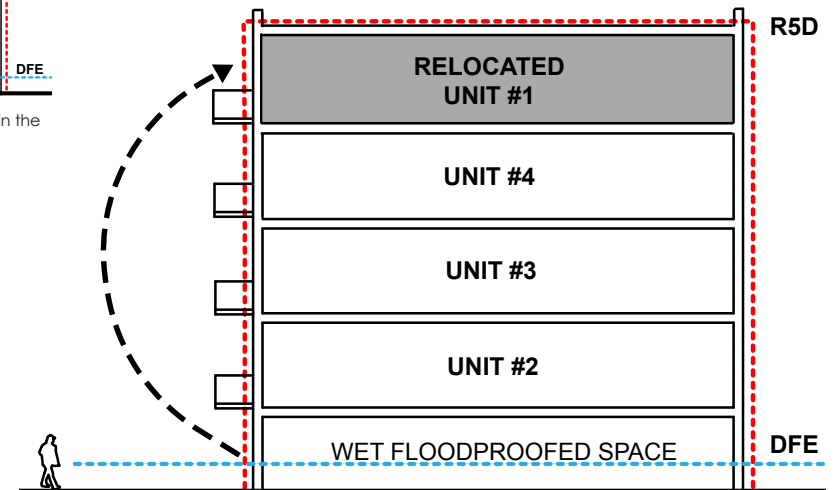
property owners to comply with FEMA and Building Code resilient building standards while also ensuring the ability to realize floor area already permitted today.

Provide envelope flexibility for retrofitting

Specifically, DCP will explore provisions to support retrofitting of multi-family buildings with residential floor area below the DFE, allowing additional height if needed, provided that the building comes into full compliance with the flood resistant construction standards of the NYC Buildings Code Appendix G. DCP will also consider allowing three-family detached buildings additional flexibility to elevate or relocate mechanical equipment if the building is already built to the maximum height permitted under zoning. This would support retrofitting by ensuring that residential units currently located within the floodplain can be relocated, where feasible.



Some zoning envelopes do not allow ground floor units in the flood zone to relocate, due to maximum height limits



Potential changes to the zoning text would allow the relocation of up to one story, so that ground floor units in the flood zone can relocate to the roof and wet floodproof the first floor

Flood insurance advocacy

Following widespread concern that many homeowners in the floodplain would be unable to afford the significantly higher flood insurance premiums, Congress passed the Homeowners Flood Insurance Affordability Act in 2014 to slow the rate at which premiums increase on an annual basis. Policyholders still face increasing premiums over time but will pay lower premiums if their properties are retrofitted to comply with flood resistant construction standards. Homeowners in areas newly mapped into the floodplain can also purchase a Preferred Rate Policy at a significantly lower rate for up to a year after new FIRMs are officially adopted. In both cases, premiums will increase on a regular basis until the policy reaches its full-risk rate.

To help make insurance premiums manageable and to reduce flood risk, the City will continue to advocate for federal regulatory reforms, including means-tested vouchers and federal grants or loans to offset the costs of those retrofits.

Promote Vibrant Commercial Corridors

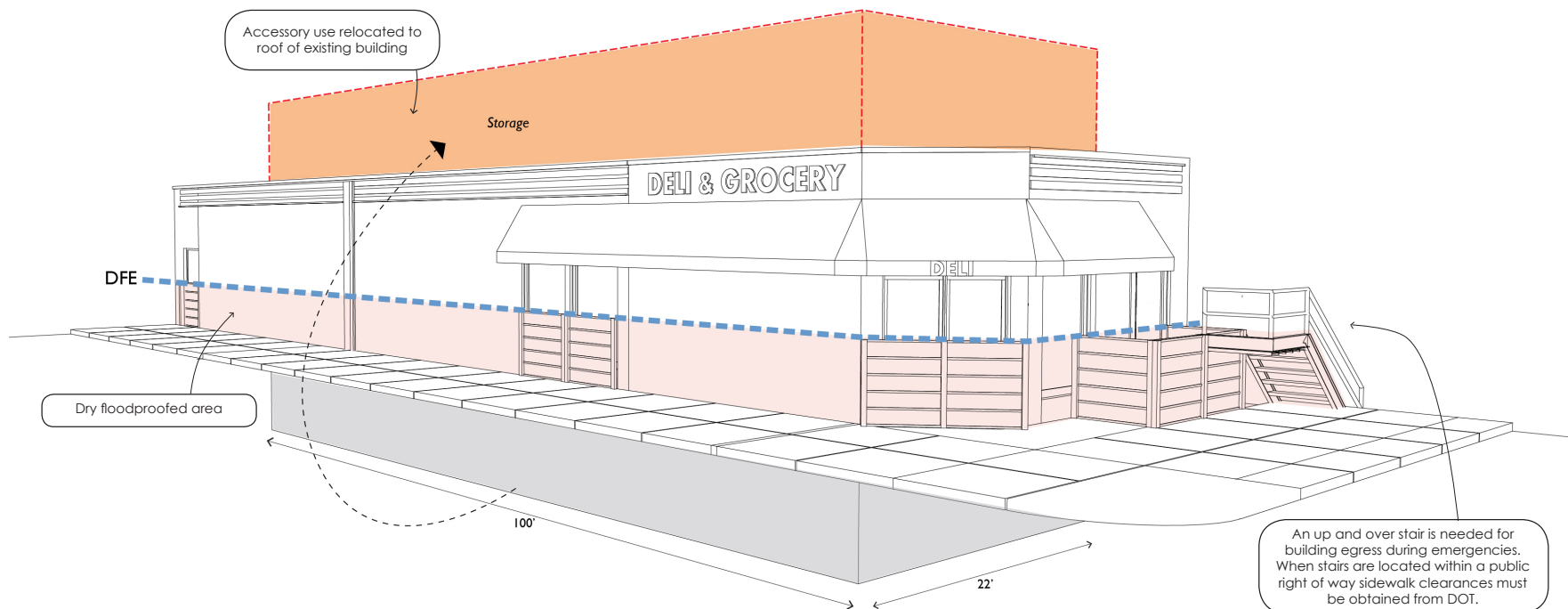
Identify alternate locations for below-grade activities

As part of the citywide study to update the zoning in the floodplain, adjustments will be explored to allow for extra height and the relocation of sub-grade commercial functions to spaces in the rear yard or above the highest story of the building. These adjustments would provide commercial property owners with more options for relocating activity from below-grade to a less vulnerable location. Still, some buildings may lack additional space within their property area to relocate lost cellar space in a rear yard, while others may find that adding more floor space on the roof is structurally and financially restrictive. More challenges and solutions are explored in the *Coastal Climate Resiliency: Resilient Retail* report, available for download at: nyc.gov/resilientretail.

Implement capacity building efforts for businesses in Rockaway Beach

Beyond additional flexibility to retrofit buildings under zoning, existing businesses in Rockaway Park and Rockaway Beach can benefit from support to enhance the resiliency of their operations, assets, and physical space before and after a flood event or other emergency. The Business Preparedness and Resiliency Program (Business PREP), a program run by SBS, is offering workshops to assist businesses with the creation of continuity plans. Starting in 2016, the program began offering on-site resiliency assessments for small businesses and micro-grants to implement specific resiliency improvements.

In addition to launching Business PREP, the City and SBS continue to reinforce merchant organizing and community based organization development efforts across the Rockaway peninsula to support the growth of both seasonal and year-round businesses while providing these organizations with guidance and resources on resilient retrofitting options and preparedness strategies for managing future flood events.



Example of changes to zoning that could allow for dry floodproofing of a single-story commercial use with cellar storage

Promote Coastal Access and Resiliency

Complete the reconstruction of the boardwalk

DPR has been working since Sandy to complete reconstruction of the Rockaway Boardwalk. Project construction is phased to minimize disruption to the community and maximize the amount of reconstructed boardwalk available to the public. Additional boardwalk amenities include custom furniture, lights, foot showers, and water fountains. By summer 2017, all construction of the Rockaway Boardwalk will be complete, providing five and a half miles of continuous boardwalk.

DPR is also actively working to rebuild the parkland adjacent to the boardwalk. This work involves constructing a number of improved oceanfront recreation elements, including the Rockaway Skate Park, Sandpiper Playground and a performance space.

Improve waterfront public access along bayfront

In 2014, DPR released the Rockaway Parks Conceptual Plan, which creates a blueprint for a comprehensive park system from Beach 2nd to Beach 149th streets, beach to bay, and the southern tip of Broad Channel. The plan,

initiated in response to devastation to parks from Hurricane Sandy, incorporates resiliency components and responds to community desires. The plan includes a number of recommendations for park improvements within the study area, such as new public open spaces along the bayfront. To complement the park improvement projects currently underway or planned along the oceanfront, the City will advance opportunities to activate the bayfront with a range recreational activities and flood mitigation strategies, beginning with the replacement of the bulkhead and the construction of a new esplanade along Beach Channel Drive between Beach 108th Street and Wainwright Street. The new esplanade will provide a linear walkway and seating, lighting, and plantings to enhance the public experience of the bayfront. Construction on the Beach 108th Street esplanade started in summer 2016 and is now complete. Other park improvement projects, including a new park along Beach Channel Drive at Beach 88th Street, will be designed and constructed as funding becomes available.

Invest in City-owned infrastructure on the Peninsula

The bay shoreline between the Marine Parkway-Gil Hodges Memorial Bridge and the Cross Bay Veterans Memorial Bridge spans approximately four miles, of which three and a half miles is within City or the U.S. Department of the Interior (DOI) jurisdiction. The remaining half mile of shoreline is privately owned by multiple owners. The shoreline is reinforced with a bay wall, which provides an important line of protection from routine, low-level bayside flooding. However, even prior to Sandy much of the bay wall was in deteriorated condition. The City will complete repair of the portion of the bay wall that falls within its ownership and work with adjacent landowners to repair other portions of the bay wall. EDC substantially completed repair of the structural baywall from Beach 108th Street to Beach 143rd Street at the end of 2015. The tide gates along Beach Channel Drive between Beach 125th and Beach 143rd Streets were completed in summer 2016.

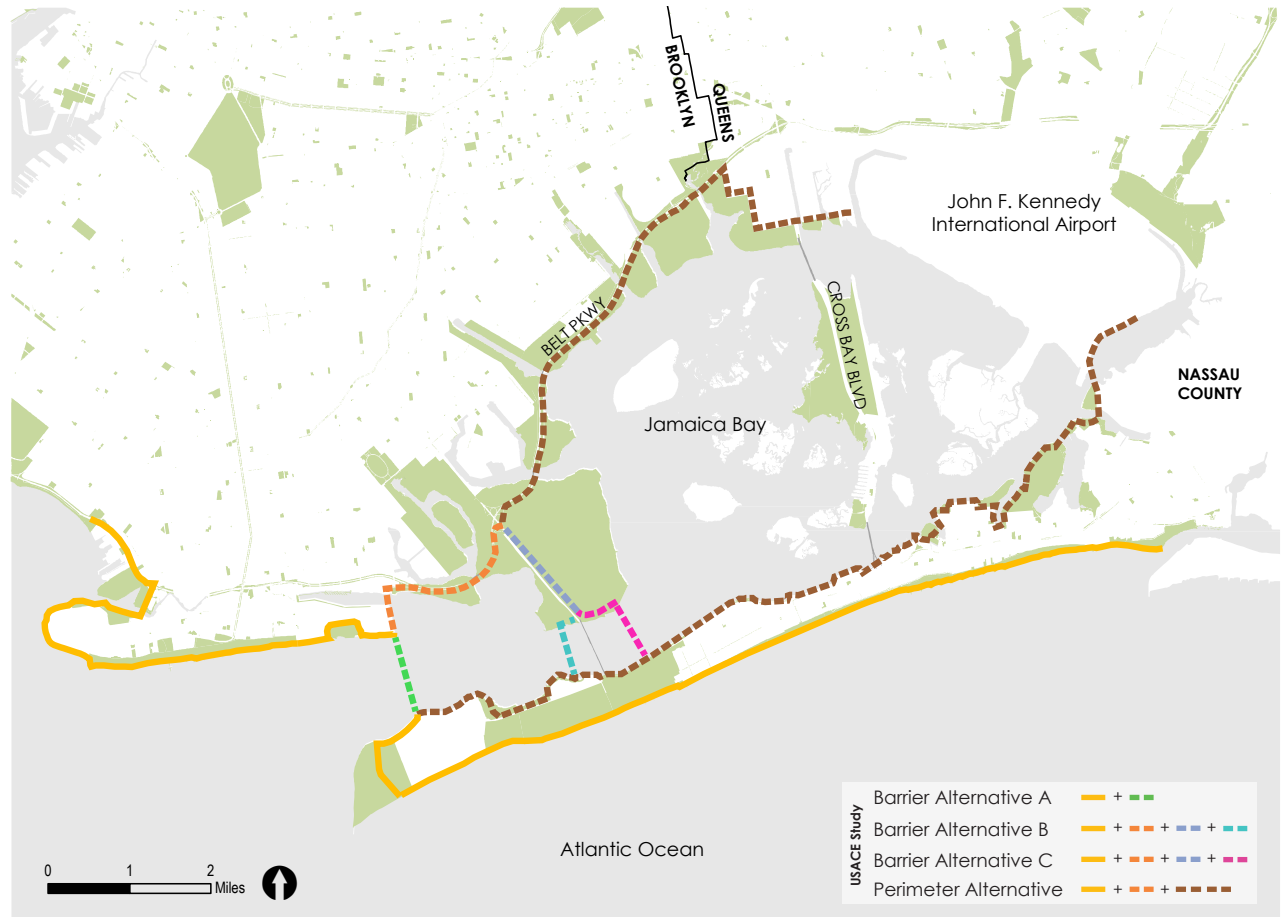


Planted dunes on Rockaway Beach

Advance area-wide coastal protection projects

The United States Army Corps of Engineers (USACE) is undertaking the East Rockaway Inlet to Rockaway Inlet and Jamaica Bay Reformulation Study to assess strategies for controlling erosion and reducing risks from coastal storms along the Atlantic shorefront. Measures being explored include groins, dunes, berms, and reinforced dunes. To reduce risks from flooding in the bay, four alternatives are being analyzed: three hurricane barrier alternatives and a shoreline protection perimeter alternative. All alternatives also include the exploration of strategies for Coney Island. The USACE has thus far determined that the hurricane barrier option is more cost-effective and will have less environmental impacts. They have tentatively selected Barrier Alternative C as the preferred alternative, but implementation of the project will require several more years of permitting and design. The alignment is still being analyzed to ensure, among other things, that water quality and coastal habitats in the bay are not compromised. In the interim, the City recommends that the USACE advance the Atlantic oceanfront element of the project, which includes beach restoration and a reinforced seawall, as well as smaller-scale projects within the bay to protect low-lying areas from sea level rise and improve coastal habitats. Importantly, the implementation of the project is not currently funded and requires approval and appropriation from Congress.

To complement this effort, the City will continue to advocate at the federal level for FEMA recognition of temporary flood barriers (for businesses), berm and restoration projects, and other alternative flood mitigation strategies for reductions in NFIP premiums.



Army Corps East Rockaway Inlet to Rockaway Inlet Study Alternatives

Improve Transportation Systems and Redundancy

Critical transportation infrastructure in the Rockaways was severely damaged by Sandy. Damage to the MTA's A and Shuttle subway lines left many riders without a direct transit connection to the rest of the city for eight months. A post-Sandy emergency ferry service was provided for commuters in the Rockaways, who otherwise had limited transportation options. Resilient and redundant transportation systems can equip the Rockaways to be prepared for a future storm event.

Implement Citywide Ferry Service

Beginning in May 2017, Citywide Ferry Service began providing a new, fast, and affordable way to travel between waterfront communities throughout New York City. The first route launched connects New Yorkers to the study area, traveling between Beach 108th Street, Sunset Park's Brooklyn Army Terminal, and the Financial District. Beach 108th Street was also the site of the post-Sandy emergency ferry service landing, and, today, the City is able to utilize the site for service and has the potential to provide off-street parking at a large, vacant site just to the south of the landing. The City also deploys a shuttle service to the east and west of the ferry landing in order to connect Rockaway residents with this additional transportation option. The City also initiated a study in spring 2016 of additional opportunities for ferry infrastructure on the Rockaway Peninsula as far east as Beach 84th Street.

Implement Select Bus Service

DOT is working with MTA to implement Select Bus Service on the Q52 and Q53 bus routes, which provide service between Rego Park, Queens and the study area along Woodhaven Boulevard, Cross Bay Boulevard, and Rockaway Beach Boulevard. The Select Bus Service is expected to provide bus travel time reductions of twenty-five to thirty-five percent, but will also be a component of a broader complete street project, designed to improve the corridor for all users, including pedestrians and



Expanded Citywide Ferry Service

drivers. The DOT and MTA plan is to implement the project in two phases beginning in 2017 with key transit and signal improvements, followed by longer-term capital projects, including median reconstruction. Lessons learned from the first phase will be incorporated into the longer-term improvements, allowing DOT and the MTA an opportunity to make adjustments as needed.

Enhance the resiliency of mass transit

The MTA has committed resources to fortifying the Hammels Wye, the area just east of Beach 84th Street where A and Shuttle subway service splits between the A service to Far Rockaway and the Shuttle service to Beach 116th Street. The Hammels Wye contains critical infrastructure including a hydraulic room, circuit breaker house, signal tower, and power substation. The MTA plans to install a flood wall to protect the Hammels Wye campus from flooding from both Jamaica Bay and the Atlantic Ocean. The wall will allow access points to be sealed off in anticipation of a storm to prevent the type of damage that Hurricane Sandy caused and protect to a higher standard than Sandy’s surge. The MTA has also been awarded federal funding to implement mitigations to fortify the Rockaway Park Rail Yard and other station components and right-of-way assets between the Howard Beach Station to the north and the end of the Shuttle line at Beach 116th Street, which are vulnerable to coastal flooding. The design of these mitigations commenced in summer 2016. The City supports the MTA’s investment in these critical components of the Rockaways’ transit infrastructure in order to provide more reliable transit service.

Reconstruct Beach 108th Street

The City, through DOT and DDC, is working with the New York Governor’s Office of Storm Recovery to finalize the scope for reconstructing Beach 108th Street between Beach Channel Drive and Shore Front Parkway.

This project, which was a priority project in the NY Rising Community Reconstruction Plan for Rockaway West, is expected to address key safety issues raised by the community. The project will also improve the look and feel of the Beach 108th Street with trees, seating, and wayfinding. Wayfinding will provide pedestrians with key information about local destinations, transit options and other amenities within walking distance. If feasible, the project will also implement stormwater management strategies. All together, these improvements will help provide a safer, more attractive street to serve as an important connection between the future ferry service and the beach and boardwalk.

Repair major east-west roadways

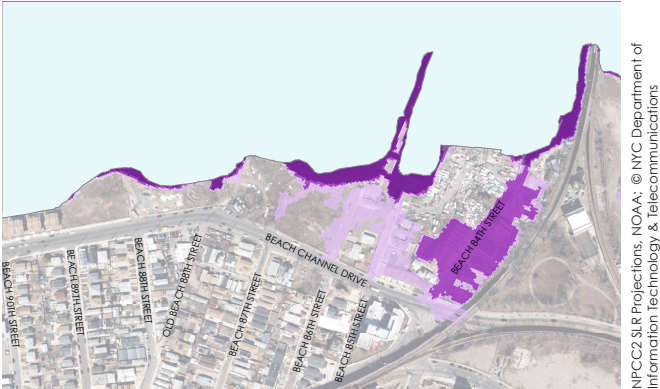
The City is committed to repair the study area’s major east-west roadways. After Sandy, the Federal Highways Administration (FHWA) approved funding for the reconstruction of Beach Channel Drive between Beach 116th to Beach 124th Streets and Rockaway Beach Boulevard between Beach 73rd to Beach 88th Streets to repair damages sustained from the storm. The FHWA also approved funding for roadway resurfacing on Beach Channel Drive between Beach 108th and Beach 116th Streets as well as between Beach 124th and Beach 144th Streets. Construction of the Rockaway Beach Boulevard improvements commenced in the beginning of 2017; the Beach Channel Drive improvements will commence in summer 2017. DOT is also working with DDC to implement pedestrian safety improvements at the intersection of Beach 116th Street and along the Rockaway Beach Boulevard corridor.

Plan for Adaptation Over Time

Monitor area subject to sea level rise

The bayfront between Beach 84th and Beach 86th Streets is the only portion of the study area that is projected to be affected by sea level rise in the 2050s. According to the NPCC, with 21 inches of sea level rise, the mid range projection for the 2050’s, a small, localized area on Beach 84th Street north of Beach Channel Drive could be flooded twice a day at high tide.

DCP will work with agency partners to explore opportunities to invest in shoreline infrastructure to reduce this area’s vulnerability to flooding and will continue to monitor the area as sea levels rise.



Future Extent of Daily Tidal Flooding (2050s High Tide)

- Low-Mid Range Estimate (+11")
- Mid-High Range Estimate (+21")
- High Estimate (+30")

CONCLUSION

Hurricane Sandy significantly affected Rockaway Park and Rockaway Beach and highlighted the risk these neighborhoods face from coastal flooding, a risk that until very recently was not fully understood. With the pending revisions to the federal flood maps, roughly ninety-five percent of the study area's buildings are now in the floodplain and are likely to be vulnerable to future flooding and higher insurance premiums. Despite this vulnerability, Rockaway Park and Rockaway Beach remain vibrant coastal communities and there are many opportunities to build on the strengths of these neighborhoods to promote long-term resiliency.

The resiliency framework and recommendations outlined in this report are intended to guide updates to zoning and public investments to support neighborhood recovery and vitality. The recommendations will inform the work of City agencies in 2017 and beyond. In summary, the recommendations are to:

Support Residential Resiliency

DCP will explore updates to citywide zoning for the floodplain to provide flexibility for the replacement of lost residential floor area at a location above flood levels. These potential zoning changes can be complemented by outreach efforts to educate residents on the benefits of investing in resiliency, and also by continued efforts by the city to help make insurance premiums manageable and offset the cost of retrofitting.

Promote Vibrant Commercial Corridors

DCP will also explore updates to citywide zoning to help make it easier to retrofit existing commercial buildings. DCP, in coordination with other agencies, will also continue to support business organization and disaster preparedness.

Promote Coastal Access and Resiliency

The City will advance opportunities to activate the waterfront with a range of recreational activities and flood mitigation strategies.

Improve Transportation Systems and Redundancy

The City is implementing strategies to increase transportation options and improve connectivity into the Rockaways and working with other transportation agencies to invest in the resiliency of critical transit infrastructure.

Plan for Adaptation Over Time

The City will explore opportunities to invest in shoreline infrastructure to reduce the study area's vulnerability to tidal flooding and sea level rise.

The recommendations for Rockaway Park and Rockaway Beach were developed with input from the community and collaboration with other City, State, and Federal agencies. The Department of City Planning remains committed to working with these neighborhoods as they adapt to changing conditions by continuing to address resiliency needs through zoning, infrastructure, and coastal flood preparedness strategies.



Cross Bay Veterans Memorial Bridge

GLOSSARY OF KEY TERMS

Base Flood Elevation (BFE)

The computed elevation in feet to which floodwater is anticipated to rise during the 1% annual chance storm shown on the Flood Insurance Rate Maps (FIRMs) issued by the Federal Emergency Management Agency (FEMA). A building's flood insurance premium is determined by the relationship between the BFE and the level of the lowest floor of a structure.

1% Annual Chance Floodplain (100 Year Floodplain)

The area that has a 1% chance of flooding in any given year. It is indicated on FEMA's Flood Insurance Rate Maps (FIRMs). See "Special Flood Hazard Areas," below.

Design Flood Elevation (DFE)

As defined by the New York City Building Code, the Design Flood Elevation (DFE) is the minimum elevation to which a structure must be elevated or floodproofed. It is the sum of the BFE and a specified amount of freeboard (see definition below) based on the building's structural category.

Flood Insurance Rate Maps (FIRMs)

The official flood map, on which FEMA has delineated the Special Flood Hazard Area (SFHA), 0.2% annual floodplain (Shaded X Zone), Base Flood Elevations (BFEs), and floodways.

Preliminary Flood Insurance Rate Maps (PFIRMs)*

The PFIRMs are the best available flood hazard data. FEMA is in the process of updating the Flood Insurance Rate Maps (FIRMs) for New York City and issued PFIRMs in December 2013 and again in 2015 as part of this process. The New York City Building Code requires new and substantially improved buildings to use the PFIRMs (unless the effective FIRMs are more restrictive) until the maps become effective. The PFIRMs, however, are not used to guide the requirements of the National Flood Insurance Program.

Floodproofing, Dry

For non-residential buildings, a flood mitigation technique that results in the building resisting penetration of flood water up to the DFE, with walls substantially impermeable to the passage of water and structural components having the capacity to resist specified loads.

Floodproofing, Wet

A flood mitigation technique designed to permit parts of the structure below the DFE to intentionally flood, by equalizing hydrostatic pressures and by relying on the use of flood damage-resistant materials. With this technique, parts of the building below the DFE are only to be used for parking, storage, building access, or crawl space.

Freeboard

An additional amount of height above the BFE to provide a factor of safety to address the modeling and mapping uncertainties associated with FIRMs, as well as a degree of anticipated future sea level rise. It is a risk reduction requirement found in Appendix G of the Building Code and recognized by NFIP as an insurance premium reduction factor. In New York City, one foot of freeboard is required for commercial and multi-family buildings, and two feet for single- and two-family buildings.

* In summer 2015, the City submitted a formal appeal to FEMA, citing internal technical analysis that showed a smaller 1% annual chance floodplain across much of the city. As part of the public review of the PFIRMs, FEMA will review the appeal and determine if a re-mapping of the floodplain is necessary.

National Flood Insurance Program (NFIP)

Federal program that makes flood insurance available to municipalities that enact and enforce floodplain management regulations that meet or exceed the criteria established by FEMA. Under this program, properties within the SFHA with a federally-backed or -regulated mortgage are required to buy flood insurance. Communities participating in the NFIP must incorporate flood-resistant construction standards into building codes.

Special Flood Hazard Areas (SFHA)

Area of the floodplain that has a 1% chance, or greater, of flooding in any given year. Also referred to as the 100-year floodplain or the 1% annual chance floodplain. The SFHA is separated into zones depending on the level of hazard:

V Zone

The area of the SFHA subject to high-velocity wave action that can exceed three feet in height.

Coastal A Zone

A sub-area of the A Zone that is subject to moderate wave action between one-and-a-half and three feet in height.

A Zone

The area of the SFHA that is subject to still-water inundation by the base flood.

Substantial Damage

Damage sustained by a building whereby the cost of restoring the structure to its pre-damaged condition would equal or exceed fifty percent of the market value before the damage occurred. When a building is substantially damaged or substantially improved (see below), it is required to comply with Appendix G of the Building Code as if it was a post-FIRM structure.

Substantial Improvement

Any repair, reconstruction, rehabilitation, addition or improvement of a building with cost equaling or exceeding fifty-percent of the current market value of the building. When a building is substantially improved, it is required to comply with the flood-resistant construction requirements of Appendix G of the Building Code.

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Data Sources

Federal Emergency Management Agency
NYC Panel on Climate Change
U. S. Department of Housing and Urban Development

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RESOURCES

TECHNICAL GUIDANCE

New York City Department of City Planning

Retrofitting Buildings for Flood Risk

www1.nyc.gov/site/planning/plans/retrofitting-buildings/retrofitting-buildings.page

Resilient Retail

www.nyc.gov/resilientretail

Designing for Flood Risk and Urban Waterfront Adaptive Strategies

www1.nyc.gov/site/planning/plans/sustainable-communities/climate-resilience.page

Flood Resilience Zoning Text Amendment

www1.nyc.gov/site/planning/zoning/districts-tools/flood-text.page

Special Regulations for Neighborhood Recovery

www1.nyc.gov/site/planning/plans/special-regulations-neighborhood/special-regulations-neighborhood.page

New York City Department of Buildings

Building Code Appendix G Flood-Resistant Construction

www1.nyc.gov/site/buildings/codes/2014-construction-codes.page

Federal Emergency Management Agency

Flood Insurance Rate Maps

region2coastal.com

National Flood Insurance Program

floodsmart.gov

INFORMATIONAL RESOURCES

OneNYC

nyc.gov/onenyc

Mayor's Office of Recovery and Resiliency

www.nyc.gov/resiliency

New York City Panel on Climate Change

onlinelibrary.wiley.com/doi/10.1111/nyas.2015.1336.issue-1/issuetoc

