IMAGINED ADAPTATIONS

SESSION 5
IMAGINED ADAPTATIONS

Dennis Carlberg | Boston University & Urban Land Institute

Mason Andrews | Hampton University

Suzanne Mathew | Rhode Island School of Design

Lisa Howe | Building Conservation Associates

Stephanie Zurek | Union Studio
IMAGINED ADAPTATIONS

Panel Explorations | Considerations

- Climate resilience for historic resources
- Prioritizing tradeoffs for resilience in historic structures
  - Scales
  - Strategies
- What is the quality of community life we create if we don’t work collectively toward shared solutions
  - Raised Building Syndrome
  - Connectivity & Continuity
  - Living with Water or Leaving from Water

Source: Frank Amaral, NPS, and Emily Michot
Issues

1. Sea Level Rise
   - 11 inches in Boston
   - 3 – 4 times faster
   - Ranked 4th in the US

2. 67% Increase in storm intensity past 60 years

3. Storm frequency increase from 1 in 50 year to 1 in 5 years

Source: NOAA & New England Weather Service
Issues

1. Sea Level Rise
   - Thermal Expansion
   - Land Based Ice Loss
   - Subsidence
   - Wind

Source: National Climate Assessment
sustainability @ BU
It's what you do.

MHHW + 4.2 ft.
Vertical Datum: NAVD88 9.0 (ft.)
Data and imagery from MassGIS

Source: sustainability@BU
3’-6”
New Buildings

Center for Integrated Life Sciences & Engineering:
1. No Basement
2. Raised Equipment

Source: sustainability@BU
Regional

Storm Surge Barrier
1. Inner Harbor Protection
2. Wetlands Restoration
3. Port of Boston Relocation

Source: Antonio DiMambro
Neighborhood

Living With Water
1. Let the water in
2. Canal / Street Integration

ULI/Kresge Study
1. Infrastructure
2. Regulatory Tools
3. Financing Tools
4. Re-insurance

Source: Urban Land Institute Boston
IMAGINED ADAPTATIONS

Mason Andrews | Hampton University

- Department of Architecture
  A Quarter Low: Tidewater Resiliency Design Challenge – Collaboration between Hampton and Old Dominion Universities
The Horsemen of the Apocalypse

- Sea Level Rise
- Subsidence
- Storms: both big blows and spike in intensity of rains
- Soils of legacy creek beds
- Slack in the Gulf Stream
SEA LEVEL RISE RECORDED & PROJECTED

8638610 Sewells Point, Virginia 4.60 +/- 0.24 mm/yr

- Linear Mean Sea Level Trend
- Upper 95% Confidence Interval
- Lower 95% Confidence Interval
- Monthly mean sea level with the average seasonal cycle removed

SE Virginia sea level rise scenarios
SUBSIDENCE

Figure 3. Shoreline retreat caused by a combination of sea-level rise and land subsidence.

Figure 3. Groundwater water-level decreases from 1900 to 2006. Modified from Heywood and Pope (2008).
STORMS, NORTH WIND, & STORMWATER
WHAT WE SAW

- Fine old houses, predominately four squares
- Remnants of unit pavers on some streets
- Submerged storm water outfalls
COMMUNITY ENGAGEMENT WORKSHOPS AND TOURS, FALL 2014
WHAT WE HEARD

MULTI-GENERATIONAL HOME OWNERSHIP
VIBRANT PORCH CULTURE
FLOODING MORE SEVERE AWAY FROM RIVER
STORM WATER SYSTEM SOURCE OF MOST FLOODING
ACTIVE CIVIC LEAGUE AND COMMUNITY LIFE
BASEMENTS BEGINNING TO TAKE ON WATER
INSURANCE RATES RISING THREATENING RETIRED FIXED INCOME HOMEOWNERS
Experimentation with raising structures by block over cisterns
GUIDING PRINCIPLES

- Leave people, buildings, & utilities in place
- Manage water as a district network
- Preference for low impact devices
- Use pipe & pump
- Initiate community network in which all scales have part to play
- Street by street, block by block, parcel by parcel
THE URBAN DISTRICT: WATER KNOWS NO PROPERTY LINES & IT HAS TO GO SOMEWHERE
THE BASEMENTS OF CHESTERFIELD HEIGHTS

- Collect all rooftop run-off & store on-site away from foundations
- Move all utilities to first floor or above
- As renovations occur, take opportunity to replace materials that will mold
- Flood vents for ventilation & structural survival
- Let the water in, do not fill, do not waterproof
EPILOGUE
THE HAGUE
THE HAGUE

Hours per year that the Hague Flooded

Past Observations (SLR=4.5 mm/y)
Future Projections (SLR=8 mm/y)

Until the 1970s: ~20 hours of flooding per year
Today: ~10 full days of flooding per year
2050: ~60 full days of flooding per year
PRE-EXISTING STUDIES: FUGRO

Evaluation Process

- Engineering (hydrologic and hydraulic) analyses
  - Moffatt & Nichol (PL, MC, H) and Timmons Group (OC)

The Hague: Project Elements

- Capital Project to protect against coastal flooding (tidal surge):
  - Tidal Barrier (floodwall) to protect against tidal surge
  - Tine gate — if navigation access required
  - Pump station to remove rainfall runoff when gate closed
  - Closure walls or berms across where land surface is low around basin/watershed perimeter
BARRIERS

LOW WATER,
All operational parts of the barrier are invisibly concealed in the ground.

RISING WATER,
The floodwater almost rises to the inlet of the barrier. The Check valve in the exhaust pipe prevents the barrier from coming up to early.

RISING WATER,
The floodwater rises to the inlet of the barrier. The basin is filled up with water and the wall rises. The support block pushes the wall against the site of the basin and makes a watertight connection.
Imagined Adaptations
Imagined Adaptations
A QUARTER LOW PRESERVATION AT THE DISTRICT SCALE

MASON ANDREWS
ASSOCIATE PROFESSOR OF ARCHITECTURE HAMPTON UNIVERSITY

Imagined Adaptations
Suzanne Mathew | Rhode Island School of Design

• Department of Landscape Architecture

*Imagining the Future Historic in the Landscape Architecture Studio*
IMAGINING THE FUTURE HISTORIC IN THE LANDSCAPE ARCHITECTURE STUDIO

RISD GRADUATE THESIS STUDIO 2015
PROTOTYPES FOR CHANGE: BOSTON 2050 - 2100
PREMISE + PROCESS:
SEA-LEVEL RECLAIMING HISTORIC GROUND IN BOSTON
RISD GRADUATE THESIS STUDIO 2015
GRADUATE THESIS STUDIO PROCESS

Feedback
Throughout your thesis work, I have been impressed with your commitment to a bold strategy and your ability to diagram your ideas clearly. In this last phase, you've made significant progress in working out some of the details of that strategy and have made a nice connection to the harbor in the north. As we heard at the review, however, how your “fire line” and other programmed open spaces will really work is still a question. Some of the greatness of the existing buildings in this part of Fort Point Channel gets lost in your renderings—it would be good to capture that so that your project would feel more like you are integrating the old and the new into a vibrant, contemporary and future environment. I know you are well aware of the “placelessness” of much of the new architecture in the district and are looking to counter that with your proposals. I would encourage you to find a way to show some detail where you imagine the quotidien day to day life of your area district will be. I think it could be exciting, but right now that is not fully depicted.

Findings + Conclusions
In 2100 water scenario, sea level rise will be 6ft, storm surge will be 5ft, which will bring more than 10ft water elevation to the existing water edge. Since the topography of the Fort Point district is nearly flat, to elevate the water edge could be a short-term strategy to protect the district from flooding in terms of stable water change such as sea level rise. However, the storm surge is temporary and may happen twice a year, so it is crucial to create an inland elevated infrastructure network to enhance the connection when the ground level is temporarily flooded as well as evolve the neighborhood.

The three prototypes test different relationships between the elevated landscape and the context (both existing and proposed), which include the relationship between building, open space and waterfront. The prototype of rooftop connection is located at an intimate space within community. Fresh water will be collected by the roof garden and be conveyed to the ground through the waterfall. Farmers market will be proposed under the landscape infrastructure and enhance community engagement. The prototype of open space connection is located at the transition space between public street and community park. It will be the threshold of the public and semi-public space. The water place is created under the viaduct to welcome the gathering and collect stormwater. The prototype of waterfront connection is located at a public space where everyone could access and have fun. The central viaduct and the harbor walk overlap at this place and are transformed into stages and ramps for easy accessibility and gathering. The elevated landscape here is intended to bring people to the waterfront and create a dynamic water edge.

Assessment
In this phase, the overall strategy is diagrammed clearly in the parts diagram. The revised master plan is more clear and caters to the feedback from phase 2 review.

According to the feedback from last review, the stance of the elevated infrastructure is not so strong. Since the “fireline” like structure is expensive to build and maintain, it is necessary to give a strong reason why it should be built. The temporary flooding scenario could provide support for the elevated landscape, but it is not enough. The stance lacks a layer of user experience to show what the future vision for the district is like in daily life.

If there is a phase 4 for the thesis, the investigation should focus on how the elevated landscape could make unique places which would evolve the neighborhood. The overall site analysis of the water scenario should be presented more clearly to show how the urban fabric will function under the flooding scenario.
SELECTED SITES – VULNERABLE COASTAL NEIGHBORHOODS
SELECTED SITES – HISTORIC LANDMARKS AND PUBLIC SPACES
SELECTED SITES – PUBLIC WATERFRONTS AND CULTURAL LANDSCAPES
FLOOD SCENARIO ANALYSIS
FLOOD SCENARIO ANALYSIS
2100: Potential New Water Routes

In a case of history repeating itself, South Boston will likely return to dependence on water transportation to connect with the outer world.
First Trial: Model Testing of Currents and Sand
PROTOTYPE TESTING
PROTOTYPE TESTING

- Wetlands with daily flood: Temporary boards will be used to trap broken shells and move water.
- Wetlands with assembly flood: Wetlands on all edges to capture sediments and create a defined relationship between the structures and wetland.
- A gentle slope on the edge ensures the water pushing up to the surface.
- Hard structure on the edge: Water permeates into the wetland through the soil below the structure.
- A study about how the structure interacts different relationships catch the soil differences.
PROJECTING THE FUTURE HISTORIC
STUDENT PROPOSALS
RESILIENT RETREAT: A PROTOTYPE FOR NEW COLONY

CARSON COOPER
RESILIENT RETREAT: A PROTOTYPE FOR NEW COLONY
CARSON COOPER
OLD COLONY: LONGSTANDING AFFORDABLE HOUSING COMMUNITY
## Comparative Matrix

<table>
<thead>
<tr>
<th>Concept 1: Stratified</th>
<th>Concept 2: Interweave</th>
<th>Concept 3: Patchwork</th>
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<tbody>
<tr>
<td><strong>Quantity of Public Space</strong></td>
<td><strong>Quality of Public Space</strong></td>
<td><strong>Overall Site Connectivity</strong></td>
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<tr>
<td><strong>ECOLOGY</strong></td>
<td><strong>FEASIBILITY + ATTRACTABILITY</strong></td>
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- Green = Meets Goal
- Yellow = Partially Meets Goal
- Red = Does Not Meet Goal

### Critical Goals

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<td>Concept 1: Stratified</td>
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</table>
1. Old Colony Development
2. Boardwalks + Viewing Decks
3. Joseph M. Tierney Learning Center
   - Public Programs
   - Computer Lab
   - Emergency Shelter
4. Columbia Road - Raised to 23'
5. Joe Moakley Park
   - Soccer/ Football
   - Splash/Water Park
   - Basketball
   - Bilo-Swales
6. New Elementary School
7. Open Viewing Lawns
8. Tidal/ Coastal Ecosystems
9. The Civic Balcony
   - Community Programs
10. Water Entry/Exit
11. Townhouse Cluster
12. Promenade Viewing Decks
13. New Colony Park
14. Main Street + Patterson Way
15. Carson's Beach
16. Edward J. McCormack Bath House
17. Pedestrian Promenade with
    Vehicular Access below grade
18. Mary Ellen McCormack Park
   - Soccer/ Football
   - Basketball
   - Tot Lot
   - BBQ Area
19. Kayak and Beach Equipment Rental
   - Boat Dock
   - Terraced Stone Wall
20. Old Harbor
21. Old Colony Avenue - Raised to 23'
22. Amphitheater and Stage
23. Terraced Stone Walls
   - Seating and Playing
24. Columbus Park Sports Complex
   - Hockey
   - Soccer/Football
   - Track/Field
   - Baseball
   - Tennis
   - Basketball
25. Columbus Traffic Circle
ANOTHER 100 YEARS: GROWING THE CHARLES RIVER ESPLANADE

ZAIXAN WANG
ANOTHER 100 YEARS:
GROWING THE CHARLES RIVER
ESPLANADE

ZAIXAN WANG
CHARLES RIVER ESPLANADE: PUBLIC PARK AND CULTURAL LANDSCAPE
Chosen Flooding Scenario by 2050: MHHW+7' (SLR+2' & Storm Surge+5')

The area will be inundated, shown in red, with 12 feet of sea level rise.

In the area, extending into SW, the
area will be flooded, the same
level as Charleston. Flood peaks will ex-
ceed the 100 year flood level, and
inundate, causing significant
environmental and economic
impact.
The Choice of a Modular System

**Fixed Singular Intervention**
- On site construction
- Larger and longer impact
- High cost
- Fixed and hard to change

**Modular System**
- Off site construction
- Smaller impact and faster built
- Low cost
- Flexible and easy to change

Modular System Form and Structure Testing

Images of various modules under different conditions are shown, highlighting the structural integrity and adaptability of modular systems in various environments.
Concept of the New Water Edge

The edge concept is to revitalize the waterfront as a dynamic, social venue, where the public can connect with the water and the city. The new water edge is a place where people can go and enjoy the water in new ways.
Phasing Plan

Current

Phase 1

Phase 2

Phase 3
Modular System Structure and Typologies
WALK INTO THE SEA

ZHI WANG
WALK INTO THE SEA
ZHI WANG
Abstract

In phase 2, I cast the phase 1 idea on a specific site, the long wharf. Considering the terminus water space at Brixton, I proposed a path and pull-relation between former infrastructure and natural lines. To construct a junction of the two, activities re-orient to the sea.

Introduction

The long wharf is the oldest wharf in Brixton. It is a symbol of history and industry. In the 19th century, when Brixton wharf was the trading port, the long wharf was the main port of urban growth expanding into the heart. In 20th-century, when the industry declined, the renewed urban area surrounded the port. The wharf, originally conceived as transport infrastructure, then in 21st century, became a symbol of the industrial history. In my proposal, the long wharf is a place that will help the expansion of both urban growth and natural history.

The study of the phase 2 project to create a path and pull-relation between former infrastructure and natural lines.

Methods

1. Study on how to create a trajectory passing leading Fleming wonderfully into the sea.
2. Study on how to lead natural space into the infrastructure.
3. Study on how to create a dynamic flow in the space so that people can experience the change of infrastructure and natural relationship when walking along the site.
4. Study on how to design the topological space and plants accommodates change contributed to the water edge.
5. Work on the infrastructural ground to make sure the drainage level can stop water from the sea, and the water’s swimming and transport at the sea front.
6. Work on the infrastructural ground to make sure the drainage level can stop water from the sea, and the water’s swimming and transport at the sea front.
LONG WHARF: HISTORIC PIER AND ACTIVE PUBLIC WATERFRONT
Hybrid structure transformation process
Terraces on the wharf

Hybrid structure having fashion show
CONCLUSIONS---WHAT IS THE FUTURE HISTORIC?
CONSIDERATIONS

• DOES THE VISUAL CHARACTER OF A HISTORIC SITE NEED TO BE PRESERVED, OR CAN ITS IDENTITY EXIST IN ITS FUNCTION/RESILIENCE?

• WHEN CAN FLOODING OCCUR? WHEN IS IT APPROPRIATE TO EMBRACE NEW TEMPORAL DYNAMICS IN A CITY?

• IF DISPLACEMENT OCCURS, WHO WILL BE AFFECTED?

• HOW WILL NEW STRUCTURES MEET OLD IN HISTORIC SITES?
DYNAMIC CHANGES TO DAILY USE
COUPLING OF NEW AND HISTORIC STRUCTURES

Juan Tan
STRUCTURAL PROGRAMMING AND MECHANISMS FOR MANY SCENARIOS
ADAPTIVE ECOLOGIES AND HARNESSED CHANGE OVER TIME

An Evolving Periphery: 2015 – 2100

2015

[Diagram of urban development with annotations]

2100

[Diagram of urban development with annotations]

Xi Yang
THANK YOU

RISD GRADUATE THESIS STUDIO 2015
PROTOTYPES FOR CHANGE: BOSTON 2050 - 2100
IMAGINED ADAPTATIONS

Stephanie Zurek | Union Studio

Lisa Howe | Building Conservation Associates

• Case study of resiliency measures for an 18th-c. Newport house and neighborhood
NEWPORT’S POINT NEIGHBORHOOD AND 74 BRIDGE STREET

KEEPING HISTORY ABOVE WATER
WHAT IS AT RISK?
OUR HISTORY AND OUR COMMUNITY

OUR HISTORY:

668 HISTORIC STRUCTURES ARE LOCATED IN NEWPORT'S FLOODPLAIN.

THE ASSESSED VALUE OF THESE HISTORIC STRUCTURES IS $559,982,649.
OUR HOMES:

53% of the acreage of Newport lies in the floodplain.

53% of the parcels in Newport’s floodplain are residential lots.

OUR RESOURCES:

$3,817,860,900 of potential property loss in Newport’s floodplain.

53% of taxes collected from Newport businesses come from businesses that lie in Newport’s floodplain.

OUR LIVES:

Our safety is threatened by flooding and access to evacuation routes.

200 named roads in Newport run through the flood plain.
MULTI-LEVEL APPROACH:

- STORMWATER MANAGEMENT
- SEA LEVEL RISE
- DESIGN AND POLICY
STORMWATER MANAGEMENT

IMPERVIOUS SURFACES
Impervious surfaces uphill increase the volume of water flowing through system downhill.

STORM & SEWER LINES
In 2012, one inch of rain produced about 860,000 gallons of discharge at Washington Street outfall.

STORM SURGE
Since 1958, very heavy precipitation events in New England have increased by 71%.
STORMWATER
NEIGHBORHOOD LEVEL SOLUTIONS

GREEN INFRASTRUCTURE SITE PLAN

RESPONSIBLE STAKEHOLDERS:

STORM WATER SOLUTIONS
DECREASE PRESSURE

OUTFALL TREATMENT
The installation of an outfall treatment system can prevent at least flooding and reduce the depth of flooding during average
rain events.

INCREASE PIPE SIZING
Larger pipes add to the flood relief capacity and reduce the magnitude of flooding for rain events at high tide levels.

PUMPING STATION
Stormwater pumping and efficient drainage for rain events at low tide to prevent excess water from overflowing into the
harbor at high tide.

NEIGHBORHOOD CISTERNS
A large cistern could increase the flood relief capacity and reduce the magnitude of flooding for rain events at high tide.
STORMWATER
BUILDING LEVEL SOLUTIONS

RETROFIT STRATEGIES
SEA LEVEL RISE IS ACCELERATING AND HAS PERMANENT IMPLICATIONS ON OUR WAY OF LIFE.
SEA LEVEL RISE
NEIGHBORHOOD SOLUTIONS

LEVÉES

RAISE STREETS & INFRASTRUCTURE

Large Scale Barrier

In response to the threat of extreme flooding, the Netherlands has built large scale barriers that protect them from 10,000-year flooding events and still allow major cities to function as active ports.
SEA LEVEL RISE
BUILDING LEVEL SOLUTIONS

ELEVATE CRITICAL SYSTEM
ELEVATE BASEMENT LEVEL
WATERPROOF BASEMENTS FOR RISE ACCESSIONS

ELEVATE HOME
ELEVATE HOME & SITE

RAISING THE HOME
Cost for the Homeowner
Cost for the City
Can be done incrementally (home by home)
Has potential to damage between character of homes and streetscape
Would require minor design guidelines to maintain character
Height of elevation based by historic character

RAISING THE NEIGHBORHOOD
Cost for the Homeowner
Cost for the City
Must be done on a large, coordinated effort (entire entire neighborhood)
Could preserve historic character of foster and streetscape
Would require design guidelines to establish adaptive relationships between streets, homes, and neighboring properties
Could raise us higher than projected sea level

NEW TOWN
- Elevate critical areas
- Fill basements
- Waterproof basements for use as reserves

REINHAB TOWN
- Elevate existing low lying areas

RAISING OVER TIME
- Improve resiliency and infrastructure to the lowest lying areas of the neighborhood

THERE ARE CURRENTLY 986 HISTORIC STRUCTURES IN NEWPORT THAT ARE VULNERABLE TO FLOODING
POLICY AND DESIGN
PRESERVING CHARACTER

PRACTICAL REALITY

REGULATORY COMPLIANCE

HISTORIC CHARACTER

CHUK COMPLIANCE CT MAMOE
HURRICANE SANDY EAST AVERSION
WAVES SUSPEN DUN MACH - SET WAVES

[Images of houses and streets]
POLICY AND DESIGN
PRESERVING CHARACTER
POLICY AND DESIGN

PRESERVING CHARACTER
2.5 Buildings along Upper Narragansett Avenue contain both bayside and residential uses, but house very residential proportions and details. Frontages are wider and setbacks are deeper. A residential scale prevails.

Documenting Character - Upper Narragansett

Many residents also cherish the more residential portion of Upper Narragansett Avenue, before Four Corners. These buildings are set further back from the street and have narrow street frontages, compared to the widths of the lots on which they sit. The frequent street trees and clear definition of private and public space help to create this valued character.

Most recent development along Narragansett Avenue, allowed under the current zoning ordinance, has created sections of Narragansett Avenue that are less enjoyable for pedestrians. These sections that could use improvement are characterized by long stretches of parking lots in front of undistinguished buildings. The traditional setbacks are not maintained and the parking at the sidewalk's edge creates a chaotic and unpleasing space. The goal of the new zoning code is to define limitations for development that would prevent the creation of such spaces again.
**POLICY AND DESIGN**

**DESIGN GUIDELINES**

---

**THE LOT & THE BLOCK**

Outbuildings and patios belong to the front edge of the lot. Accessory structures should be placed in such a way as to help create a sense of enclosure in the front edge of the house.

The second story, in a 2-3 story house, is not in the way of the principal building and should have relatively regular setbacks.

The building setback should include trees that buffer the back edge of the house. The buffer zones are important to create a sense of residential privacy.

**AVOID**

- It is important to maintain the quality of the site when designing on new lots in traditional neighborhoods. Design that is not harmonious with the existing blocks can contribute to the community of the neighborhood.

---

**LOCATING STRUCTURES**

Structures should be placed on the lot to create a variety of public, semi-private, and private spaces. Principal structures located along the front setback line define a continuous building edge along each block. Accessory structures can help frame the spaces or the transition of each lot.

**AVOID**

- Continuously placing structures on the rear edge along with an irregular buffer design can lead to a loss of privacy and obstructed views.
Simplicity of Massing

Discussion:

- Traditional New England residential architecture is characterized by simple building shapes. Simple, unadorned, and well-proportioned forms prevent clutter.

- Historically, people have relied on simple, well-designed forms that make efficient use of space, allow for easy maintenance, and open up for sunlight into the interior.

- Smaller homes may be one single, clear floor - larger homes may incorporate second and third stories.

- Simple composition and proper detailing can make even a simple form elegant.

- Many contemporary residential examples show how the beauty of simplicity and uncluttered space can make the most of a compact footprint.

Transformations

10.3 Simple elements such as dormers, bay and porches can be added to homes to accommodate growing families and tastes.

10.4 A tasteful addition to the main house is one that carries the character of the older home in its design. There is a sense of continuity in the three pieces that can be understood from the streetscape.

10.5 There are many ways to expand and transform an existing house. Additions are most successful when they fill in unused and non-proportional space to the primary form of the original building.
• Located in Historic Point Neighborhood within Newport Historic District

• Constructed in 1728 by Christopher Townsend, a Newport cabinetmaker

• Additions in 1840, mid 19th C. and 1985

• Stone foundation, plank on frame construction with lime based plaster walls – materials able to dry out after cyclical wetting

• Purchased by NRF in 2014
74 BRIDGE STREET
FLOODING SCENARIOS

100-YEAR STORM

"5'-8" NAV

+

SEA LEVEL RISE

2016

2016 + 1'/8'

2090 + 8'-5"

= TOTAL WATER LEVEL

2016

2058

2090
Challenges

- Sea level rise + storm events
- Regulatory issues
- Infrastructure challenges
- Neighborhood Context

Recent Mitigations Efforts

- Use of appropriate restoration materials
- Elevated mechanical to kitchen wing
- Installed sump pump
- Elevated basement electrical wiring to framing
Floodwater can enter the building through…

- Foundation or wall masonry and mortar joints
- Cracks in external walls
- Vents
- Around windows and doors
- Door thresholds
- Gaps around pipes that pass through walls and floors
- Sanitary appliances caused by back flow from flooded drainage systems
- Manholes
- Entrances to cellars and basements
- From under the floor or foundations.
Dry Floodproofing prevents the entry of flood waters from the enclosed areas of a building

- Build up doorsteps
- Use sandbags during flooding
- Install vent covers and seal gaps around pipes in exterior walls
- Install barriers fitted to exterior doorways and windows
- Maintenance repointing to keep water out
- Evaluate structure for buoyancy and hydrostatic pressure
Wet Floodproofing allows water to enter the enclosed areas of a building

- Raise utilities above likely flood level – including furnaces, hot water heaters, electrical circuitry
- Fit plumbing with backflow valves
- Provide ventilation through basements and cellars
- Ensure proper foundation drainage
- Install a sump pump with submersible power supply
- Strengthen foundation walls against flood water and debris
- Utilize damage-resistant materials

Note: Historic materials located below the flood level will be exposed to repeated saturation.
Elevation

- Raise individual building above expected flood levels (right, Newport Point neighborhood)
- Build up site above expected flood levels (below, Galveston)
- Install a buoyant foundation system (lower right, New Orleans)
Relocation

- Relocate building to sit on new foundations on a new site above expected flood elevations

Demolition

- As a last resort... when it is no longer feasible to retrofit, raise or relocate a building, demolition of historic buildings to be considered
Elevate electrical equipment and outlets above anticipated highest high water levels.

Fill basement above fluctuating tide levels. Eliminates need for sump pump.

Install vents to allow water to flow through during floods, and to provide air flow to dry out crawlspace after inundation.

Elevate kitchen to same level as main floor – raise out of current highest flood levels.

Modify landscape to drain all water away from building. Cisterns not feasible due to high water table.

Fill basement above fluctuating tide levels. Eliminates need for sump pump.
Elevate Neighborhood
Massive infrastructure project that requires state and town funding and initiative

Move House to higher ground
Lose context and character of neighborhood

Demolish
Lose vital historic fabric and context

Other Options???
IMAGINED ADAPTATIONS

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