Resilient Neighborhoods

Harding Park

resilient neighborhoods
NYC PLANNING

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THE CITY OF NEW YORK
MAYOR BILL DE BLASIO

DEPARTMENT OF CITY PLANNING
CARL WEISBROD, DIRECTOR

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www.nyc.gov/resilientneighborhoods

FOREWORD

Harding Park is one of the Bronx's most eclectic waterfront communities, with a truly unique built character and waterfront environment. While these traits give Harding Park a special appeal, they also make it vulnerable to flooding today and, to an even greater degree, in the future.

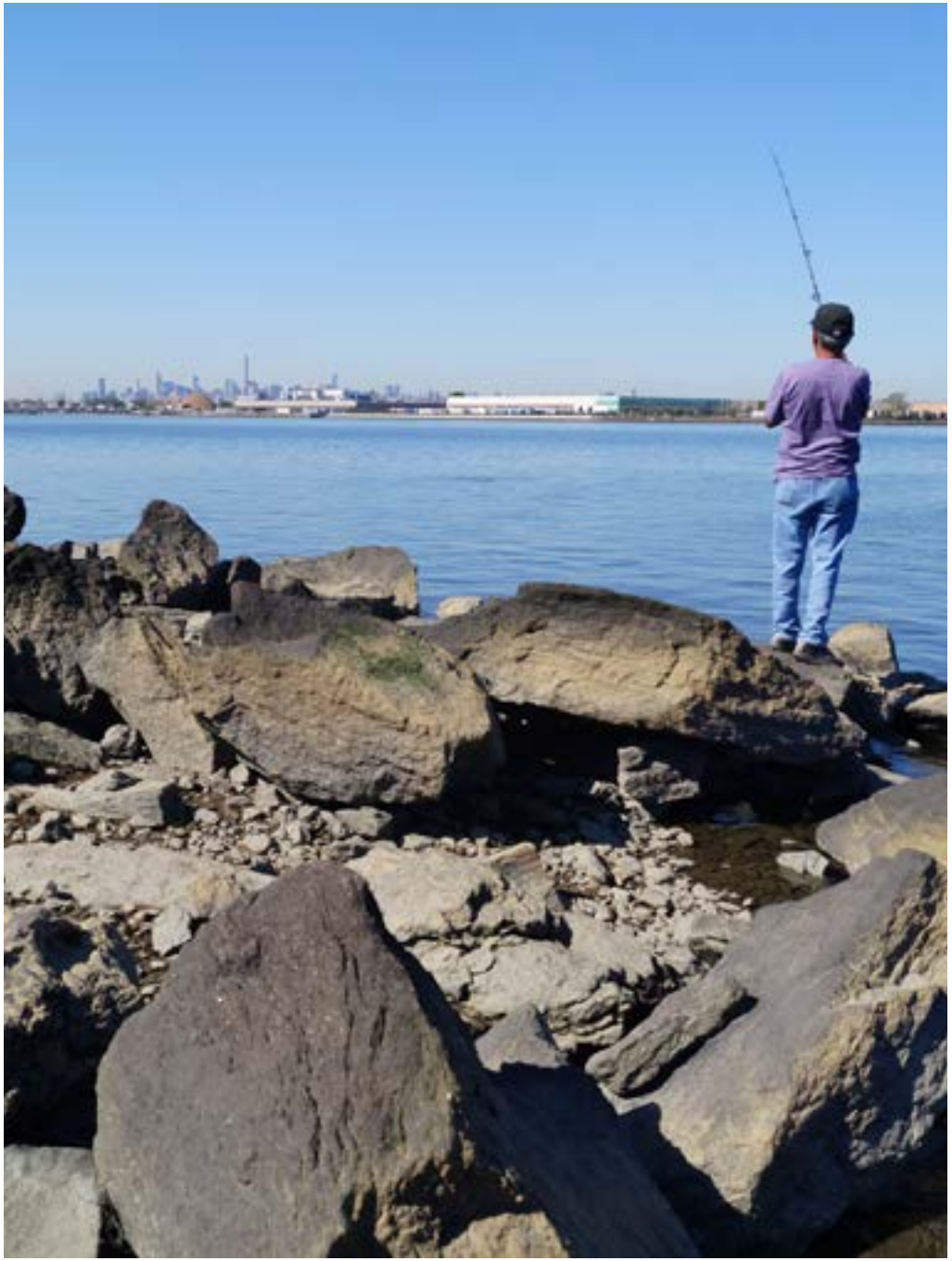
Hurricane Sandy starkly demonstrated the coastal hazards that New York City's coastal neighborhoods like Harding Park face. The storm also highlighted the city's and this community's resilience—its ability to bounce back from the storm and become stronger in the face of the next. In the time since the storm, the Department of City Planning, along with other City agencies, has been working to increase the resiliency of coastal neighborhoods throughout the city. Our work includes a citywide flood resiliency zoning text amendment that changes zoning in the floodplain to make it easier for property owners to retrofit their buildings, and guidance documents, such as *Retrofitting Buildings for Flood Risk* and Urban Waterfront Adaptive Strategies, that help designers, planners, and residents plan for and adapt to the risks of flooding.

Resilient Neighborhoods, the program of which this report is a part, complements these citywide efforts by working with communities to generate neighborhood plans to advance resiliency through changes to zoning and land use and investments in infrastructure. The program includes ongoing coordination with other City agencies and illustrates the importance and effectiveness of pursuing resiliency through place-based planning.

This report is the culmination of over a year-and-a-half of working with the Harding Park community to envision a long-term future for the neighborhood. Residents will not only find guidance on retrofitting buildings typically found in Harding Park but also a concept for improved open spaces that help mitigate flooding and provide a recreational resource.

This plan is not the end, but instead the beginning of a conversation and a commitment to working with the community to ensure the ongoing vibrancy and resiliency of Harding Park.

Carl Weisbrod, Director
Department of City Planning



Carl Weisbrod fishing in Harding Park.

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EXECUTIVE SUMMARY

Hurricane Sandy's devastating impacts on New York City served as a stark reminder of the city's vulnerability to coastal storms and flooding. Though much of the Bronx was spared the damage sustained in many neighborhoods across other boroughs due to the trajectory of the storm and the timing of the tides, climate change is expected to increase the frequency and severity of future storm events, putting New Yorkers living and working on 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 careful 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 and able to withstand and recover quickly from future flood events.

Resilient Neighborhoods is a place-based planning initiative led by the New York City Department of City Planning that has worked with communities to identify locally-specific strategies to support the ongoing vitality and resiliency of ten communities located in the city's floodplain. This report provides details on retrofitting single-family homes and bungalows for flood risk, as well as implementing coastal protection measures and managing stormwater through green infrastructure.

The City's work in Harding Park has been guided by three primary goals:

Reducing flood risk

Consider means of improving waterfront open spaces with green infrastructure strategies to prevent erosion and manage stormwater while providing public open space and enhancing connectivity.

Planning for adaptation over time

Enable buildings to be retrofitted or rebuilt to withstand flooding and other hazards while minimizing disruption to residents through the adoption of the Flood Resilience Text Amendment.

Creating resilient, vibrant neighborhoods

Support the continuing vitality of Harding Park, considering both short-term and long-term challenges by working with the homeowner's association to promote an understanding of how current and future flood risk will affect the community and exploring how residents might invest in resiliency measures to protect their property and safety.

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

As important as this work is, coastal resiliency cannot be achieved through one study at one moment in time, but rather must be pursued through ongoing recognition of and responses to evolving risks and changing conditions. In response to this challenge, the City will continue to work with communities such as Harding Park to ensure that goals for resiliency can be met while maintaining a focus on equity, livability, and safety for residents.


COVERED PORCH / STAIRTURN
STREETSCAPE MITIGATION
STRATEGIES
SPACE BELOW HOME IS STORAGE / ACCESS ONLY
RESILIENT HOMES:
ELEVATED TO REQUIRED DESIGN FLOOD ELEVATION
TRAFFIC
MIX OF OPEN SPACE + VEGETATED EDGE/BANK
MIX OF SALTWATER MARSH PLANT LIFE.
PEDESTRIAN WALKWAY
ACCESS TO PARK
PEDESTRIAN CIRCULATION
OBSERVATION DECK GIVES USER A UNIQUE EXPERIENCE OF PARK + LAGOON.
LAGOON: SALTWATER MARSH
BREAKWATER: SERVES AS FIRST LINE OF DEFENSE FOR UPLAND AREAS + PEDESTRIAN WALK
STORM SURGE FROM EAST RIVER SHALL BE REDUCED BY BREAKWATER
EAST RIVER

INTRODUCTION

Resiliency Planning in New York City

Following Hurricane Sandy in October 2012, the City developed a detailed action plan for rebuilding, called "*A Stronger, More Resilient New York*," that focused on both post-disaster recovery and long-term resiliency for the city's coastal communities, buildings, and infrastructure. In the time since, the City has made significant progress in implementing the plan, funding a $20 billion climate resiliency program and advancing rebuilding through initiatives such as Build it Back, as well as long-term resiliency through infrastructure investments and upgrades such as the Hunts Point Resiliency Project.

OneNYC

Drawing on this work and earlier planning efforts, in Spring 2015 the City released "*OneNYC: The Plan for a Strong and Just City,*" a long-term strategic plan to address the city's most pressing challenges, including a rapidly growing population, rising inequality, aging infrastructure, and climate change. *OneNYC* looks to the year 2025, when the City will celebrate its 400th anniversary and begin its fifth century, to guide a conversation about how New Yorkers might meet these challenges over the next ten years and beyond. The plan is organized into strategic visions around four key themes: growth, equity, sustainability, and resiliency. A set of ambitious goals are associated with each theme. In all, the plan outlines over 200 new initiatives intended to achieve these goals over the next ten years.

The City's resiliency goals are premised on a vision that New York City's neighborhoods, economy, and public services will be ready to withstand and emerge stronger from the impacts of climate change and other 21st century threats. As detailed in the diagram to the right, the goals are divided into categories: neighborhoods, buildings, infrastructure, and coastal defense. Through select initiatives at each of these scales, ranging from

Resiliency refers to the ability of people, the places where they live, and the infrastructure they rely upon to withstand a stress or shock event, to recover, and to emerge even stronger.

Neighborhoods	Every city neighborhood will be safer by strengthening community, social, and economic resiliency
Buildings	The city's buildings will be upgraded against changing climate impacts
Infrastructure	Infrastructure systems across the region will adapt to enable continued services
Coastal Defense	New York City's coastal defenses will be strengthened against flooding and sea level rise

strengthening community-based organizations to pursuing policy reforms of the federal flood insurance program, the City hopes to achieve measurable impacts, including eliminating disaster-related long-term displacement of New Yorkers from homes, reducing the social vulnerability index for neighborhoods, and lowering average annual economic losses resulting from climate-related events.

Resilient Neighborhoods

One of the initiatives presented in *OneNYC* is Resilient Neighborhoods, a place-based planning initiative to identify locally specific strategies, including zoning and land use changes, to support the vitality and resiliency of communities in New York City's floodplain. The initiative focuses on ten study areas located throughout the five boroughs, ranging from dense mixed-use districts in Manhattan to lower-density residential communities in the Bronx, Brooklyn, Queens, and Staten Island. The Department of City Planning (DCP) identified these study areas based on localized resiliency challenges that warranted additional study beyond what was being undertaken as part of other citywide resiliency projects.

As a former summer campground on the shores of the Harlem and East Rivers that has retained much of its historic, rustic charm, Harding Park was selected for this initiative due to the significant flood risk it faces given the unique challenges and opportunities posed by the community's topography, existing housing stock, and governance and land ownership framework.

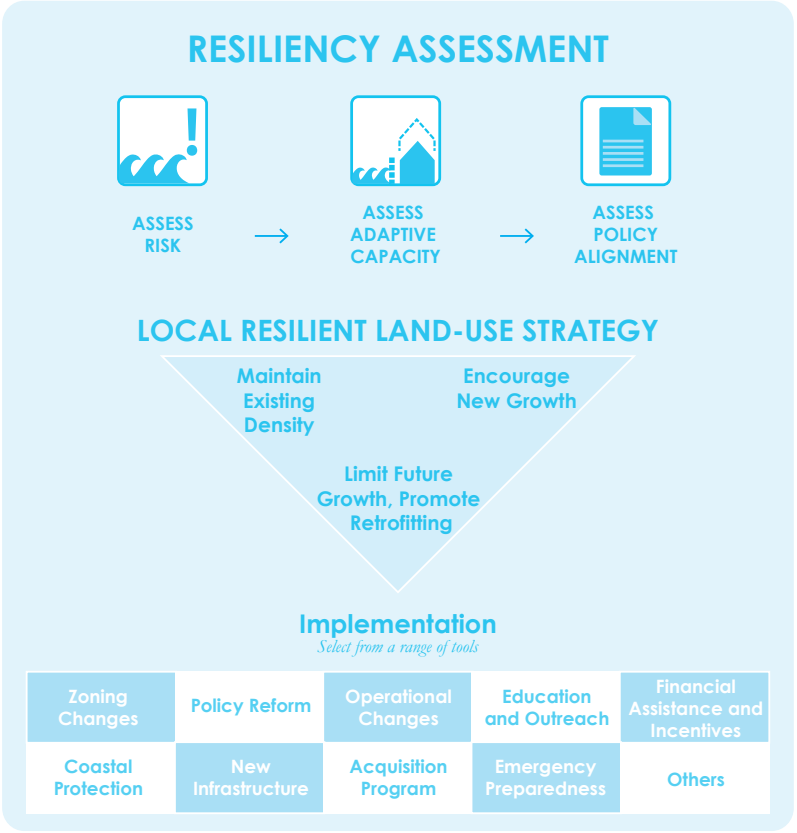
The Harding Park study is a product of collaboration between DCP and other City agencies, including the Mayor's Office of Recovery and Resiliency, the Departments of Parks and Recreation, Environmental Protection, and Transportation. The Bronx Office of DCP led three tours of the study area to promote awareness among agency stakeholders about the flood risk vulnerabilities in Harding Park in addition to directing a concerted effort to identify opportunities for investment in resiliency measures in and around the community.

Recommendations made through Resilient Neighborhoods also draw on previous work by DCP and other City agencies. The Department's Flood Resilience Zoning Text Amendment, adopted in October 2013, changed zoning regulations to enable new and existing buildings to incorporate flood protection measures more easily. This text amendment, adopted as a temporary measure immediately after Sandy, is currently in the process of being revised and updated before its permanent adoption. In addition, "*Retrofitting Buildings for Flood Risk*," a report released by DCP in 2014, provides a comprehensive analysis of and guide to retrofit options available for buildings in the floodplain. DCP is also conducting studies on resiliency issues as they relate to retail corridors and industrial land uses throughout the city, and expects to release these findings in 2016.

Planning Approach for Resiliency

The ten Resilient Neighborhoods study areas encompass a variety of physical, environmental, social, and economic conditions, the combination of which creates a distinct set of resiliency challenges for each neighborhood. To account for this diversity of contexts and to ensure that a consistent planning approach underpins the City's resilient land use goals, the Department of City Planning developed a tool for coordinated analysis and risk-based decision-making. The latter half of this report details the strategies and recommendations that have been developed for Harding Park based on this process.

The tool has three central components, outlined in the diagram to the right, beginning with a resiliency assessment. Through a series of discrete analyses, the resiliency assessment evaluates coastal risks, the capacity of neighborhoods to adapt to and/or mitigate these risks, and the alignment between potential adaptation actions and other policy goals or community priorities, such as the improvement of open space. The objective of the assessment is to determine which hazards and vulnerabilities are present within a neighborhood and evaluate the potential for adaptive investments, such as building-scale retrofits or new coastal protection infrastructure, to reduce these vulnerabilities.



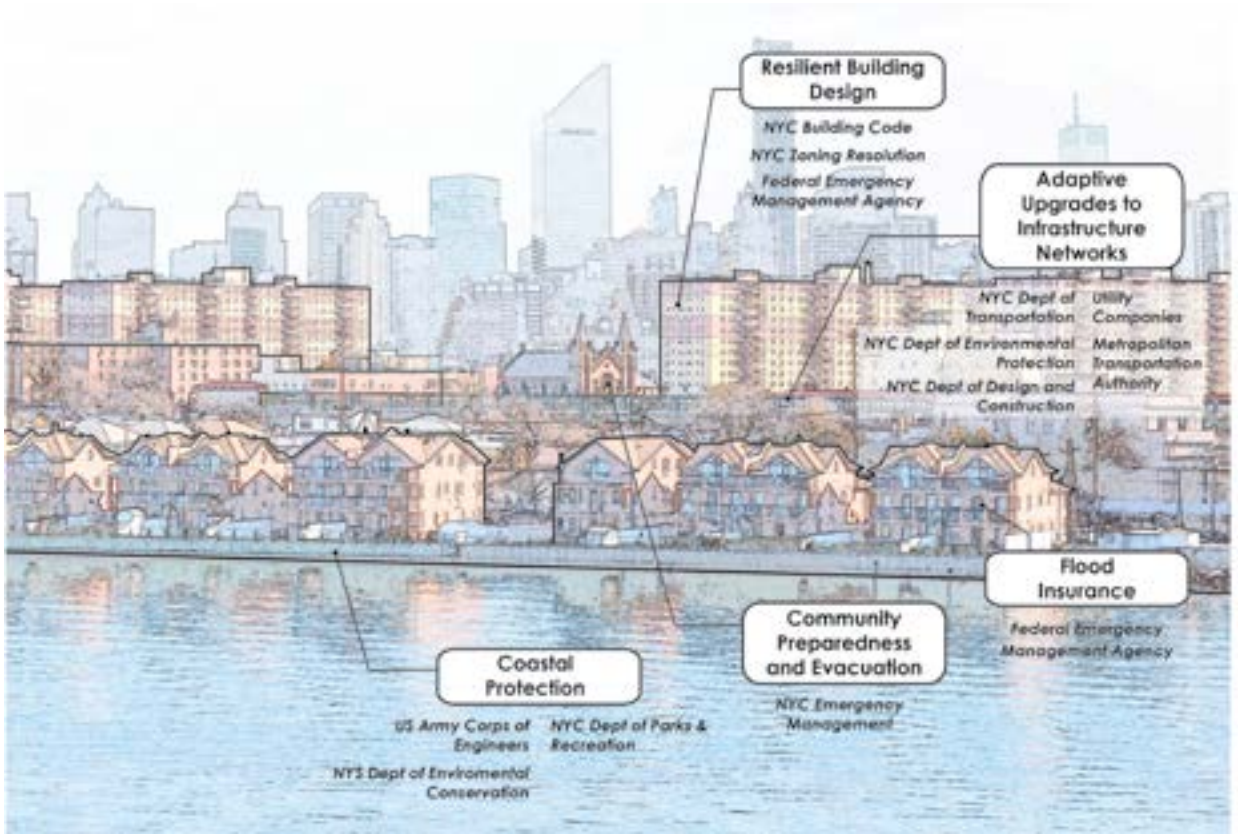
The results of the resiliency assessment, in addition to input generated through community outreach, inform the selection of one or more local land use strategies. The strategies are chosen based on a number of criteria that determine which long-term approach to development is necessary to reduce risks and achieve a more resilient built form. Across the city, there are a spectrum of potential strategies, ranging from limiting growth in areas that are at significant risk from future daily tidal flooding due to sea level rise, to maintaining existing density but altering regulations to promote retrofits, to encouraging new growth and redevelopment of an existing built environment that cannot be retrofitted in place to achieve resiliency goals. Often, more than one land use strategy must be pursued throughout a neighborhood.

The final component of the process is the implementation of the chosen local resilient land use strategy through a variety of planning and policy tools. The range of tools include, but are not limited to, zoning changes, policy reform, operational changes, education and outreach, financial assistance, construction of new or adapted infrastructure, and emergency preparedness training. Frequently, a combination of tools enacted at different scales and amongst different stakeholders is necessary to fully implement a land use strategy. This process of risk assessment, land use strategy selection, and implementation helps shape a planning framework for resilient development that is calibrated to challenges and opportunities within specific neighborhoods.

Regulatory Framework

One of the most important considerations in planning for neighborhood resiliency is the regulatory framework that determines how and where buildings are constructed in the floodplain. There is a wide array of programs and regulations at various levels of government that work together to manage flood risk and promote resilient

development. Since Hurricane Sandy, many federal and local laws and regulations have been modified, with significant implications for the construction and retrofitting of buildings in New York City's floodplain. At the same time, federal, state, and local authorities have been upgrading infrastructure networks and planning new coastal protection measures across the city, while also pursuing programmatic investments that will increase community preparedness and emergency response in the wake of future disasters. This mix of infrastructure investments, emergency preparedness planning, and building regulations, as illustrated in the diagram to the right, come together to create a framework for a more resilient city.



Federal Flood Maps and Flood Insurance

Most relevant to this study are a set of regulations that influence how homes and businesses are constructed in the floodplain. In the United States, floodplain regulation begins with Flood Insurance Rate Maps (FIRMs), which are created and maintained by the Federal Emergency Management Agency (FEMA). The maps show the extent and elevation that flood waters are expected to rise to during a 100-year flood event, also known as the 1% annual chance floodplain.

The 1% annual chance floodplain is divided into three zones. The V and Coastal A zones are subject to risk from wave action, while the A zone denotes areas of flood inundation without significant wave action. The V and Coastal A zones differ in degree of wave risk, the former having computed wave heights in excess of three feet and the latter having computed wave heights from one-and-a-half to three feet. FIRMs also show the 500-year or 0.2% annual chance floodplain, which is shown as the Shaded X zone on the flood maps.

The 1% annual chance floodplain is also known as the Special Flood Hazard Area, the area where National Flood Insurance Program (NFIP) floodplain building standards apply, and where property owners with federally-backed or regulated mortgages are required to carry flood insurance. In order to participate in NFIP, municipalities must first incorporate FEMA flood resilience building standards into local building codes. Flood insurance premiums under NFIP are determined by the relationship between the lowest occupied floor of the structure and the Base Flood Elevation (BFE) shown on the FIRMs at the structure's location, as well as other factors. Buildings with residential occupancy or commercial uses below the BFE have a higher risk of incurring damage from flooding and are accordingly subject to higher insurance premiums, while buildings with all occupancy and other active uses elevated above the BFE have lower damage risk and qualify for lower premiums. Elevation and flood proofing standards are described and enforced through the New York City Building Code (see next page for additional information).

For the past several years, FEMA has been in the process of updating the FIRMs for New York City, which were implemented in 1983 and not significantly updated since. In many areas of the city, flooding from Sandy extended far beyond the floodplain shown on the 1983 FIRMs, reflecting the insufficiency of these maps

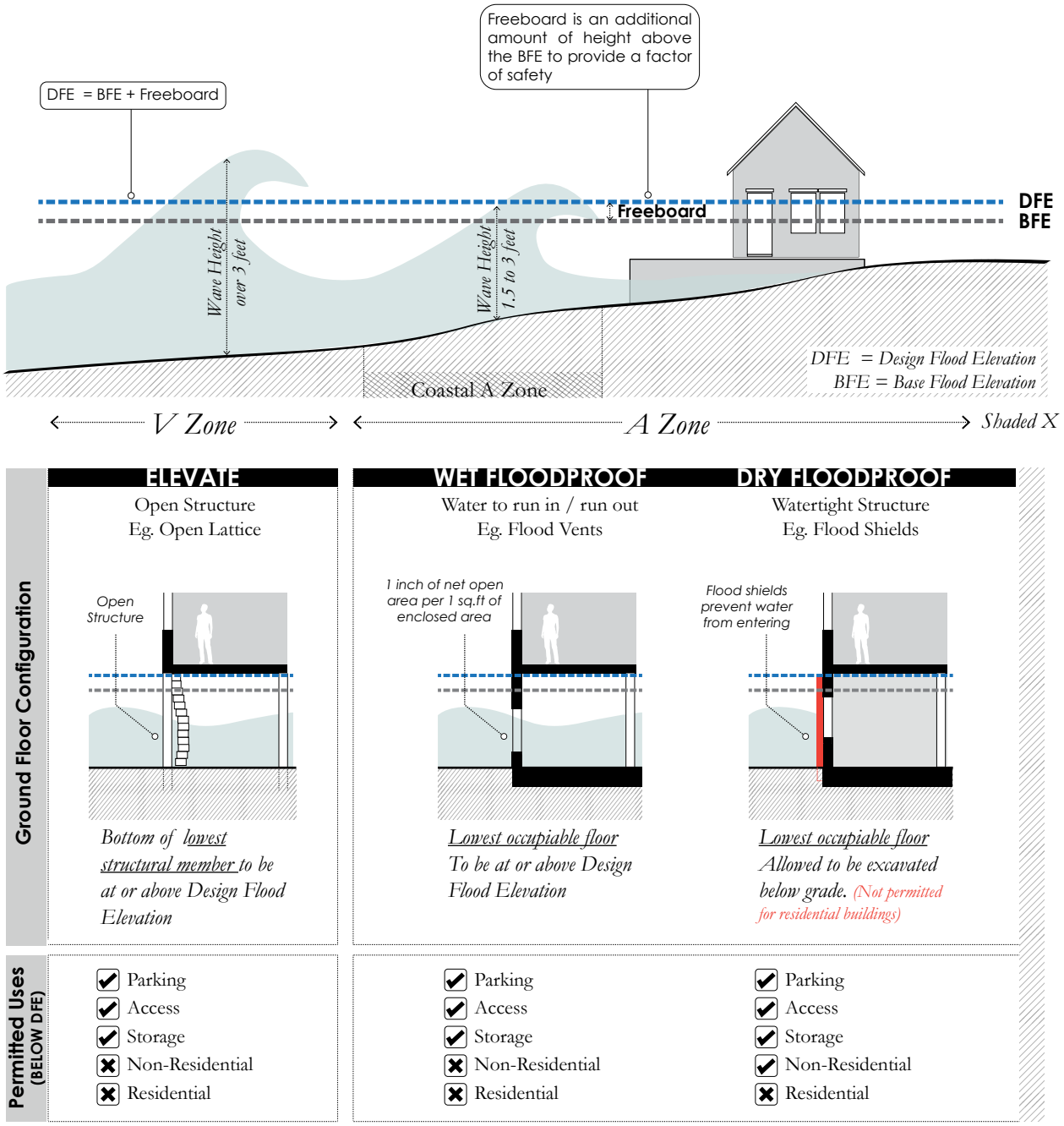
as a regulatory risk mitigation tool. As part of the mapping update, FEMA issued updated Preliminary FIRMs (PFIRMs) in December 2013 with another revision in January 2015. In most places, these PFIRMs show an expanded 1% annual chance floodplain. The maps also heighten Base Flood Elevations for much of the city. The changes in inundation extent and flood elevation result from refinements to the flood modeling technique.

The implications of the expansion in the city's floodplain are great. If the PFIRMs are officially adopted, the number of property owners in the city required to carry flood insurance will more than double. In addition, congressional changes to NFIP will make flood insurance more expensive over time for many property owners.

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.

Flood Resilient Construction and Building Design

Flood resilient building standards are enacted through the New York City Building Code, specifically Appendix G on "Flood-Resistant Construction," which as of 2015 applies to the Special Flood Hazard Area shown on FEMA's PFIRMs or the 1983 adopted FIRMS, whichever of the two is more restrictive at the location of proposed development. Appendix G includes different elevation and floodproofing requirements for each flood zone, as well as separate requirements for residential and non-residential structures. The requirement to meet Appendix G is triggered by new construction or when a building is substantially damaged or undergoes a substantial improvement. As defined



by Appendix G, "substantially damaged" buildings are those where the cost of restoring the building to its undamaged condition equals or exceeds fifty percent of the market value of the building (not including the land). "Substantially improved" buildings are those where any improvement, including repair, rehabilitation, or addition, would equal or exceed fifty percent of the market value of the building.

A number of new provisions within the building code were enacted after Sandy to help support resilient building in the city's floodplain. To align with New York State standards for flood protection, the New York City Department of Buildings introduced rules requiring most residential and commercial buildings to protect one or two feet higher than the FEMA-designated Base Flood Elevation. Under these rules all new, substantially damaged, or substantially improved one- and two-family dwellings must elevate the lowest occupied floor an additional two feet of "freeboard" above the BFE shown on the flood maps. Multifamily buildings are required to provide an additional one foot of freeboard above the BFE. The elevation of the BFE plus freeboard is called the Design Flood Elevation (DFE).

To meet 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. Wet floodproofing requires the use of construction materials that are not damaged by water and providing vents to allow flood waters to pass through building walls. The wet floodproofed space can only be used for storage, parking, or building access. Basements or cellars that are below grade on all four sides are not allowed in purely residential buildings. Below-grade space is allowed if there is an adjacent grade on one side that is below the lowest level of the enclosure so that flood waters would be able to flow out by gravity. Non-residential buildings (any building that contains any amount of non-residential floor area under Appendix G) have the option of elevating and wet floodproofing, or dry floodproofing. Dry floodproofing involves design strategies, such as flood walls, that keep water from entering a building. Dry floodproofed buildings must be designed so that walls can resist the lateral pressure of water (even walls below grade) and foundations can resist the force of buoyancy that occurs when a building is surrounded by water. 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 the lowest NFIP premiums.

Owners of buildings that are not new, substantially damaged, or substantially improved are not required to meet Appendix G requirements, but may voluntarily choose to implement partial flood mitigation strategies including elevating or floodproofing a building's mechanical systems. These measures may not 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 in the aftermath of a flood.

Citywide Zoning for Flood Resiliency

To accommodate many of these building regulations, the Department of City Planning has instituted a series of zoning changes that remove impediments to retrofitting residential and commercial properties. The first of these changes was an emergency Executive Order, issued on January 31, 2013, that suspended height and other restrictions to the extent necessary for property owners to rebuild after Sandy. Many of these changes, as well as additional measures, were subsequently adopted by the City Council as the Flood Resilience Zoning Text Amendment on October 9, 2013. This text amendment created allowances for measuring building height from the latest FEMA flood elevations (including freeboard), providing building access from grade, locating mechanical

systems above flood levels, accommodating off-street parking above grade, and restricting ground floor uses. As represented in the images to the right, it also incorporated provisions to mitigate adverse streetscape impacts by promoting visual connectivity, façade articulation, inviting access points, and neighborhood character. The text amendment rules applied to all buildings in the 1% annual chance floodplain.

The 2013 Flood Resilience Zoning Text Amendment was passed with a sunset provision and is set to expire a year after the PFIRMs are formally adopted by FEMA. As mentioned previously, DCP is currently conducting analysis for a permanent amendment that will include many of the provisions set forth in the 2013 text amendment, along with additional regulations more attuned to certain building and lot conditions found in the city's floodplain. These changes are intended to make it easier for property owners to comply with FEMA and Building Code resilient building standards while also maintaining or maximizing permitted floor area. The Resilient Neighborhoods initiative complements these citywide efforts by studying zoning and land use changes in ten neighborhoods with unusual or particularly complex building and lot conditions that warrant additional analysis.

Streetscape Mitigation | Urban Design Principles

Visual Connectivity
Buildings should engage the sidewalk. Activity on sidewalks along building frontages supports pedestrian-friendly neighborhoods. This provide visual interest, which in turn promotes a walkable neighborhood. On commercial streets, this visual connectivity is important to the viability of local retail.

Façade Articulation
Buildings often contribute to the character of a place by offering human-scale architectural elements, particularly on the first floor. Having the windows and front door of a building face the public street can create a sense of security and comfort for pedestrians.

Inviting Access
Access elements such as ramps and stairs should be designed to appear inviting for people walking by. In residential neighborhoods, porches, stoops, and generous access elements can help mitigate disconnections from the sidewalk level.

Neighborhood Character
Some neighborhoods exhibit a relative uniformity of building form. Elevating buildings will necessarily produce variations in building height and, in some cases, placement on the lot. Designers should respect a neighborhood's character by taking cues from existing context.

Ssite tour of Harding Park.

Outreach Process

The Department of City Planning met with the Harding Park Homeowner's Association and others in late 2013 to launch a neighborhood resiliency study in the community. DCP has maintained an ongoing relationship with stakeholders in Harding Park and developed a collaborative vision of resiliency measures that can be undertaken at both the public (City) and private (homeowner's association and home-owner) level. These include site-specific strategies that protect buildings and mitigate stormwater and flooding on individual properties, as well as more comprehensive strategies such as reducing impervious surfaces and installing green infrastructure within the community.

COMMUNITY RISK PROFILE

Community Character and History

Harding Park is a small, private waterfront community located on the southwestern tip of the Clason Point peninsula. Bounded by the Bronx River to the west and the East River to the south, the neighborhood includes over 12,000 square feet of City-owned parkland and open space along the waterfront. The community reaches Soundview Park to the north and as far as White Plains Road to the east.

Named for President Warren G. Harding, Harding Park was originally established as a beachfront summer campground and cottage colony in the late 19th century. Bungalows were gradually winterized and expanded to become permanent homes as the area's prominence as a summer resort and recreation destination waned during the Great Depression, and a largely immigrant community consisting of Irish, German, Scandinavian and Italian residents settled in the area.

These converted homes typify the neighborhood today, fronting narrow, paved lanes without sidewalks. Such features contribute to the nostalgic waterfront landscape of the community.

In 1957, residents won a decisive battle against then Parks Commissioner Robert Moses, who had planned to raze the neighborhood. The three saltwater lagoons within the study area, built from the construction debris generated by Moses's capital projects as an initial step towards filling the shoreline.

Several years later, the residents fought steep rent increases and eviction notices, and successfully lobbied the state legislature for rent control protections. The City took control of Harding Park in 1978 when the last private owners of the property, Federated Homes, defaulted on their taxes. After years of negotiations, residents secured $2.5 million of public investment to rebuild the private sewer system and resurface private ways within the community, and reacquired the land from the City for $700,000. In 1981, Harding Park became the first cooperatively owned low- and moderate-income community in New York.

Today, approximately 400 residents live in 226 single-family homes in this tight-knit, residential neighborhood. The Harding Park Homeowner's Association administers the community and manages the privately-owned properties and roads. The community has retained its immigrant character, with current residents hailing from all over the world. The population is largely Hispanic, with many residents from Puerto Rico. Two local bus routes, the BX-27 and BX-39, serve the area, which sits south of the Bruckner Expressway in between Soundview and Puglsey Creek Parks. A ferry service routed along the east side of Manhattan and terminating at Wall Street is planned for Soundview Park beginning in 2016.

2015 Preliminary FIRMs

Number of Homes in PFIRM Flood Zones

2 V Flood Zone

45 Coastal A Flood Zone

33 A Flood Zone

Basemap Features

- Bus Stops
- NYC Park's Property
- Building Footprint
- Study Area Boundary

PFIRM Flood Zones

- V Zone
- Coastal A Zone
- A Zone
- Shaded X Zone
- Subject to Wave Risk (LiMWA)

NYC Department of City Planning

Flood Risk Vulnerabilities

While Sandy arrived in the New York harbor at high tide, causing unprecedented damage to neighborhoods concentrated in the southern coastal areas of the city, the storm reached the Long Island Sound at low tide, minimizing the destructive impact to waterfront communities in the Bronx, northern Queens and upper Manhattan. According to modeling undertaken by the storm surge research team at the Stevens Institute of Technology and depicted in the map on the following page, if Sandy had arrived just a few hours earlier, the extent and severity of flooding in these areas would have been significantly greater.

Harding Park is vulnerable to a variety of flood hazards, including significant inundation and wave action from coastal storm surge, and ponding in streets and yards from rainfall events due to insufficient drainage infrastructure. With projections for more frequent and severe storms as well as sea level rise from climate change, these hazards are expected to worsen over time.

As shown on the previous page, approximately one third of homes in Harding Park are located within the 1% annual chance floodplain. Of these 85 buildings, **the majority are located in the Coastal A or V Zone** and are thus at risk from severe storm surge, substantial flood water depths, and high to moderate wave action. The majority of these homes are located in the southern portion of the study area, below Harding Park/South Street.

The Preliminary Flood Insurance Rate Maps indicate that the Base Flood Elevations (BFEs) – the height to which water is expected to rise during a 1% annual chance flood event – range between one and ten feet above grade in Harding Park. **Nearly half of homes within the floodplain have BFEs over three feet, while a quarter have BFEs over five feet. The properties with the highest BFEs are in the southern portion of the community.**

Further, the **projected flood extents for the year 2050** as modeled by the New York City Panel on Climate Change, a group of scientists and private sector experts that provide local climate change projections for the City of New York, **shows a significantly increased floodplain, nearly doubling the number of homes and residential units within the 1% annual chance floodplain.**

Flood risk in Harding Park is further exacerbated by the **limited stormwater infrastructure within the community.** The six City-owned streets that intersect the study area are part of the City's combined sewer system, which discharges to a Combined Sewer Overflow (CSO) outfall in the East River. However, the HOA-owned land that comprises much of the area is unsewered except for a private sanitary network that services the community. In these areas with no drainage system, stormwater is unmitigated and runoff flows directly over the ground until it is either absorbed or eventually channeled into waterways. **These conditions cause regular inundation of streets, yards, and homes within the community during rainstorms.**

Homes with mortgages from federally regulated or insured lenders within the 1% annual chance floodplain are required to carry flood insurance. As of February 2013, **only one quarter of homes** located in these vulnerable areas within Harding Park were reported to **have active policies**, meaning that a significant number of homeowners living in high-risk, flood prone areas likely have no mechanism to protect their assets from the financial losses sustained in a storm event.

On an individual level, this can lead to severe hardship in recovering from and rebuilding after an acute storm event. Property owners may not be able to afford to repair the damages sustained to homes, and may be forced to sell their houses and relocate. On the neighborhood scale, this can lead to disinvestment and vacancy.

During Sandy, several homes were significantly impacted by flood waters. According to data from FEMA, **residents of Harding Park reported almost $300,000 worth of damage to buildings alone, with average damages claimed at $45,000.**

The current average flood insurance premium paid annually within the community is $2,000, though there is a wide range currently paid by Harding Park residents (between $600 and $4,700). Premiums vary based on how much coverage is purchased and how homes are financed. Because the vast majority of homes in Harding Park were constructed prior to the City's adoption of the federal FIRMs in 1983 and are not currently elevated to the DFE, the **premiums paid by many policyholders will likely rise significantly as the new flood insurance regulations take effect if homeowners do not invest in flood resilient retrofits to their structures.**

Sandy Compared To Sandy 9 Hours Earlier

Building and Lot Typology Profile

Harding Park is characterized by a unique variety of lot sizes and construction types. The majority of the 226 single family homes are one- to two-story bungalow structures originally constructed when the community was first established during the early 20th century. The old, light-frame, and combustible building stock within Harding Park is highly susceptible to structural damage from various kinds of climate-based hazards. Weathering has already caused considerable damage to properties throughout the community.

Over the years, homeowners and renters have made ad hoc improvements to existing homes, expanding the footprints of their buildings, adding second stories and erecting accessory structures. This piecemeal construction has led to the dynamic and varied architectural character within the community. However, due to the structural integrity of some of these homes, rebuilding them may be more feasible than flood resilient retrofitting.

Lots in the northern section of the study area above Gildersleeve Avenue are uniformly narrow, fronting narrow mapped streets and even narrower private lanes. Here, homes have limited to nonexistent front, side, and rear yards and are located extremely close to one another.

Lot dimensions below Gildersleeve Avenue in the southern section of the study area are generally wider and vary drastically in size. Though there are pockets of density similar to the northern section of the study area, many of the properties in this area contain significantly more open (yard) space. Most of the streets in the southern portion of the study area are private, with widths ranging between nine and thirteen feet. Coupled with structural and access issues, the density of the built environment in much of the community poses challenges to resilient retrofitting and investment.

Homes in Harding Park are located in close proximity to one another.

Homes are built to the lot line and have small side yards in Harding Park.

Zoning Analysis

Like many of the city's older neighborhoods, Harding Park is zoned R3A, which is a contextual district that features modest single- and two-family detached residences on lots as narrow as twenty-five feet in width.

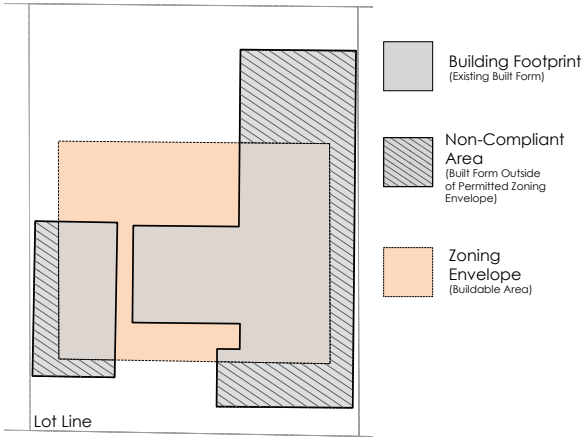
Many homes within the community are non-compliant with the bulk regulations of the district, as the built form in Harding Park predates the 1961 Zoning Resolution. Lot coverage is overbuilt throughout the community due to horizontal expansions and additions as well as lack of yard space, and approximately half of the homes within the flood zone exceed the maximum Floor Area Ratio allowance of the R3A district. The existing non-compliant homes are "grandfathered" regardless of their degree of non-compliance because they were built before the enactment of the zoning resolution. Such homes, however, cannot be altered in any way that increases the degree of their non-compliance.

The underlying R3A district mapped as part of the Harding Park Clason Point rezoning in 2007 best fits the character of the community, as it permits an appropriate density and preserves the built form of the neighborhood. In R3A districts, newly constructed detached homes like those in Harding Park must have two side yards totaling at least eight feet, but there is no minimum width requirement for each yard. Homes may be built at the lot line as long as a side yard of eight feet is provided on one side. Front yards must be ten feet deep and, to promote a unified streetscape, the yard must be as deep as an adjacent front yard but not exceed a depth of twenty feet. The R3A district requires a minimum lot size of 2,375 square feet. The maximum FAR of 0.5 may be increased up to twenty percent by an attic allowance for the inclusion of space beneath a pitched roof. The perimeter wall may rise to twenty-one feet before sloping or being set back to a maximum building height of thirty-five feet. Parking is in the side or rear yard, but an in-house garage is allowed if the lot is thrity-five feet or wider, provided the driveway is at least eighteen feet deep. One off-street parking space is required for each dwelling unit.

Two residential structures on a single lot are prohibited in an R3A District.

With the adoption of the Flood Resilience Text Amendment, the current zoning in Harding Park does not present a barrier to redevelopment or investment in building-scale resiliency measures. The amended building envelope and yard requirements permit space for the elevation of homes as well as streetscape mitigation strategies.

Diagram:
Example of a non-complying home in Harding Park



Summary of Resiliency Challenges

1 Harding Park is vulnerable to coastal storm surge and wave action.

At the building scale, these conditions make elevating properties and investing in resilient retrofits both physically and financially difficult. On the neighborhood scale, compliant structures have the potential to alter the character of the community.

2 Existing building conditions further impede building scale retrofits.

The existing degree of noncompliance in the community as well as the structural integrity of homes further exacerbates the difficulties in physically retrofitting buildings for flood risk.

3 Due to limited stormwater infrastructure, the neighborhood also faces flooding from regular or severe rain events.

The private streets in Harding Park are unsewered and impervious, contributing to water ponding and flooding from daily rain as well as storm events.

RESILIENCY FRAMEWORK

A long-standing coastal neighborhood at the confluence of the Bronx and East rivers, Harding Park is vulnerable to multiple flood-related hazards. The aging and often ad hoc construction that typifies the former campground community is subject to wave action and high flood elevations. Additionally, the risk of coastal storm surge is exacerbated by the limited drainage infrastructure within the area, which contributes to the regular flooding of private streets owned by the Homeowners Association (HOA).

The map on the following page depicts the extent of the study area and floodplain within Harding Park, and highlights the three geographies and scales that the resiliency framework addresses: individual homes and buildings, private HOA-owned property such as streets, surface parking areas and vacant spaces, and publicly-owned waterfront areas including parks, lagoons and breakwaters.

Building Scale Strategies

Flood resilient improvements to buildings in Harding Park are enabled by the Flood Resilience Zoning Text Amendment, which removes regulatory barriers to retrofitting and rebuilding homes in compliance with Appendix G of NYC Building Code and FEMA standards by allowing building height to be measured from the design flood elevation. This study provides illustrative examples of retrofitting and rebuilding strategies for homes within the community, including those that are fully compliant with applicable regulations, as well as those that are only allowed for non-substantially improved buildings.

The historic character of the community, with its overbuilt lots, piece-meal additions, aging construction and obstructions to access, make elevating and floodproofing existing structures complicated and expensive. In many cases, such retrofitting would likely exceed the market value of a home, and some structures may not be able to withstand elevating and meeting other FEMA standards needed in order to qualify for the lowest premiums. Taking measures to retrofit to partial FEMA compliance such as elevating mechanicals, reinforcing foundations or even retrofitting ground floor space with flood resistant materials can reduce damage to property and increase life safety, even though such measures will not necessarily result in lower annual insurance premiums. Over the long term, rebuilding may be a simpler, more cost-effective option for flood resilient investment in Harding Park, allowing residents to quality for a full reduction in flood insurance premiums in addition to improving access and providing more open space within the community.

Private Land and Publicly-Owned Waterfront Area Strategies

Flooding from coastal storms, wave action and inundation from smaller-scale rain events could be mitigated through a combination of green infrastructure interventions within Harding Park. Through a preliminary analysis of drainage in the study area performed using data from local 311 sewer complaints, site observations, and mapping simulations, DCP has identified several strategic sites within the community that experience regular and/or severe runoff and ponding in both private and public areas.

Working in conjunction with the Departments of Parks and Recreation, Environmental Protection and Transportation as well as the Mayor's Office of Resilience and Recovery, DCP has identified opportunities to utilize the City-owned parkland and open space in and around Harding Park as a multipurpose community amenity that mitigates coastal flood risk, promotes stormwater management, and improves ecological resources. These strategies require further study, and are contingent on additional funding. The HOA and tenants are encouraged to pursue similar strategies on the private streets, surface parking areas and vacant land within the community.

Framework Map

Building Scale Strategies

Homes in Harding Park that are located in the 1% Annual Chance Floodplain

Private Land Strategies

Homeowner's Association-owned streets, surface parking lots and vacant land.

Publicly-Owned Waterfront Area Strategies

New York City Department of Parks and Recreation-owned open spaces, breakwaters and lagoons.

1% Annual Chance Floodplain

The area that has a 1% chance of flooding in any given year.

Study Area Boundary

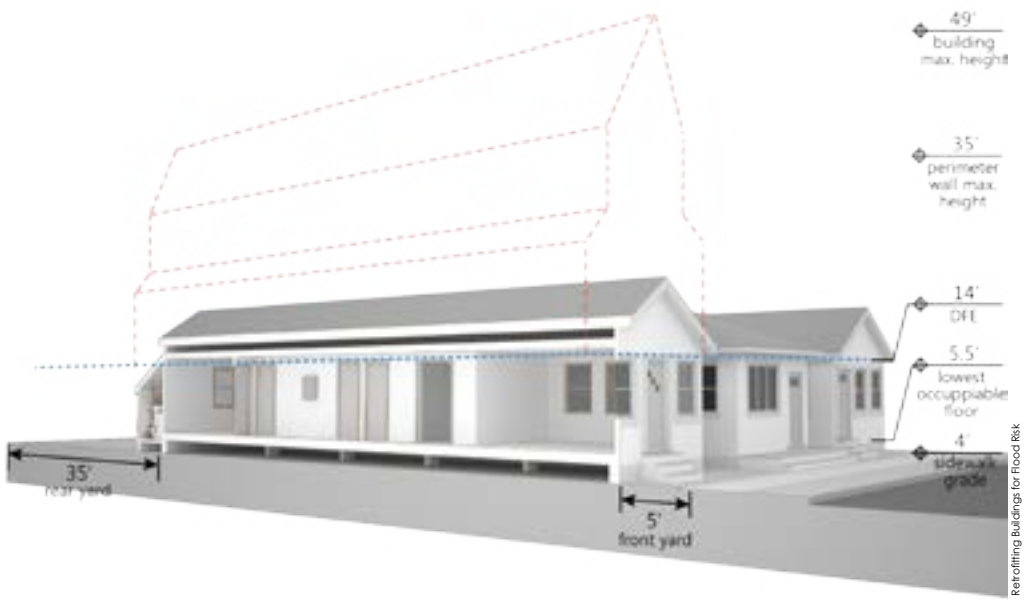
The study area encompasses the entire Harding Park Homeowner's Association.

Building-Scale Strategies

The following case studies illustrate how homes in Harding Park can be retroffited to be more resilient.

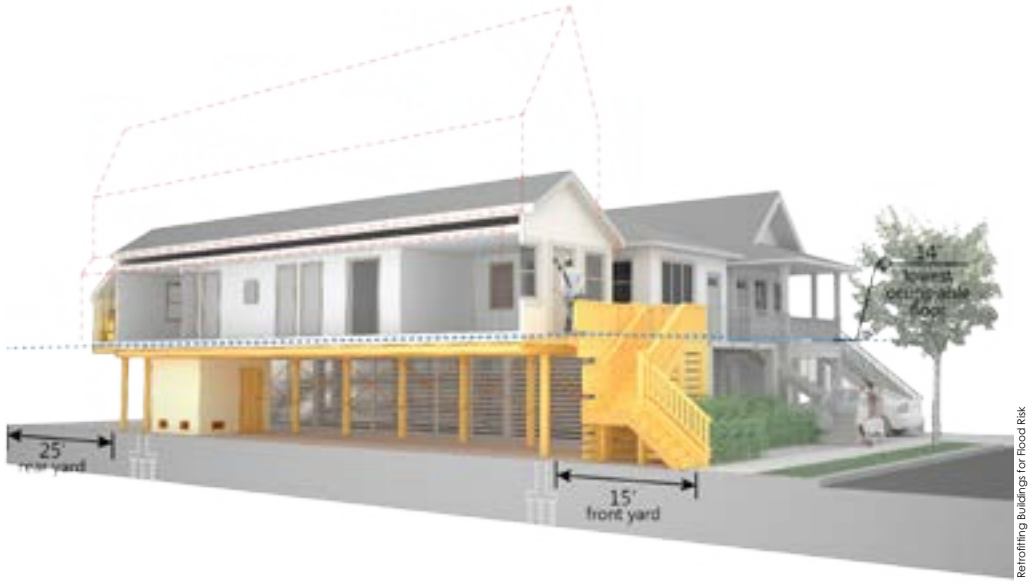
Existing Conditions

The image to the right depicts a single-story wood frame combustible construction type home on shallow unreinforced masonry foundation. The wood structure is not sufficiently tied to the foundation. The existing building has non-compliant front and side yards, and does not provide required parking. These non-compliances must be considered when retrofitting. Building access is provided at the front and rear entrances approximately one foot above grade. All systems are located in a rear enclosure below the DFE. The allowable building height is measured from the DFE, as shown to the right.



Full Compliance Retrofit Strategy

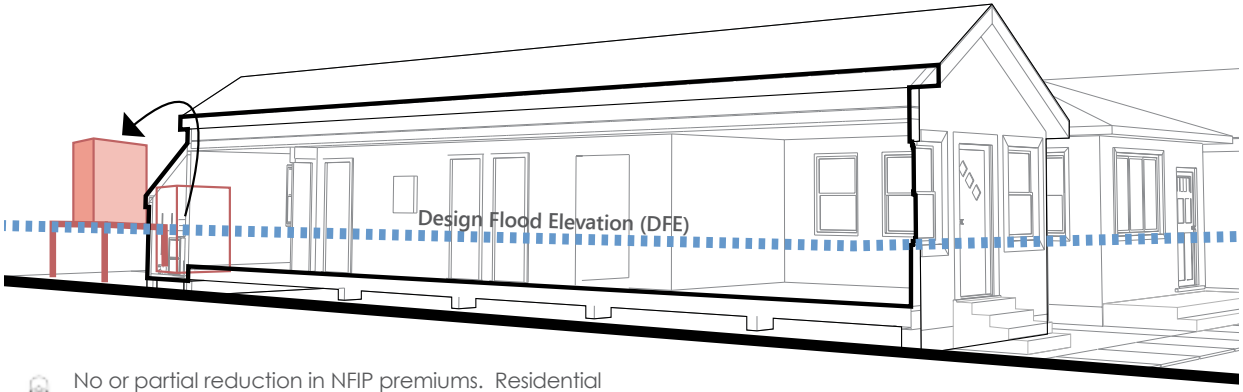
Elevate the existing structure on a new foundation system to bring the lowest occupiable floor above the DFE. To accommodate access to the elevated structure, shift the existing building footprint back from the front property line into the rear yard. Elevate critical systems above the DFE.



Alternative Building-Scale Strategies

Non-Substantially Improved buildings within the floodplain are not required to comply with Appendix G of the NYC Building Code. This allows for greater flexibility in adapting buildings for flood resiliency. The alternatives illustrated below lower the risk for buildings and provide practical pathways for adaptation. Under current NFIP regulations, these measures may not lower insurance premiums.

If the lowest occupiable floor is left below the DFE, life safety must be considered. Residents should always follow evacuation procedures.



No or partial reduction in NFIP premiums. Residential use and lowest occupiable floor remain located below the DFE.

Elevate Systems

No or partial reduction in NFIP premiums.

If the DFE is within a few feet of the base of the lowest occupiable floor, consider keeping the strucure in place and using flood damage-resistant materials below the DFE. Residential use and lowest occupiable floor remain located below the DFE. Elevate the critical systems above the DFE. Create a continuous load path by connection of the frame to the roof and foundation.

- Occupied Space
- Critical Systems
- Dry Floodproof
- Wet Floodproof
- Open Structure
- NFIP Premium Reduction
- No/partial NFIP Premium Reduction

Private Land Strategies

Streets

The private streets in Harding Park are owned and maintained by the Harding Park Homeowner's Association. Paved with tar and located throughout the community, they have limited stormwater infrastructure, and potholes collect and hold stormwater runoff.

Strategies:

- Repave with permeable pavement, and/or completely remove pavement and replace with layered compacted gravel.
- Pedestrianize streets to allow for the construction of bioswales, permeable pavers, planted strips, and other green infrastructure measures.
- Construct vegetated swales or planted strips that divert stormwater runoff to lower lying collection sites in the community

Key Map: Location of streets

Stormwater ponding on private streets in Harding Park.

Stormwater sheet flow and ponding on surface parking areas in Harding Park.

Private Land Strategies

Surface Parking

There are two primary private surface parking areas in Harding Park located in strategic areas where considerable runoff flows during average storm events.

Strategies:

- Repave the parking areas with more permeable pavers that can absorb a greater amount of stormwater runoff.
- Implement green infrastructure practices on site, such as planted swales, tree pits, or open green space that can retain runoff.
- Limit the footprint of the parking areas and add green open space.

Key Map: Location of surface parking

Private Land Strategies

Vacant Land

There are a number of vacant open spaces throughout Harding Park that are critical points for stormwater retention.

Strategies:

- Remove invasive plant species and incorporate native plantings.
- Install rain gardens, bioswales, or even retention ponds where stormwater runoff is most significant.
- Incorporate neighborhood amenities in open spaces, such as benches, pergolas, or other site furnishing that allow for passive recreation.

Vacant land in Harding Park.

Key Map: Location of underutilized space

Open space in Harding Park.

Publicly-Owned Waterfront Area Strategies

Open Spaces

Much of the coastline within Harding Park is public land that has been used for illegal dumping. The following interventions will enhance the ecological value of the publicly-owned waterfront areas in addition to mitigating stormwater and recharging the ground water table.

Strategies:

- Remove invasive plant species and remediate soil in order to introduce native plant life.
- Add bioswales and rain gardens to collect stormwater runoff.
- Plant upland maritime forest species around lagoon to slow rate of storm surge and subsequent wave energy.
- Remove concrete surfaces and repurpose planter boxes for decorative features to hold plantings.
- Install active and passive recreational amenities such as benches and play spaces.
- Re-grade waterfront portions of the site to increase the area of saltwater marsh and provide berm-like topography to protect inland areas.

Key Map: Location of open spaces

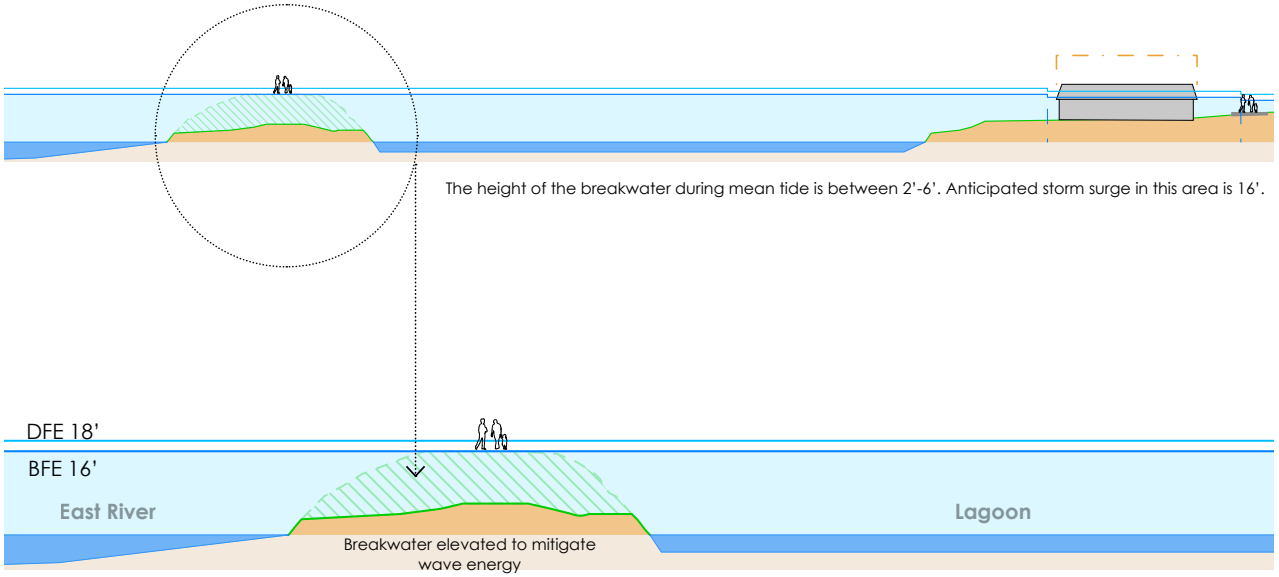
Publicly-Owned Waterfront Areas

Breakwaters

The breakwaters that surround the lagoons range from two to six feet above sea level. These stone barriers protect the community and existing aquatic life within the marsh area from storm surge. Enhancements to these breakwaters must also consider impacts on adjacent wetlands.

Strategies:

- Increase the height of breakwaters (four to five feet) to reduce wave impact.
- Add soils that can sustain plants with deep-rooting systems in order to mitigate wave energy and provide aesthetic value.
- Widen breakwaters to accommodate pedestrian circulation. This must be done with care to preserve existing wetlands.



Breakwaters in Harding Park.

Key Map:
Location of breakwaters

Lagoons in Harding Park.

Publicly-Owned Waterfront Areas

Lagoons

The three saltwater marsh lagoons serve as a buffer between Harding Park and the Bronx River, and provide important ecological services to the community.

Strategies:

- Remove debris and remediate saltwater marshes.
- Establish more aquatic plant life to accommodate existing and new wildlife (e.g. cord grass, fiddler crab).
- Open small channel to allow more efficient in/out flow of saltwater from Bronx River.

Key Map: Location of Lagoons

CONCLUSION

Due to factors including the timing, path and size of the storm, the Bronx was spared the brunt of Hurricane Sandy's impact. With almost 100 miles of shoreline, the borough nevertheless faces serious flood risk that is only projected to increase in the coming years with sea level rise, expanded floodplains, and more frequent and severe storms. Through its Resilient Neighborhood's place-based planning initiative, the Department of City Planning aims to empower stakeholders at all levels to identify and pursue locally-specific strategies to support the ongoing vitality and resiliency of coastal communities such as Harding Park. Here, three strategies aimed at different scales of intervention were identified to address the vulnerabilities of the community:

Raise awareness of and mitigate flood risks

Engage with the homeowner's association and build community capacity to prepare for and respond to future flooding.

Facilitate resilient retrofits

Remove barriers to residential retrofitting and rebuilding in Harding Park through the adoption of the 2013 Flood Resilience Zoning Text Amendment and work towards making these provisions permanent.

Promote resiliency through green infrastructure investment

Mitigate storm water runoff by working with public agencies to study the feasibility of green infrastructure investment within the community.

The Resilient Neighborhood Study of Harding Park was a participatory process that ultimately empowered the community to understand, proactively prepare for, and mitigate flood risk and future damage within their neighborhood. As an outcome of this process, the City was able to successfully address regulatory barriers that inhibited resilient retrofits and the construction of new, fully compliant homes within the neighborhood, as well as identify strategies for the use of open space that will mitigate both current and future floodrisk within the community.

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 one-percent 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 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 Preliminary FIRMs 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 Preliminary FIRMs in December 2013 as part of this process. The New York City Building Code requires new and substantially improved buildings to use the Preliminary FIRMs (unless the effective FIRMs are more restrictive) until the maps become effective following the public comment period, which is expected in 2016 or 2017.The Preliminary FIRMs, however, are not used to guide the requirements of the National Flood Insurance Program. Following a comment period and opportunity for appeals, FEMA is expected to issue final Effective FIRMs in 2016 or 2017, which will trigger the expansion of flood insurance purchase requirements.

Floodproofing, Dry
For non-residential buildings, a flood retrofitting 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 retrofitting 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 the New York City Building Code Appendix G 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.

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 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 3 feet in height. More restrictive NYC Building Code standards apply.

Coastal A Zone
A sub-area of the A Zone that is subject to moderate wave action between 1.5 and 3 feet in height. Building regulations are more restrictive than in A Zones and can be similar to those standards that apply for V Zones.

A Zone
The area of the SFHA that is subject to still-water inundation by the base flood with specific NYC Building Code standards.

Substantial Damage
Damage sustained by a building whereby the cost of restoring the structure to its pre-damaged condition would equal or exceed 50-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 50 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 New York City Building Code.

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resilient neighborhoods

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