

Resilient Neighborhoods

Edgewater Park





This study was funded through the U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant Disaster Recovery Program (CDBG-DR), as part of the New York City Department of City Planning's Resilient Neighborhoods Initiative.

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Edgewater Park

THE CITY OF NEW YORK
MAYOR BILL DE BLASIO

DEPARTMENT OF CITY PLANNING
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June 2016
www.nyc.gov/resilientneighborhoods

FOREWORD

Edgewater Park is a charming, historic waterfront community nestled along the Long Island Sound in the Bronx. While these elements are part of what make Edgewater Park special, they also make it vulnerable to flooding today and, to an even greater degree, in the future.

Hurricane Sandy starkly demonstrated the hazards that New York City's coastal neighborhoods like Edgewater Park face. The storm also highlighted the city's and this community's resilience—their ability to bounce back from the storm and become stronger in the face of the next. Since the storm, the Department of City Planning has been working with other City agencies 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.

The report presented here is part of Resilient Neighborhoods, a program funded by the U.S. Department of Housing and Urban Development that complements DCP's citywide efforts by working with communities to generate neighborhood plans that advance resiliency through neighborhood-specific changes to zoning and land use and by identifying needs and opportunities for 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 Edgewater Park community to envision a long-term future for the neighborhood that is consistent with OneNYC's commitment to fostering a more resilient city. Residents will find guidelines on retrofitting buildings in Edgewater Park, as well as a series of case studies for how new development can be made more resilient, while still contributing to the community's unique character.

This plan is the beginning of a conversation and a commitment to work with the community to ensure the ongoing vibrancy and resiliency of Edgewater Park.



Carl Weisbrod, Director
Department of City Planning



Homes in Edgewater Park

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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 the New York City Department of City Planning 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 retrofitting single-family homes and bungalows for flood risk, as well as recommendations for implementing coastal protection measures and managing stormwater through green infrastructure.

The City's work in the neighborhood of Edgewater Park has been guided by three primary goals:

Reduce flood risk

Enable buildings to withstand flooding and other hazards while minimizing disruption to residents by updating the Edgewater Park Co-op bylaws to allow for flood resilient construction and investment.

Plan for adaptation over time

Support the ability of the Edgewater Park community to adapt and prepare for a changing climate by providing information on risk and a menu of neighborhood-appropriate resiliency measures.

Creating resilient, vibrant neighborhoods

Ensure that resilient buildings are in line with community character.

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.

OVERALL HEIGHT
OF HOME IS 33'
ABOVE GRADE.
25' ABOVE
DPE

DECORATIVE GATE +
SHRUB AS PRIVACY
FOR REAR YARD

WATERFRONT
WALKWAY

BREAKAWAY
LATTICE WALL
HELPS BUFFER
STORAGE SPACE OF
HOME

STAIR TURN REMOVES
A VERTICAL DISCONNECT
FELT FROM HEIGHT OF HOME
+ STREETSCAPE MITIGATION
STRATEGY.

26' PRIVATE WALK
TO REAR YARD + WATERFRONT

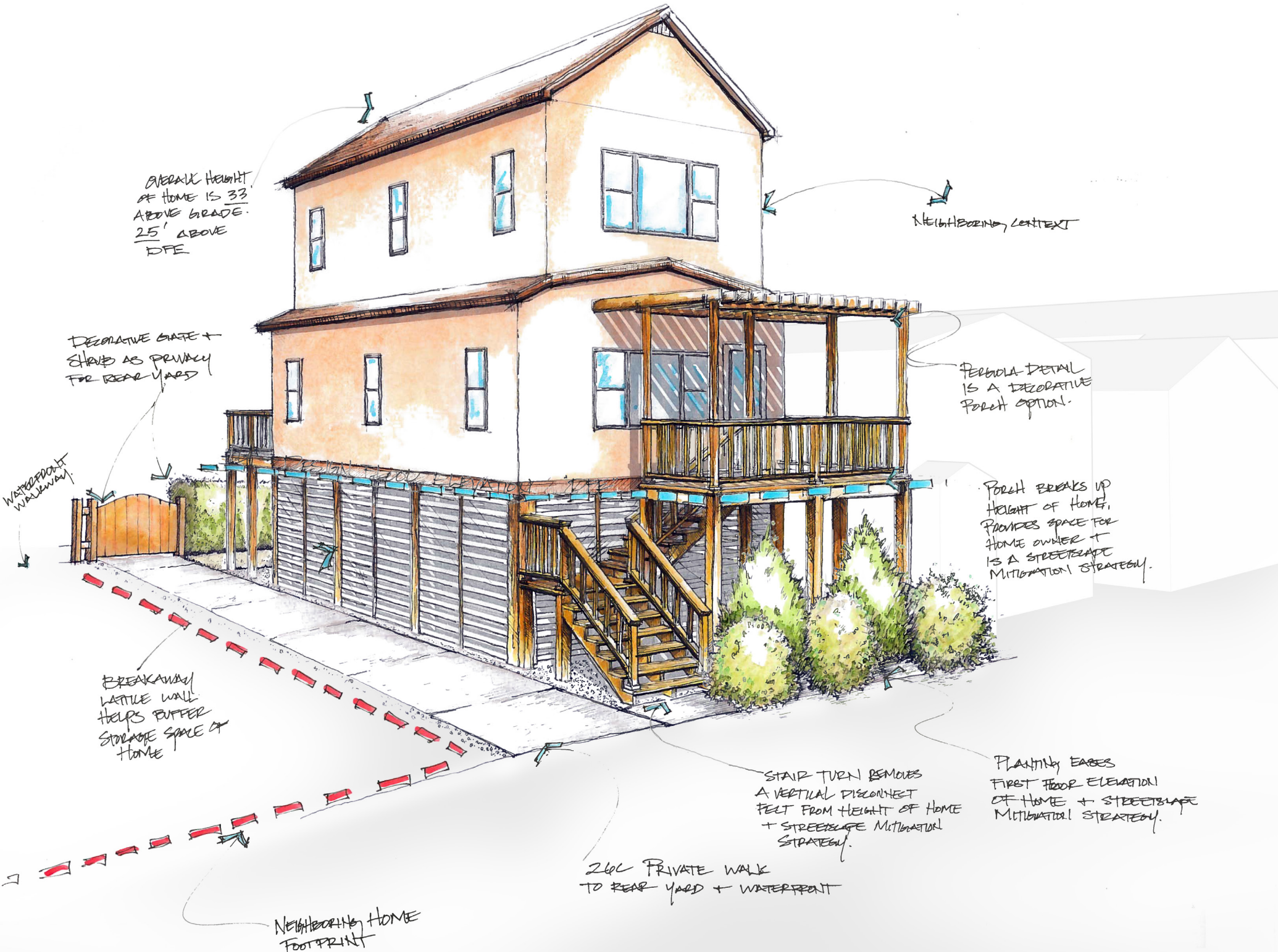
NEIGHBORING HOME
FOOTPRINT

NEIGHBORING CONTEXT

PERROLA DETAIL
IS A DECORATIVE
PORCH OPTION.

PORCH BREAKS UP
HEIGHT OF HOME,
PROVIDES SPACE FOR
HOME OWNER +
IS A STREETSCAPE
MITIGATION STRATEGY.

PLANTING EASES
FIRST FLOOR ELEVATION
OF HOME + STREETSCAPE
MITIGATION STRATEGY.



INTRODUCTION

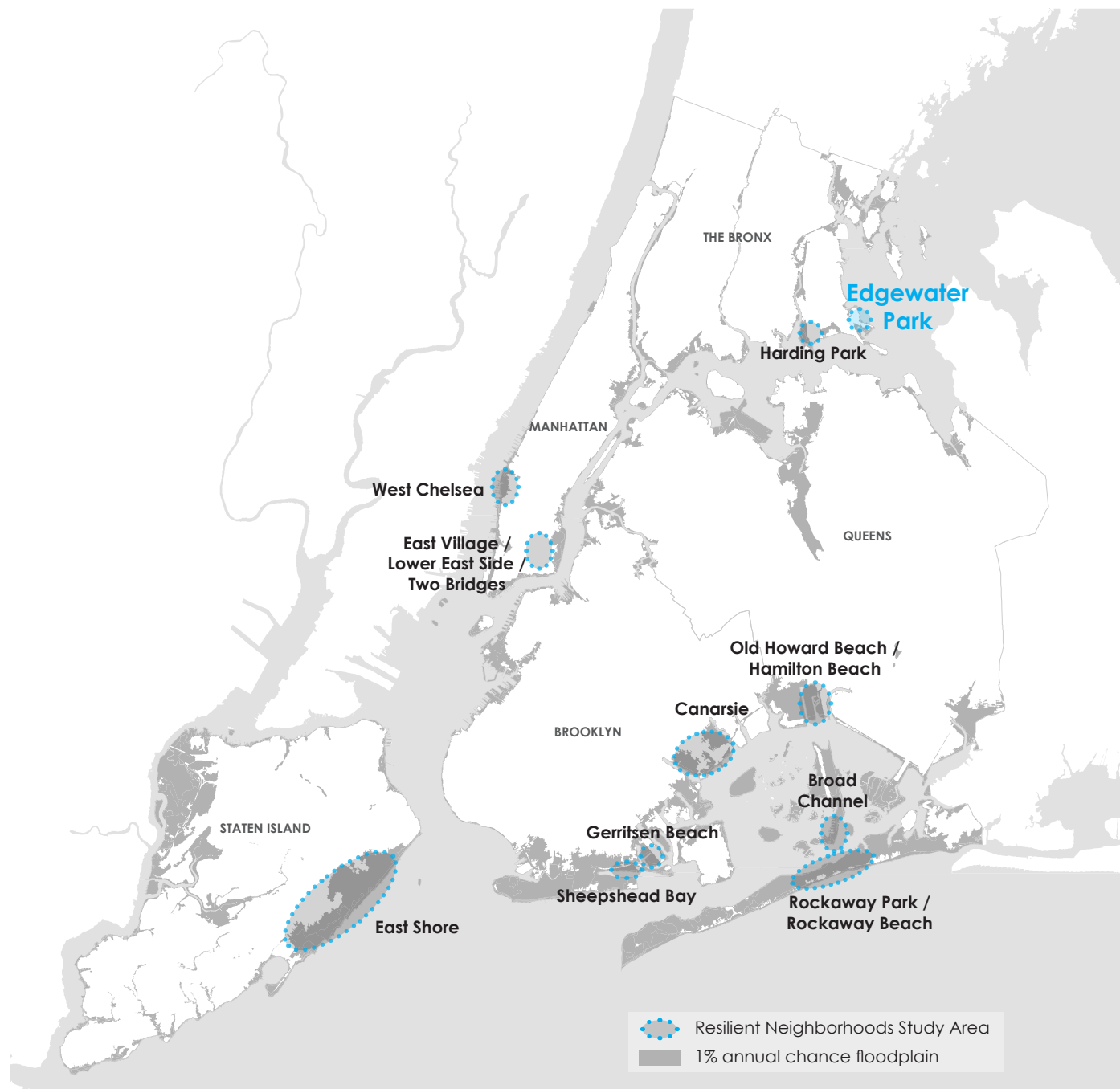
Resiliency Planning in New York City

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 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.

While the Bronx fared better during Sandy than other areas of the city due to the tides at the time of Sandy's arrival in New York City, many communities within the borough have been severely impacted by previous storms and are at risk from future storms. Edgewater Park was selected for this initiative because of the high flood risk it faces due to its unique building typology



and vulnerable location on the Long Island Sound. Established as a summer bungalow community, homes were adapted over time for year-round living. Structures are located immediately adjacent to one another on narrow streets, and while these conditions contribute to the charming and distinctive character of the neighborhood, they also inhibit the adoption of standard resiliency measures. Today, Edgewater Park is a private cooperative community governed through bylaws administered by an active co-op board. This ownership structure creates both operational and regulatory challenges and opportunities for creating a more resilient neighborhood.

The Edgewater Park study is a product of collaboration between DCP and other City agencies, including the Mayor's Office of Recovery and Resiliency, the Housing Recovery Office, and the Department of Buildings as well as New York State's New York Rising Initiative.



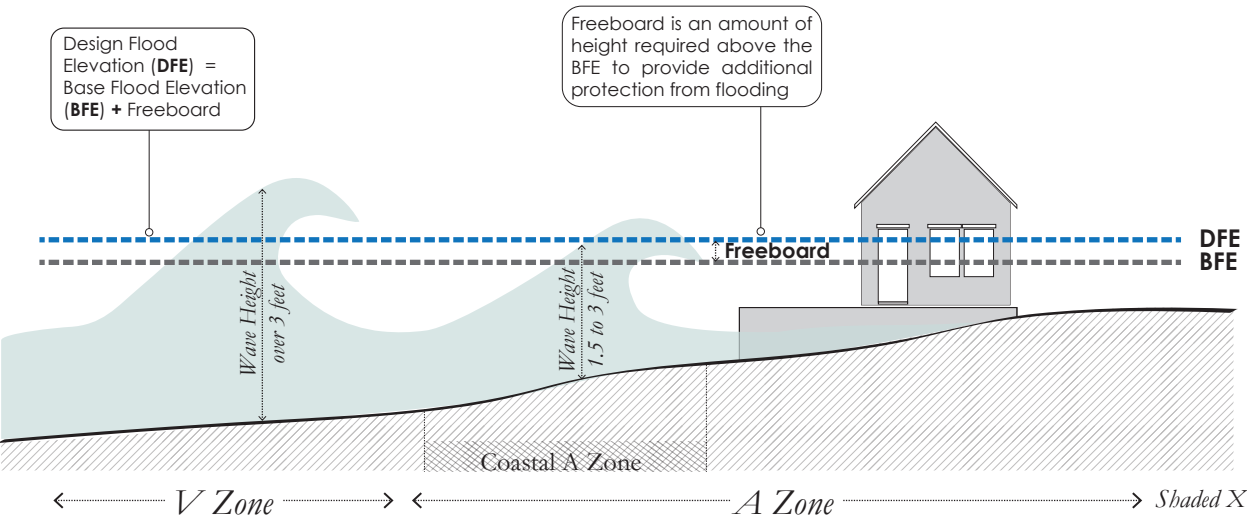
Regulatory Context

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. Homes 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 New York City, which were implemented in 1983 and most recently updated in 2007. As part of the mapping update, FEMA issued



	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

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 City has filed an appeal of the PFIRMs because they overstate the size of the city's 1% annual chance floodplain due to inaccuracies in FEMA's underlying analysis. The City is committed to resolving the appeal and adopting accurate flood maps as quickly as possible.

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 New York City Building Code's Appendix G on "Flood-Resistant Construction," which as of 2013 applies to the 1% annual chance floodplain shown on FEMA's PFIRMs or the 2007 effective 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) 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 in the aftermath of 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. The City Council adopted many of these changes as the Flood Resilience Zoning Text Amendment in October 2013. This text 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 allowing reallocation of floor space that is abandoned and wet floodproofed. It also incorporated provisions to mitigate adverse streetscape impacts. The rules, still in effect, apply to all buildings in the PFIRM 1% annual chance floodplain.

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.

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

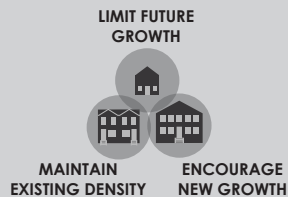
ESTABLISH RESILIENCY FRAMEWORK



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.

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

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 Edgewater Park using this process.

Outreach Process

The Department of City Planning met with the Edgewater Park leadership in late 2013 to kick off a two year resiliency study. DCP has worked closely with stakeholders in Edgewater Park to identify and explore resiliency issues facing the community, as well as develop a framework for retrofitting existing residential structures, rebuilding in the floodplain, and ensuring the safety of future development.

In December 2013, DCP staff presented an overview of the Department's resiliency work program at the monthly Edgewater Park leadership meeting. In March 2014, staff participated in a guided tour of the community led by the Co-op. Through a participatory process, several waterfront properties were identified for further examination and selected as model sites for targeted, community-specific guidelines for retrofitting buildings for flood risk.

In July 2014, DCP returned to the monthly Edgewater Park Leadership meeting to update the community on the progress of the study, and to discuss other ongoing resiliency efforts affecting the area.

The following month, DCP and the Mayor's Office of Resiliency and Recovery facilitated a workshop with the Edgewater Park Community Leadership at the Edgewater Park firehouse. The Federal Emergency Management Agency (FEMA) presented an overview of the National Flood Insurance Program (NFIP) and the Preliminary Flood Insurance Rate Maps (PFIRMs), and DCP's Bronx Office presented the resiliency work program. The presentation concluded with a question and answer session.

As part of its outreach efforts to educate communities about the flood risk they face, DCP has continued to coordinate regularly with Edgewater Park leadership. This has included several site tours and working meetings



Co-op leadership streetscape mitigation presentation, August 12, 2015.

in which staff have worked with the community to communicate a wide range of flood related design and construction issues, such as demonstrating how residents may go about calculating and measuring required flood elevations as well as exploring site-specific reconstruction and elevation issues. Through

this process, DCP identified aspects of the Co-op's architectural guidelines that inhibited flood resilient investment or were not consistent with City resiliency policy, and has worked with the leadership to update the bylaws to allow for such retrofits and construction.

COMMUNITY RISK PROFILE

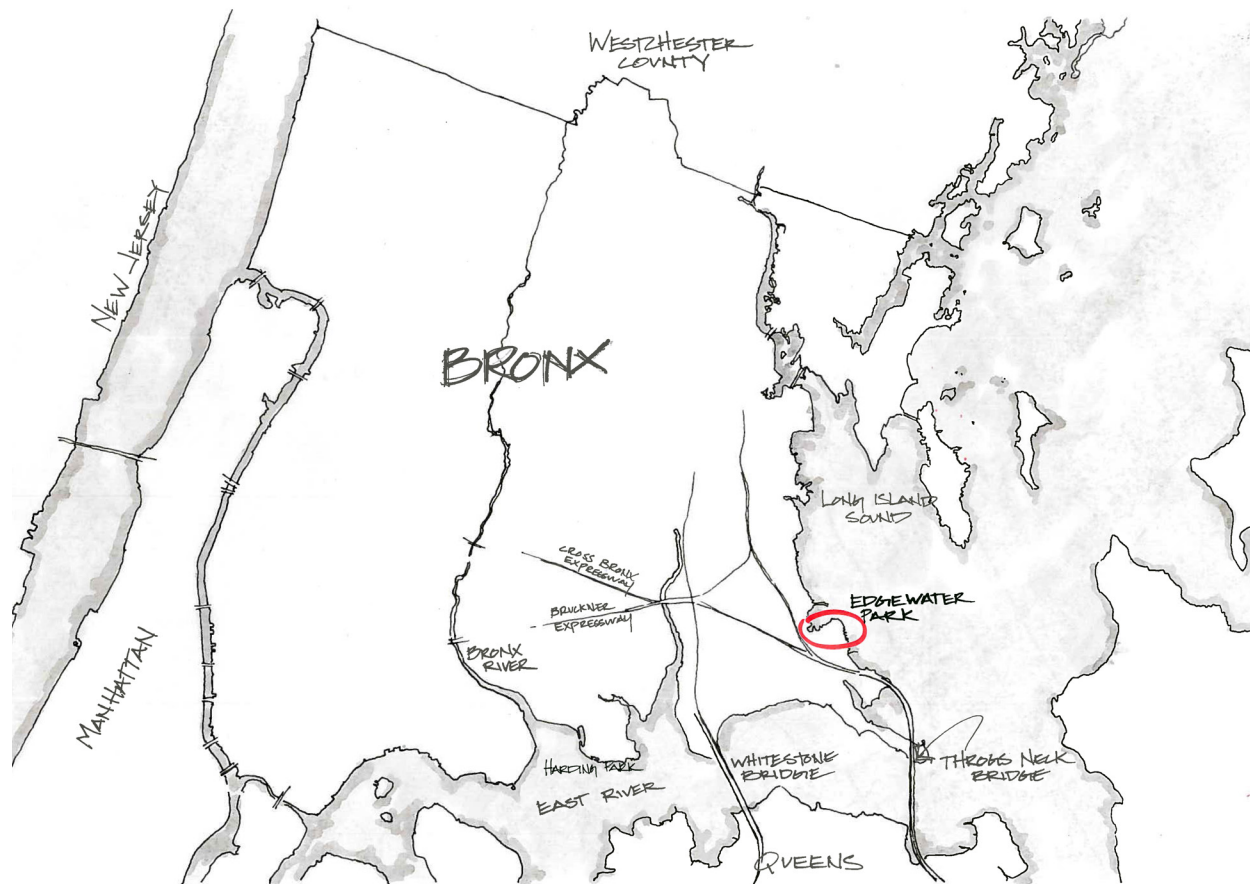
Community Character and History

Edgewater Park is a small, private waterfront community located on the Throgs Neck Peninsula in Long Island Sound. Bounded by a fieldstone bulkhead and three sandy beaches, the neighborhood fronts a half-mile of shoreline to the north and east. True to its name, Edgewater Park is built out directly to the water's edge, with a small concrete promenade separating the first row of homes from Long Island Sound. It is bounded by Miles Street to the south, the Throgs Neck Expressway and Veterans Memorial Park to the west, and Weir Creek and Eastchester Bay to the north and east, respectively.

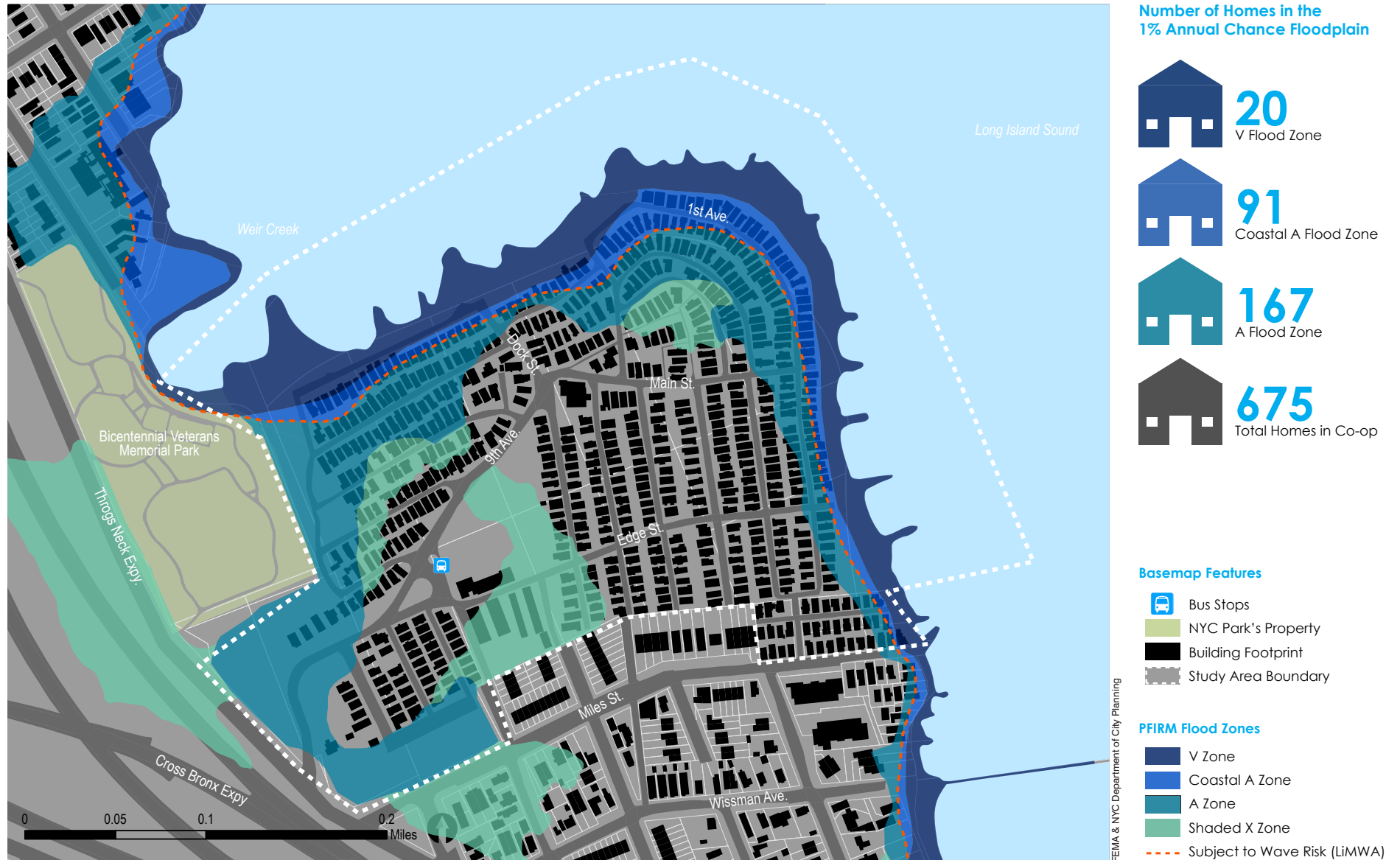
Historically the private estate of the Adee family, the area was used as a seasonal campground and rented to summer vacationers who pitched tents on the beach around the turn of the 20th century. Summer cottages and bungalows were erected during the 1920's, and were winterized to support a year-round community during the Great Depression. These quaint, converted homes still largely characterize the neighborhood today. Streets are small and narrow. Most are unmapped and without sidewalks, giving Edgewater Park the feel of a seaside town rather than an urban neighborhood.

Edgewater Park is one of a few private cooperative communities existing in New York City today. The Edgewater Park Co-op (the Co-op) was formed in 1988 when residents who formerly rented the land purchased it from the primary leaseholder. Though residents own their homes outright in these cooperative communities, they continue to lease the land, divided into shares, from owners' collectives, and pay dues to maintain communal areas and infrastructure. While Co-op properties are serviced by the City's sanitation and water systems, the community maintains a private sewage network and volunteer fire company. A board of directors, consisting of fifteen stockholders and residents, administers the community and sets forth architectural and construction guidelines, which regulate its built form.

Today, the Co-op spans fifty-five acres and includes 675 single-family residences that house approximately 3,000 residents. It is exclusively residential save for a single delicatessen that now stands where a full suburban style shopping center once existed before a fire left it damaged beyond repair in the early 1980s. The community makes use of two surface parking lots and is served by two bus lines: the Bx8, a local bus, and the BxM9, an express bus making the fifty-minute trip from the Throgs Neck area to midtown Manhattan.



Preliminary FIRMs



Flood Risk Profile

With a substantial number of homes in the floodplain, Edgewater Park faces significant risk as the community is vulnerable to multiple kinds of flood hazards including coastal storm surge with wave action and high floodwater depths. The majority of homes within the community were built prior to the enactment of floodplain management regulations and are therefore not built to today's codes for flood resistant construction. Approximately 278 homes, or just over forty percent of all homes in Edgewater Park are located in the 1% annual chance floodplain. A substantial number of these homes are located in the V Zone, where the most severe storm surge with high floodwater depths and wave activity of three feet or more could be experienced. Just fewer than 100 homes are within the Coastal A Zone, which is also characterized by considerable flood water depths and wave activity of three feet or less. The remaining 167 homes are in the A Zone, where wave activity is less a concern, but water depths could still reach damaging levels.

Base Flood Elevations (BFEs) within the study area, or the height to which water is expected to rise during a flood event, are among the highest in New York City. Approximately two thirds of homes could experience inundation between one and five feet above grade, while the remaining one third could experience floodwaters between six and eleven feet in depth.

The homes at the greatest risk of wave action and substantial inundation are located in the lowest lying areas of the community and along the water's edge. On the waterfront, homes sit as close as ten feet from Long Island Sound. The existing shoreline infrastructure, a five-foot tall concrete bulkhead, provides some protection from smaller storm events, but not the 1% annual chance storm.

With climate change and projected sea level rise, the floodplain is likely to increase over time, putting as many

as seventy-five percent of all homes in Edgewater Park in the 1% annual chance floodplain by the 2050s.

Homes within the 1% annual chance floodplain with mortgages from federally-regulated or -insured lenders are required to carry flood insurance. As of February 2013, only half of the homes located in these vulnerable areas within Edgewater Park were reported to have active NFIP policies, meaning that a significant number of homeowners living in high-risk, floodprone areas 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 a climate event. Property owners may not be able to afford to repair the damages sustained to homes, and could even be forced to sell their houses and relocate. This can lead to disinvestment and vacancy in affected properties on the neighborhood scale.

During Sandy, dozens of homes were significantly impacted by floodwaters. Homeowners within the Edgewater Park community reported over \$1 million worth of damage to buildings alone, with average

damages claimed at over \$17,000 according to NFIP data.

Vacancy rates in the community have more than doubled in recent years, increasing from five to between ten and fifteen percent. Typical turnover without cash or outright ownership necessitates a mortgage and high financial investment in resiliency measures for many properties in the community to qualify for lower NFIP premiums.

The average current flood insurance premium paid annually within the community is \$1,050, though this figure does not represent the wide range currently paid by Edgewater Park residents (between \$200 and \$5,000 per year). Premiums vary based on how much coverage is purchased and how homes are financed. Because the vast majority of homes in Edgewater Park were constructed prior to New York 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.



Pedestrian walkway in the rear yards of homes, Edgewater Park

Building and Lot Typology Profile

Edgewater Park is made up of densely built single-family detached and multi-story bungalow-style homes that reflect the community's history as a summer campground. These kinds of older, light-frame and combustible buildings are highly susceptible to structural damage from various kinds of climate-based hazards. Because all of the homes within Edgewater Park were under the single ownership of the Co-op in 1961, the year in which zoning lots were created, the entire community is considered a single, large zoning lot. The 675 homes within the community are built on plots determined by the community's cooperative agreement and are subject to the architectural guidelines developed and enforced by the Co-op.

Individual lots within the community are very narrow, ranging from just twenty to thirty feet in width and fifty to seventy feet in depth. This creates an extremely shallow buildable footprint, and the majority of homes within the community occupy the entirety of their

plot. Structures in Edgewater Park are thus situated immediately adjacent to one another: Side yards are very narrow (often between two and five feet in depth) and in some cases, the eaves of one roof extend to abut those of an adjacent building. Front yard space is most commonly occupied by decks and other constructed spaces that extend directly to the street, creating a compact, tightly built-out community. Streets are also extremely narrow, often just twelve to fifteen feet wide.

This dense built environment poses challenges to investment in resilient retrofitting measures, as these kinds of construction projects require a certain amount of space to set up equipment, erect foundations and provide adequate access. Such construction disturbs the surrounding homes, potentially disrupting immediate and adjacent sub-surface foundations. Construction in V Zones requires deep piles that are potentially prohibitive due to cost and issues of structural engineering. Finally, a considerable number of homes have basements.

FEMA's flood resilient building standards mandate that the lowest floor of a residential building (including a basement) must be at or above the BFE. Basements are thus not permitted in new construction or substantially improved residential buildings within the floodplain, as any space below grade will retain flood waters and has the potential to damage the structural integrity of a home. Homes with basements will also face higher flood insurance premiums.



Bungalow building typology, Edgewater Park



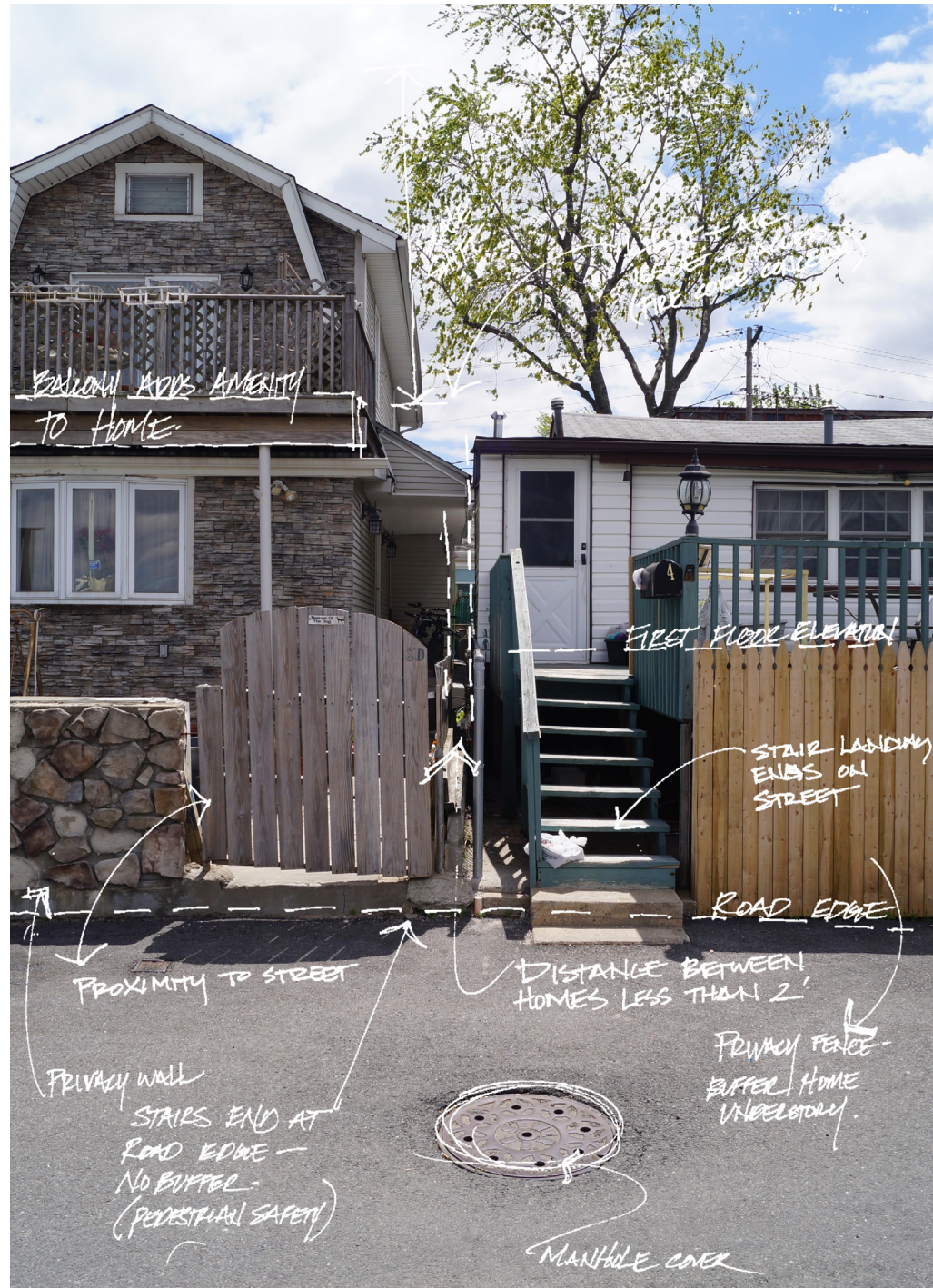
Bungalow and two story building typology, Edgewater Park

Zoning Analysis

Edgewater Park is comprised of 675 buildings, thirteen tax lots and a single zoning lot. Due to this unique condition in which the entire community exists on one zoning lot, the Department of Buildings (DOB) treats plots determined by the Co-op as zoning lots for the purposes of reviewing renovations and enlargements. The Co-op strictly enforces its own guidelines for residential renovation and construction, which largely ensure the preservation of the existing built character of the community by limiting growth and vertical expansions.

The neighborhood was rezoned to R4A in 2004 as a part of a larger contextual rezoning of the Throgs Neck Area to prevent the construction of non-contextual homes in communities like Edgewater Park. The R4A district allows for one- and two-family residences that often take the form of a two-story house with an attic beneath a pitched roof. A floor area ratio of up to 0.75 (plus a 20% attic allowance) is permitted in the district, and a minimum lot width of thirty feet is required. Modest front yards ranging from ten to twenty feet are required, as well as deep rear yards over thirty feet in addition to a distance of at least eight feet between buildings on adjacent properties.

The existing zoning does not present a barrier to redevelopment or investment in resiliency measures in Edgewater Park as the Flood Resilience Text Amendment, adopted in 2013, allows for homes in the community to elevate as-of-right, regardless of existing non-compliances. However, DCP found that the Co-op's guidelines and DOB's approach to vertical expansions needed to be updated to allow for such resilient construction and investment, as the elevation and complete reconstruction of homes and certain required streetscape mitigation strategies were prohibited.



Zoning analysis of homes, Edgewater Park

Summary of Resiliency Challenges

1 Community is vulnerable to high coastal storm surge elevations 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 drastically alter the character of the community.

2 Many existing buildings are not built to resiliency standards and retrofits are challenged by lot conditions

Coupled with the narrowness of plots, the dense, tightly built-out nature of the community further exacerbates the difficulties in physically retrofitting buildings for flood risk.

3 Complex regulatory environment and permitting process

Co-op bylaws and the City's regulatory procedures do not adequately facilitate the elevation of existing buildings to the DFE, certain required streetscape mitigation strategies for resilient buildings, and the construction of new, resilient homes.

RESILIENCY FRAMEWORK

DCP worked closely with stakeholders in Edgewater Park to address the community's vulnerability to storm surge, coastal flooding and sea level rise while preserving the unique character of the neighborhood. Defined as a single zoning lot by the City, this private cooperative community containing hundreds of homes has its own mechanisms for regulating the built environment that are potentially at odds with resiliency best practices. Exacerbating this difficulty is the density to which this historic waterfront community is built, as well as the kinds of risk it faces: coastal storm surge, wave action, and high flood elevations.

These issues were addressed in a layered approach that first examined the regulatory framework of Edgewater Park's built environment, including the Co-op's architectural guidelines and the City's rules, and then providing site-specific, building-scale case studies of retrofitting strategies that both meet the latest flood resilient construction requirements and maintain the distinguishing qualities of the neighborhood.

The framework map on the following page depicts the study area and the extent of the floodplain within Edgewater Park. Building footprints outlined in yellow represent homes within the 1% annual chance floodplain where our Resilient Retrofitting and Rebuilding Guidelines apply. The solid yellow footprints designate the five case study homes, which were selected to exemplify the range of retrofitting and resiliency investments homeowners can make to both protect their properties as well as reduce the financial burden of carrying flood insurance.



Resilient Retrofitting and Rebuilding Guidelines

Homes in Edgewater Park located within the 1% annual chance floodplain that must make resilient retrofits in order to comply with FEMA standards.



Edgewater Park Case Study

Homes selected by the Edgewater Park Co-op to be analysed and conceptually modified with resilient retrofit strategies.



1% Annual Chance Floodplain

Marked on FEMA's Flood Insurance Rate Maps, this is the area that has a 1% chance of flooding in any given year. It is also referred to as the "Special Flood Hazard Area."



LiMWA

The Limit of Moderate Wave Action is the inland limit of the area expected to receive waves breaking over 1.5 feet during the 1% chance flood event.



Study Area Boundary



Long Island Sound

Weir Creek

1st Avenue

Throgs Neck Expressway

Cross Bronx Expressway

Bicentennial Veterans
Memorial Park

Parking Area

Case Study: 57D

Parking Area

9th Avenue

Edge Street

Miles Street

Main Street

Case Study: 160C

Case Study: 26C

Case Study: 73C

Case Study: 49B

Wissman Avenue

0 0.05 0.1 0.2 Miles



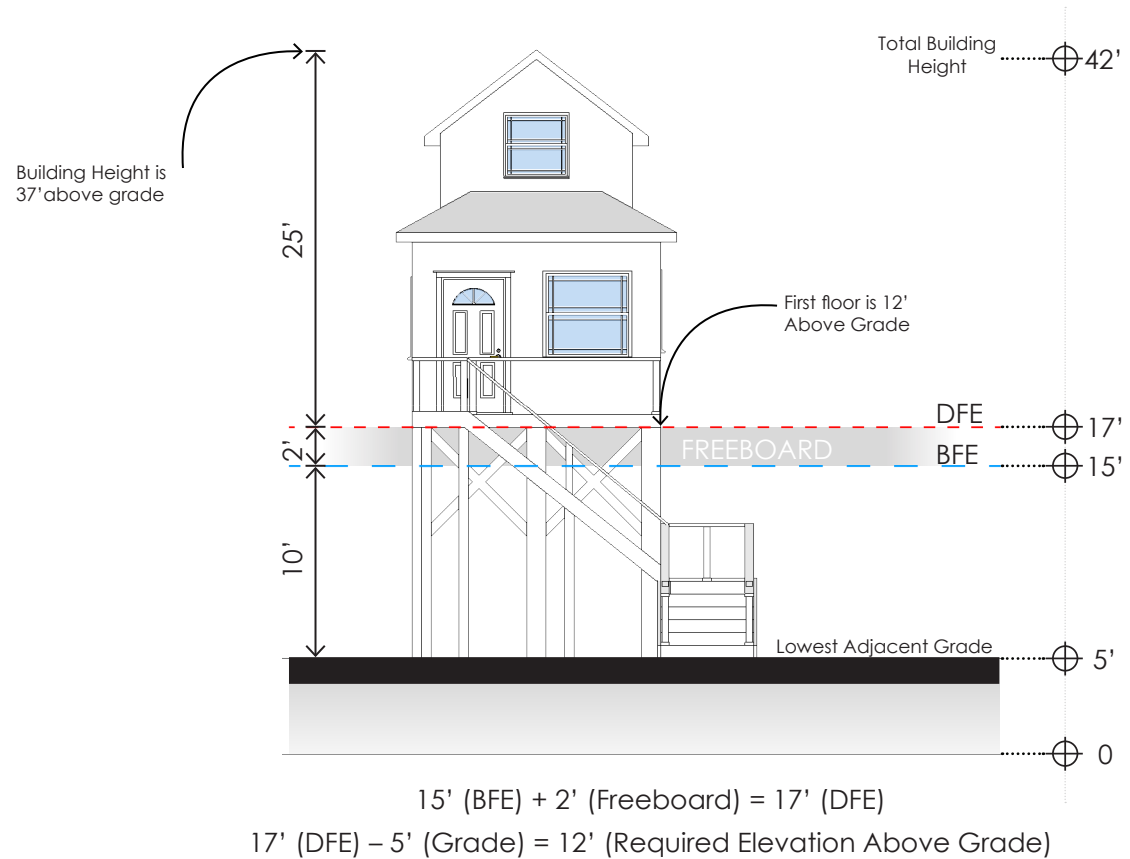
Resilient Retrofitting and Rebuilding Guidelines

As the existing regulations in Edgewater Park that control the built environment are not conducive to flood resilient construction and retrofits, DCP has worked with the community and appropriate agencies to facilitate investment in resilient homes. A primary aspect of this effort was collaborating with Edgewater Park residents in the amendment of their Co-op bylaws to allow for the elevation of homes and the incorporation of required streetscape mitigation strategies.

Previously, the Co-op mandated that the maximum height of any house could be no higher than twenty-five feet above the Bronx Datum (a base measurement for elevation) or twenty-seven feet above grade, which does not allow for the elevation of structures to FEMA-compliant levels. After presentations and workshops with FEMA, DCP, and the Mayor's Office of Resilience and Recovery about flood risk and resilient design standards, the Co-op voted to amend its bylaws to allow for building height to be measured from the design flood elevation while maintaining its twenty-five foot height limit, thus enabling homes to elevate to the new standards while maintaining the same allowable building envelope.

DCP has also worked with the Department of Buildings (DOB) to clarify and strengthen guidelines for the examination of plans to enlarge or vertically extend existing residential building walls in Edgewater Park to allow for flood resilient construction. Much like the amendment to the Co-op's bylaws, DOB now allows for building height to be measured from the Design Flood Elevation as opposed to adjoining grade. Additionally, DOB has revised its approach to the minimum allowable distance between buildings in Edgewater Park so as not to impede any from-the-ground-up construction of a new resilient homes in existing non-compliant footprints.

Design Flood Elevation (DFE) for homes in the 1% Annual Chance Floodplain





Planting

- Represents **ONE** strategy
- Must be at least 3 feet in height
- Planting beds must be at least 3 feet in width
- Plants shall screen at least 50 percent of street wall



Stair Turn

- Represents **ONE** strategy
- Must change direction at least 90 degrees
- No lower or higher than 2 feet from beginning and end of stair run



Porch

- Represents **ONE** strategy
- Finished floor must be at least 6 inches below lowest occupiable floor
- Depth must be at least 5 feet



Enclosed Porch

- Represents **TWO** strategies
- Same regulations as porch

Regulations within Edgewater Park's architectural guidelines also prohibited several of the streetscape mitigation strategies that homeowners are required to implement when elevating a structure. These strategies, pictured to the left, help promote the urban design principals discussed earlier in this report and are critical to preserving neighborhood character and a visual connection to the public realm. Ground-floor level windows and doors facing the street have been historically prevalent features of buildings in New York City and can create a sense of security and comfort for pedestrians. Elevating the first floor of a building can limit the relationship to the street and detract from the walkability and vibrancy of neighborhoods.

DCP worked with the Edgewater Park leadership to understand the importance and value of these strategies. The case study models on the following pages were developed and workshopped with the community in order to communicate the requirements for resilient retrofits and rebuilding, present an array of techniques to achieve them, as well as demonstrate the aesthetic value of the streetscape mitigation strategies. After several successful meetings, the leadership voted to remove stipulations within their bylaws that prohibited covered porches, stair turns, and plantings.

Elevation requirements for streetscape mitigation strategies:

0-5 feet: **NO** streetscape mitigation strategies required

5-9 feet: **ONE** streetscape mitigation strategy required

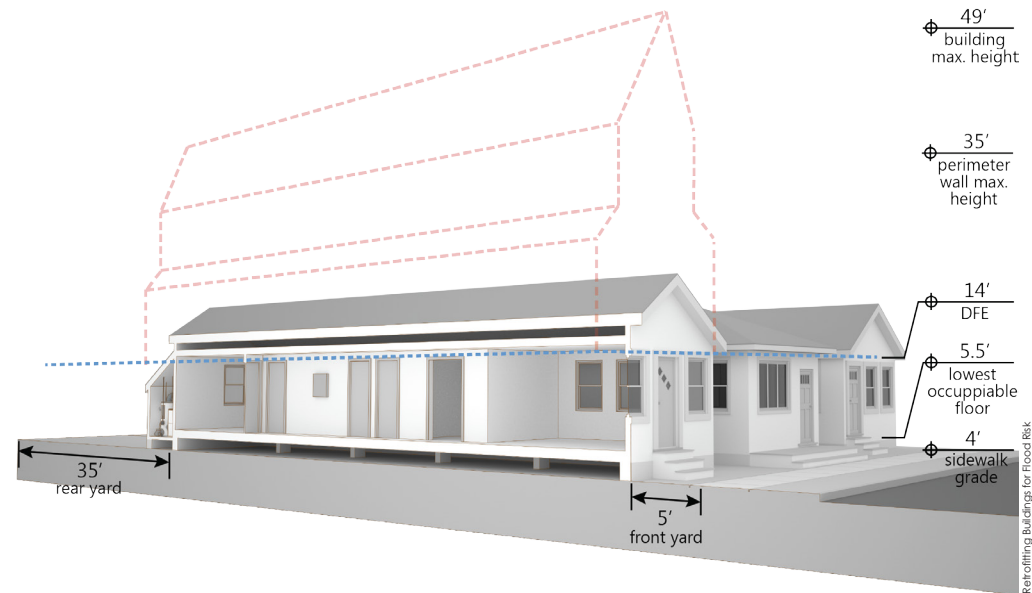
9 feet & Above: **TWO** streetscape mitigation strategies required

Case Studies

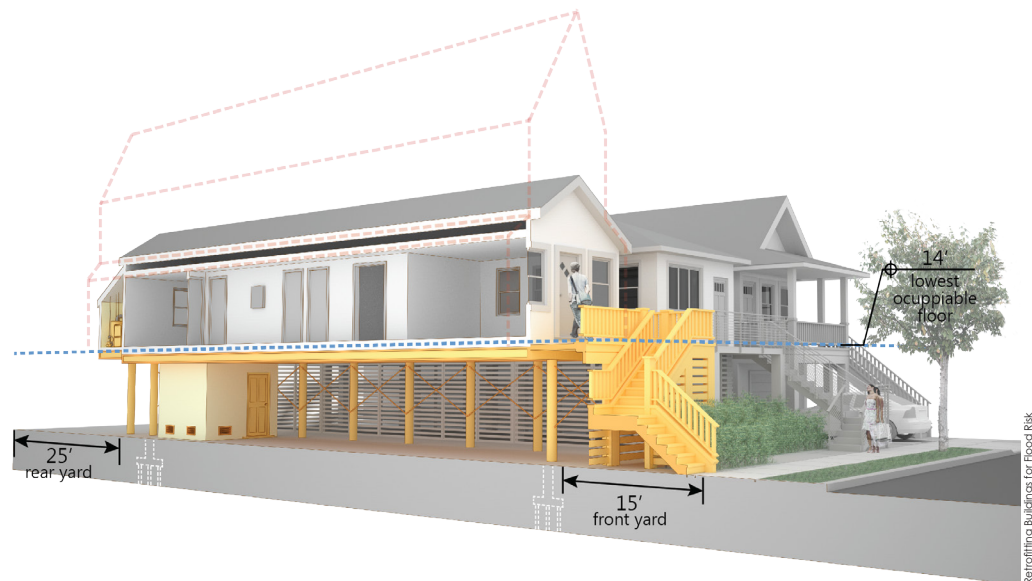
While the images to the right and on the next page are from DCP's [Retrofitting Buildings for Flood Risk](#) manual and depict the city-wide approach to making bungalow-style homes more resilient, the case study models in the following pages are site-specific and targeted illustrations of what homes elevated to FEMA's elevation requirements would look like in compliance with DCP's Zoning Flood Text Amendment and the community's updated bylaws. They are intended to provide guidance to the community for future retrofitting and rebuilding, and act as a reference tool for residents as sites in the flood zone are rebuilt. The properties were chosen to demonstrate the range of flood risk and design considerations that must be taken into account in resilient retrofits and construction within Edgewater Park, as well as provide examples as to how they may be addressed in ways that preserve the unique character of the neighborhood.

Each of the following case studies was modeled after an existing structure or the footprint of a preexisting home, and each property posed unique challenges for resilient retrofitting, including first floor elevation and access, circulation, structural and critical systems locations, parking issues, and the maintenance of a healthy and vibrant streetscape.

Though the models reflect the specifications of individual properties within the community, this exercise demonstrates the range of physical resiliency requirements that meet both the latest and most robust city-wide standards as well as community specific building requirements, and provides an inventory of best practices for flood resilient investment in Edgewater Park.



Existing Conditions



Elevation Strategy

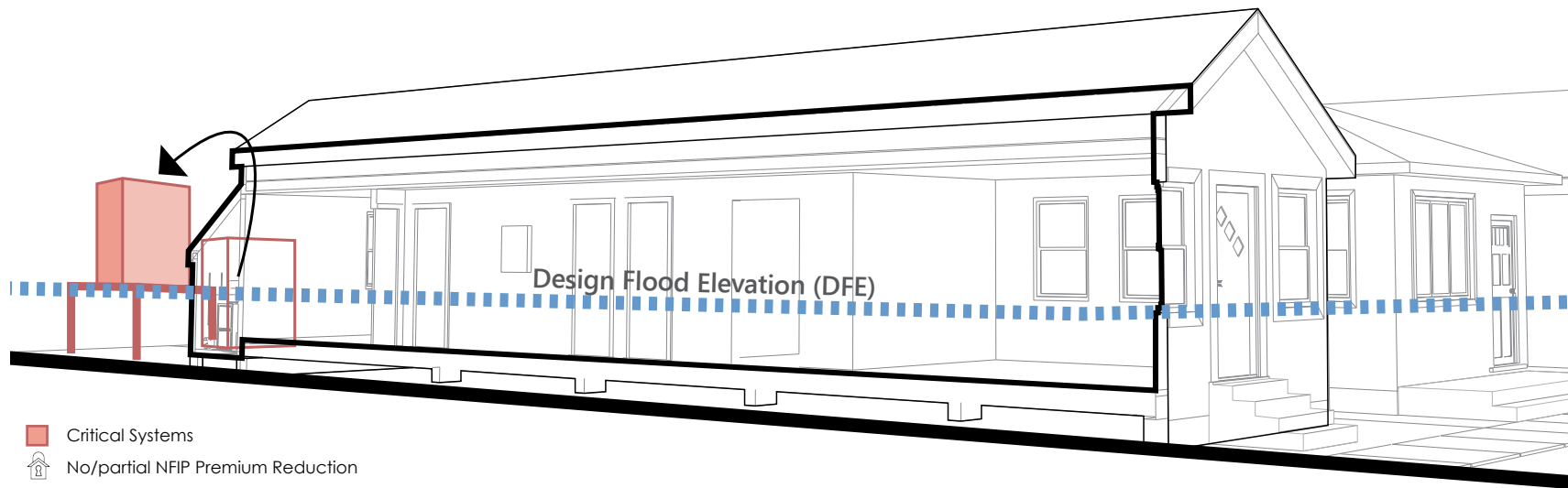
Alternative Building-Scale Strategy: Elevate Systems

Non-substantially damaged and non-substantially improved buildings within the floodplain have more flexibility in complying with Appendix G of the New York City Building Code. The alternative illustrated below reduces the amount of damage from flooding, but 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.

If the DFE is within a few feet of the base of the lowest occupiable floor, consider keeping the structure 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.



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



Case Study: 57D

57D is located in A Zone, which means the area is subject to waves under one and one half feet and inundation up to the Base Flood Elevation (BFE) in the event of a storm. The BFE for this property is thirteen feet; with the addition of two feet of freeboard, the Design Flood Elevation (DFE) is fifteen feet. The grade elevation of this site is eight feet above mean sea level. In order to calculate the first floor of this home, the grade elevation must be subtracted from the DFE. Here, the first floor of habitable space must be seven feet above grade. Any space below the first floor of the home may only be used for storage and access purposes. This site has a considerable elevation requirement that poses unique design and construction considerations, given the limited lot size. The illustrative home on the following page shows two streetscape mitigation strategies, a stair turn and covered porch, though only one is required.

Key Characteristics

FLOOD RISK

Flood Zone/BFE	A/ 13'
DFE	15'
Average Site Elevation	8'

TPOLOGY

Lot Size	30' x 60'
Building Size	26' x 46'
Yards	W. 3' / E. 8'
Construction Type	Wood Frame
Foundation Type	Slab on grade
Stories	1.5
Roof Height	17'

SITE CONDITIONS

Sidewalks	Yes, rear yard
Roadbed Width	17'
Zoning District	R4A



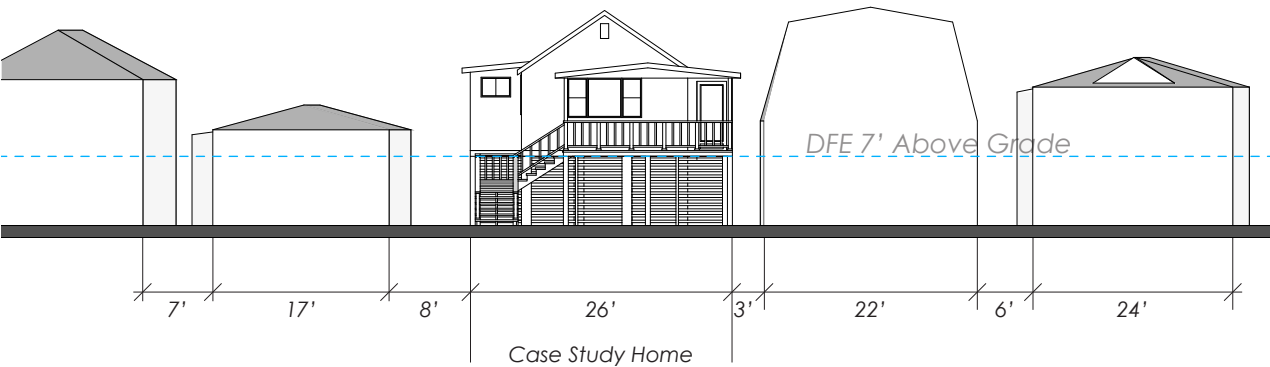
Site Plan

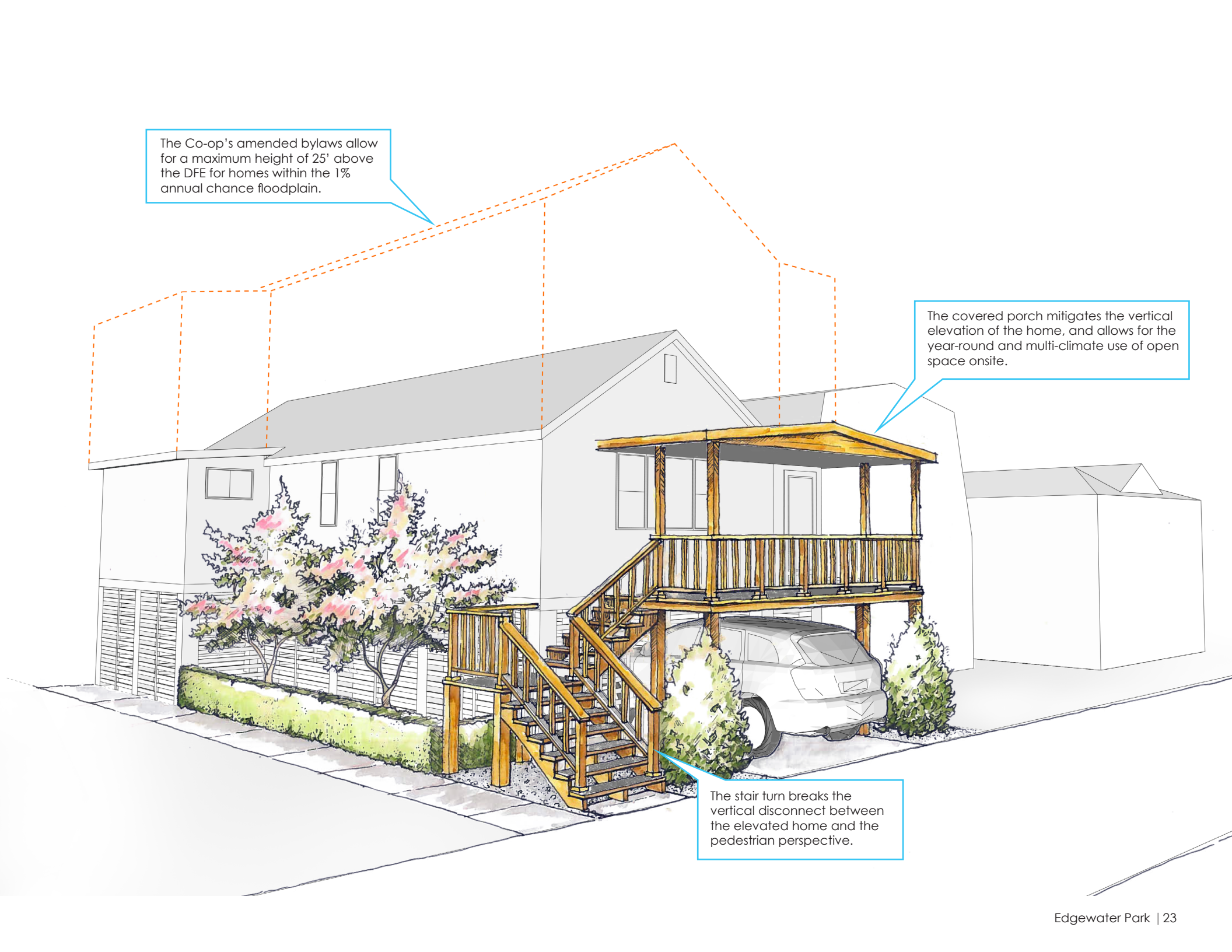


PFIRM Flood Zones

- A Zone
- Case Study Property

Site Section Elevation





The Co-op's amended bylaws allow for a maximum height of 25' above the DFE for homes within the 1% annual chance floodplain.

The covered porch mitigates the vertical elevation of the home, and allows for the year-round and multi-climate use of open space onsite.

The stair turn breaks the vertical disconnect between the elevated home and the pedestrian perspective.

Case Study: 160C

160C is located in one of the lowest lying areas in the neighborhood. The northern edge of the home is located within the Coastal A Zone and on the LiMWA line. The Coastal A Zone is subject to moderate wave action between one and one half and three feet in height. Due to this increased risk, building codes are more restrictive here than in A Zones and can be similar to the requirements of a V Zone construction. The Base Flood Elevation (BFE) for 160C is sixteen feet. With the additional two feet of freeboard, the home has a Design Flood Elevation (DFE) of eighteen feet. The first floor of the home must be seven and a half feet above grade. The illustrative home on the following page shows three streetscape mitigation strategies, a stair turn, porch, and plantings, though only one is required.

Key Characteristics

FLOOD RISK

Flood Zone/BFE	Coastal A/ 14'
DFE	16'
Average Site Elevation	8.5'

TYOLOGY

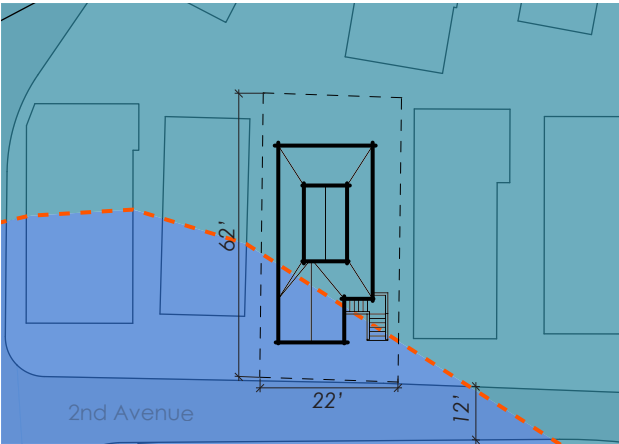
Lot Size	22' x 62'
Building Size	18' x 31'
Yards	W. 5' / E. 8'
Construction Type	Masonry/ Wood Frame
Foundation Type	Slab on grade
Stories	1.5
Roof Height	16'

SITE CONDITIONS

Sidewalks	Yes, rear yard
Roadbed Width	12'
Zoning District	R4A



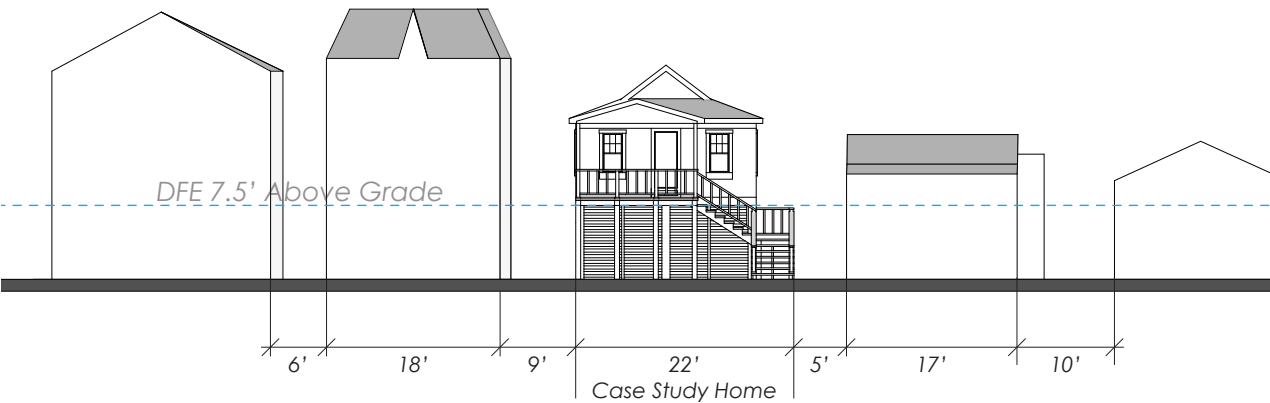
Site Plan

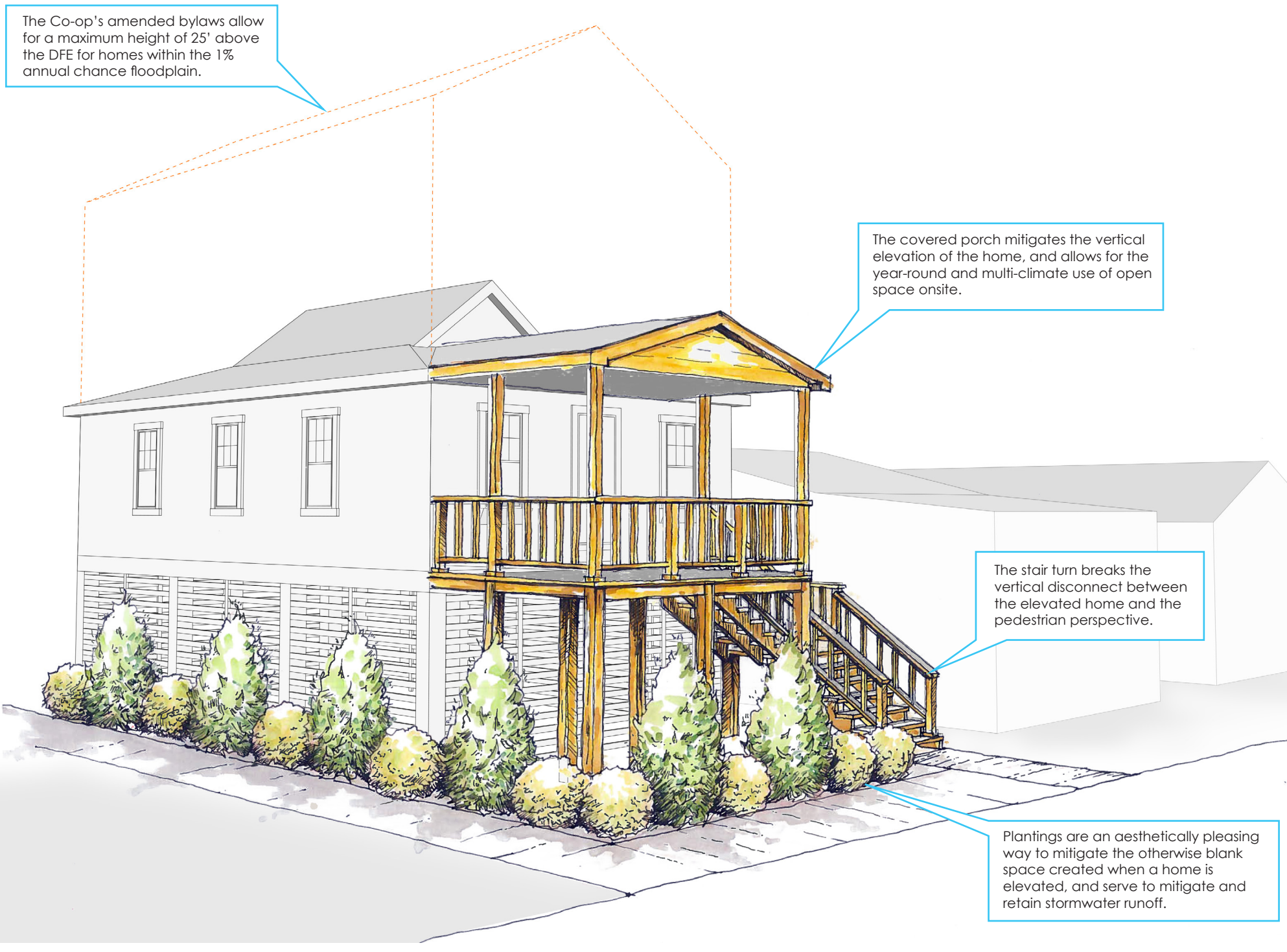


PFIRM Flood Zones

- Coastal A Zone
- A Zone
- Subject to Wave Risk (LiMWA)
- Case Study Property

Site Section Elevation





The Co-op's amended bylaws allow for a maximum height of 25' above the DFE for homes within the 1% annual chance floodplain.

The covered porch mitigates the vertical elevation of the home, and allows for the year-round and multi-climate use of open space onsite.

The stair turn breaks the vertical disconnect between the elevated home and the pedestrian perspective.

Plantings are an aesthetically pleasing way to mitigate the otherwise blank space created when a home is elevated, and serve to mitigate and retain stormwater runoff.

Case Study: 26C

26C is located in the Coastal A Zone, meaning that wave activity between one and one half and three feet in height can be expected during a storm event. Due to this increased risk, building codes are more restrictive here than in A Zone and can be similar to the requirements of a V Zone construction. 26C is a single-story bungalow that is approximately twenty feet tall. The existing first floor of the home is about three feet above grade, and there is an enclosed storage space underneath the structure. This home must be elevated five additional feet to reach the DFE of 16. The illustrative home on the following page shows three streetscape mitigation strategies: a porch, stair turn and planting. Only one is required.

Key Characteristics

FLOOD RISK

Flood Zone/BFE	Coastal A/ 14'
DFE	16'
Average Site Elevation	8'

TPOLOGY

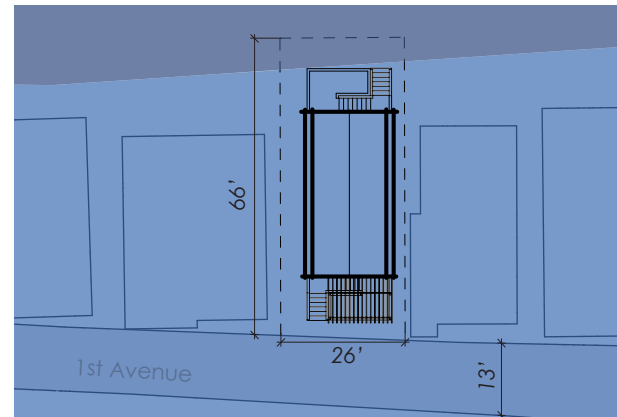
Lot Size	26' x 66'
Building Size	18' x 31'
Yards	W. 5' / E. 8'
Construction Type	Wood Frame
Foundation Type	Slab on grade
Stories	1.5
Roof Height	16'

SITE CONDITIONS

Sidewalks	Yes, rear yard
Roadbed Width	13'
Zoning District	R4A



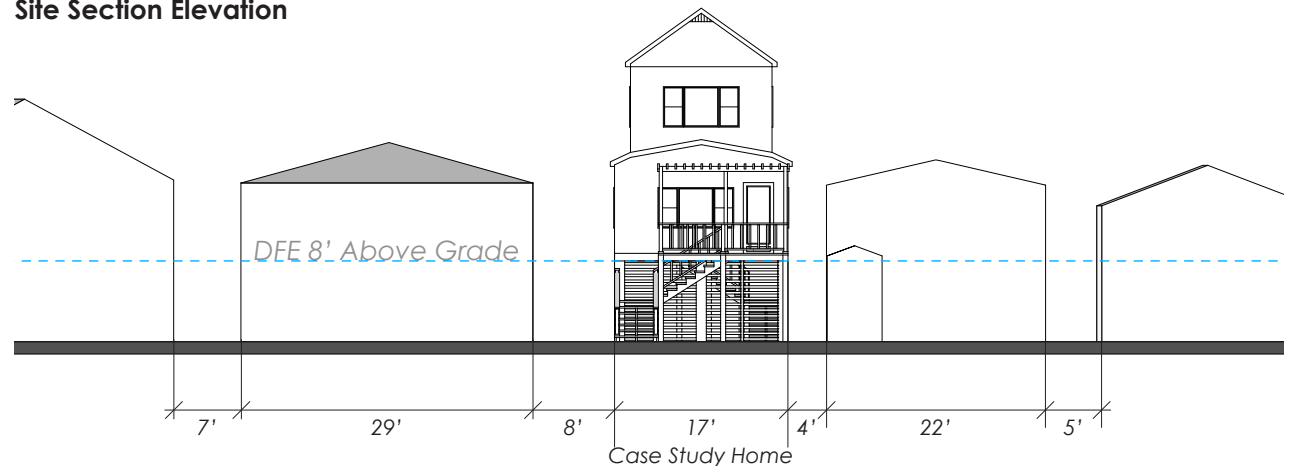
Site Plan

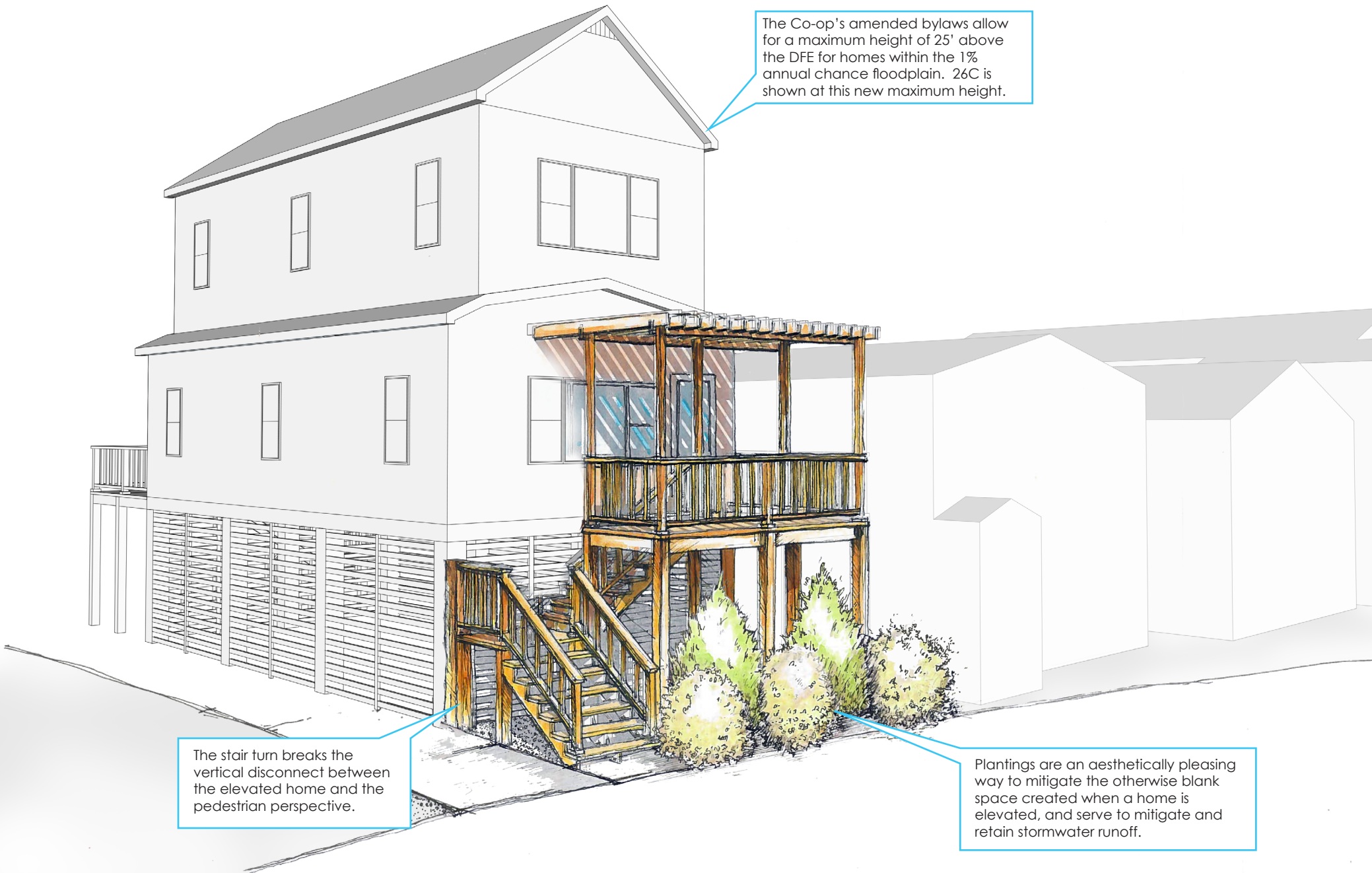


PFIRM Flood Zones

- V Zone
- Coastal A Zone
- Case Study Property

Site Section Elevation





The Co-op's amended bylaws allow for a maximum height of 25' above the DFE for homes within the 1% annual chance floodplain. 26C is shown at this new maximum height.

The stair turn breaks the vertical disconnect between the elevated home and the pedestrian perspective.

Plantings are an aesthetically pleasing way to mitigate the otherwise blank space created when a home is elevated, and serve to mitigate and retain stormwater runoff.

Case Study: 73C

73C sits within the A Zone, which means that wave activity of one and one half feet in height or less can be expected. The BFE for this property is thirteen feet. Once freeboard (the addition of two feet) and grade are accounted for, the first floor elevation of 73C must be three feet above the existing ground elevation. Since open space is limited in the front and rear yard, retrofitting this site for resiliency purposes requires special design considerations in order to address access issues. Though no streetscape mitigation strategies are required because the ground floor is less than five feet above grade, the illustrative home on the following page shows two: plantings and a covered porch.

Key Characteristics

FLOOD RISK

Flood Zone/BFE	A/ 13'
DFE	15'
Average Site Elevation	12'

TPOLOGY

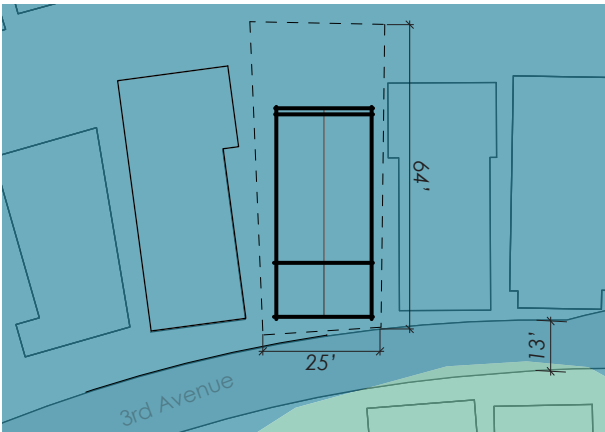
Lot Size	25' x 64'
Building Size	25' x 49' (Pre-existing)
Yards	W. 6' / E. 7'
Construction Type	NA
Foundation Type	NA
Stories	NA
Roof Height	NA

SITE CONDITIONS

Sidewalks	Yes, rear yard
Roadbed Width	13'
Zoning District	R4A



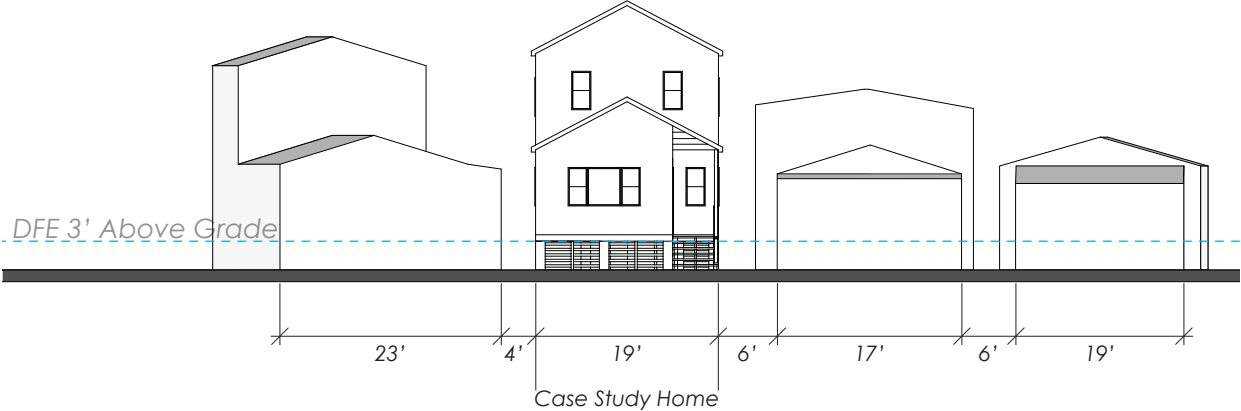
Site Plan

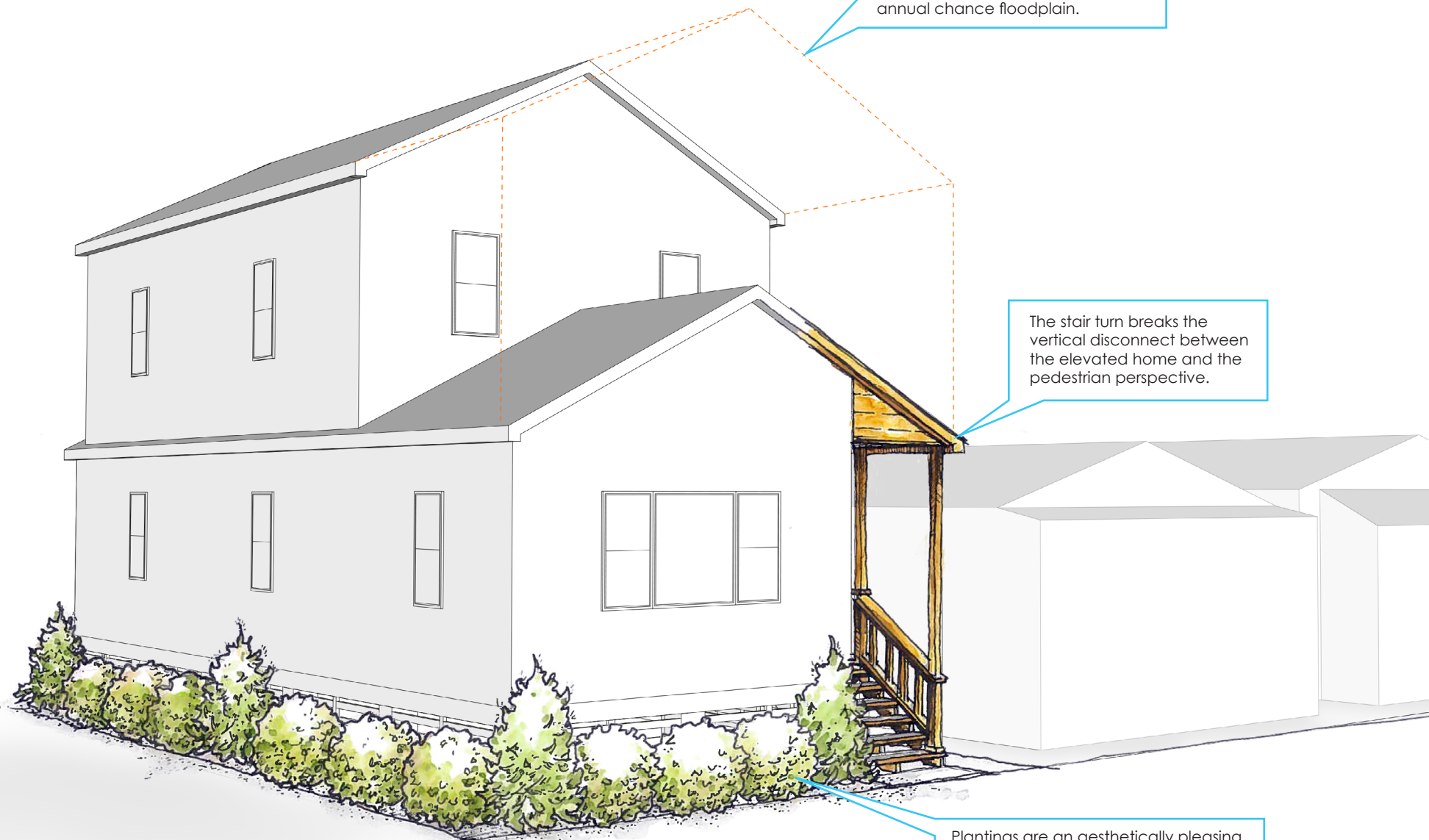


PFIRM Flood Zones

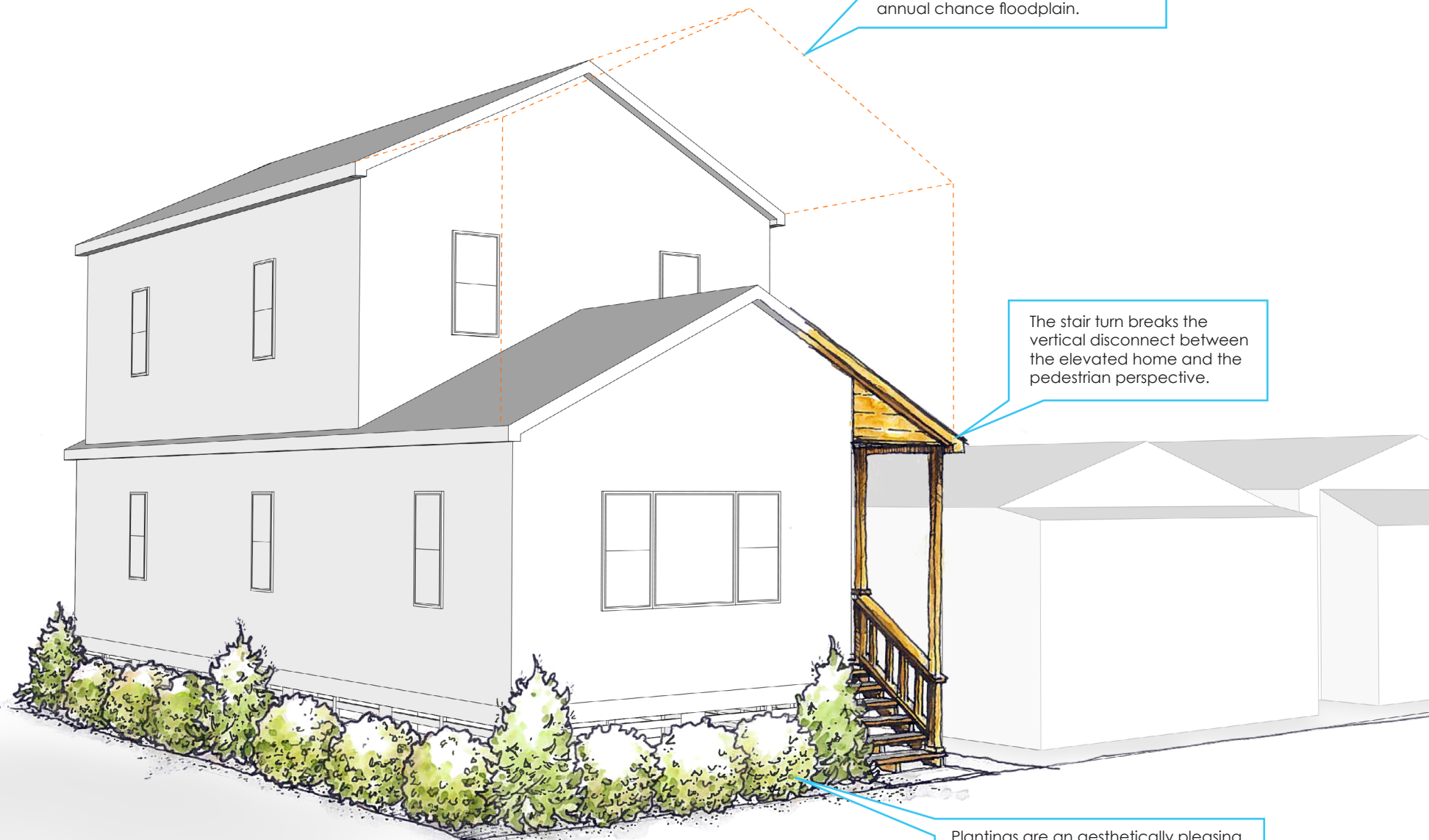
- A Zone
- Shaded X Zone
- Case Study Property

Site Section Elevation

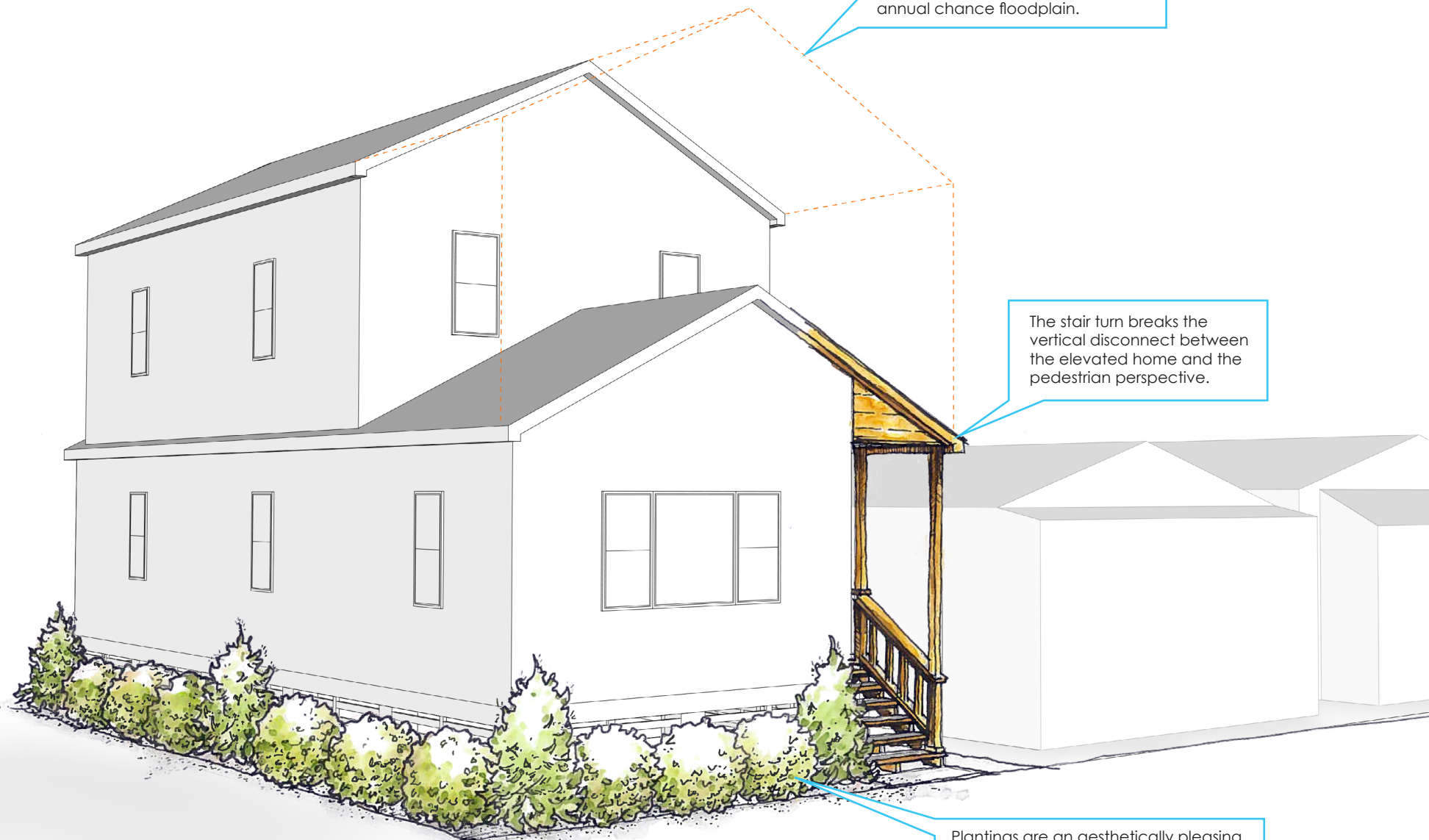




The Co-op's amended bylaws allow for a maximum height of 25' above the DFE for homes within the 1% annual chance floodplain.



The stair turn breaks the vertical disconnect between the elevated home and the pedestrian perspective.



Plantings are an aesthetically pleasing way to mitigate the otherwise blank space created when a home is elevated, and serve to mitigate and retain stormwater runoff.

Case Study: 49B

49B is located within the A Zone. The structure is expected to experience inundation up to the base flood elevation (13 feet), as well as wave activity of one and one half feet or less in height. Taking into account freeboard and grade, the home must be elevated three feet above the existing ground elevation. Though no streetscape mitigation strategies are required due to the low elevation requirement of five feet, the illustrative home on the following page shows two: plantings and a covered porch.



Key Characteristics

FLOOD RISK

Flood Zone/BFE	A/ 13'
DFE	15'
Average Site Elevation	12'

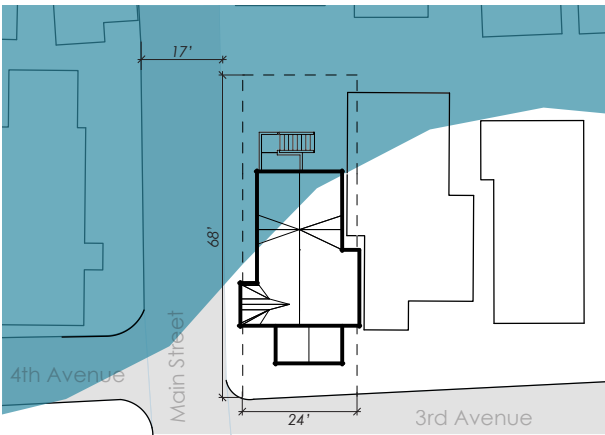
TPOLOGY

Lot Size	24' x 68'
Building Size	24' x 32'
Yards	W. 5' / E. 8'
Construction Type	Clapboard
Foundation Type	Slab on grade
Stories	1.5
Roof Height	12'

SITE CONDITIONS

Sidewalks	Yes, rear yard
Roadbed Width	W. 17' / N. 17'
Zoning District	R4A

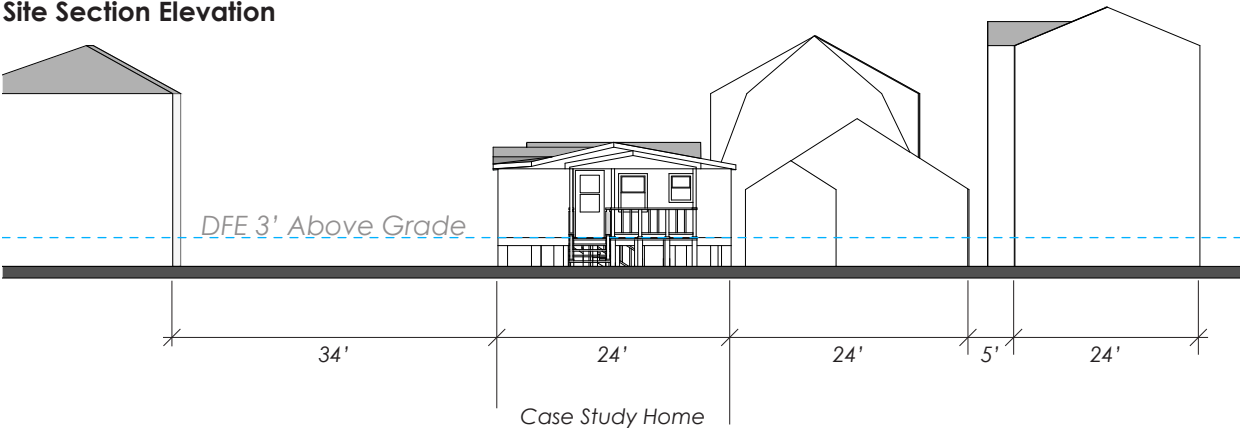
Site Plan



PFIRM Flood Zones

- A Zone
- Case Study Property

Site Section Elevation



The Co-op's amended bylaws allow for a maximum height of 25' above the DFE for homes within the 1% annual chance floodplain.

The stair turn breaks the vertical disconnect between the elevated home and the pedestrian perspective.

Plantings are an aesthetically pleasing way to mitigate the otherwise blank space created when a home is elevated, and serve to mitigate and retain stormwater runoff.

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 Edgewater 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

DCP has worked with the Edgewater Park community to understand current and future climate risks and provide a menu of targeted building scale resiliency measures for residents to protect their property and life safety.

Facilitate resilient retrofits

DCP has provided guidance for the community to update the Edgewater Park Co-op bylaws to meet the most robust resiliency standards that the City can encourage and enforce, while also maintaining existing community character.

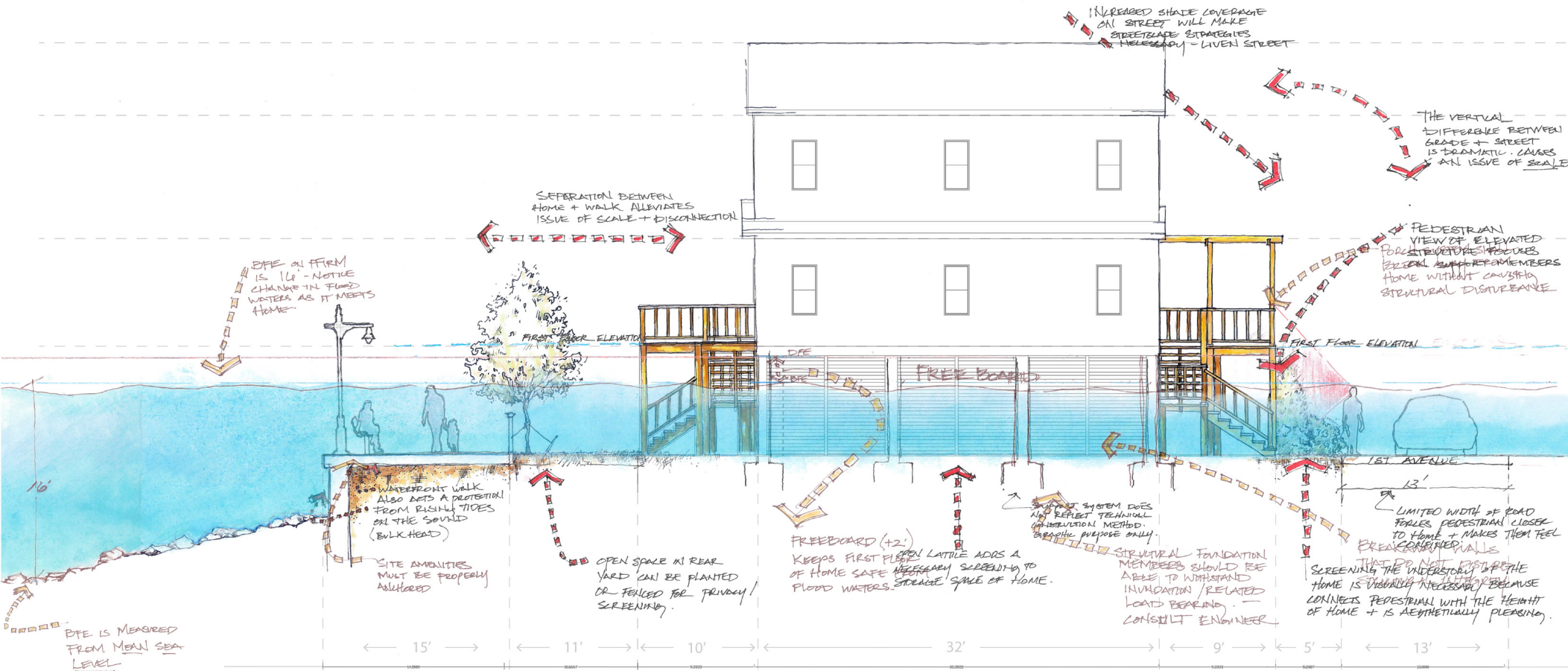
Streamline City regulations

DCP has worked with other city agencies to clarify and strengthen the the City's permitting review process for unique conditions such as those that exist in Edgewater Park and other similar communities.

The Resilient Neighborhood study of Edgewater 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 while ensuring the longevity of and enhancing the unique character of the community.

Resiliency Considerations

There are many considerations that must be addressed when elevating a home located in the 1% annual chance floodplain, such as existing circulation, height of expected flood waters, the relationship to surrounding context and how to access the first floor of the new home. This image illustrates some of the thinking behind the case studies that were provided on the previous pages.



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.

ACKNOWLEDGMENTS

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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

nyc.gov/retrofittingforfloordrisk

Designing for Flood Risk

nyc.gov/designingforfloordrisk

Urban Waterfront Adaptive Strategies

nyc.gov/uwas

Flood Resilience Zoning Text Amendment

nyc.gov/assets/planning/download/pdf/plans/flood-resiliency/flood-resiliency.pdf

Special Regulations for Neighborhood Recovery

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

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/html/planyc/html/resiliency/resiliency.shtml

New York City Panel on Climate Change

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

