Resilience Planning

I-195 Redevelopment District

May 18, 2022

Agenda

1. Background & Goals
2. Baseline Risk Analysis & Opportunity Assessment
3. Implementation to Increase Resilience
   a. Development Parcels
   b. Park
4. Process & Next Steps

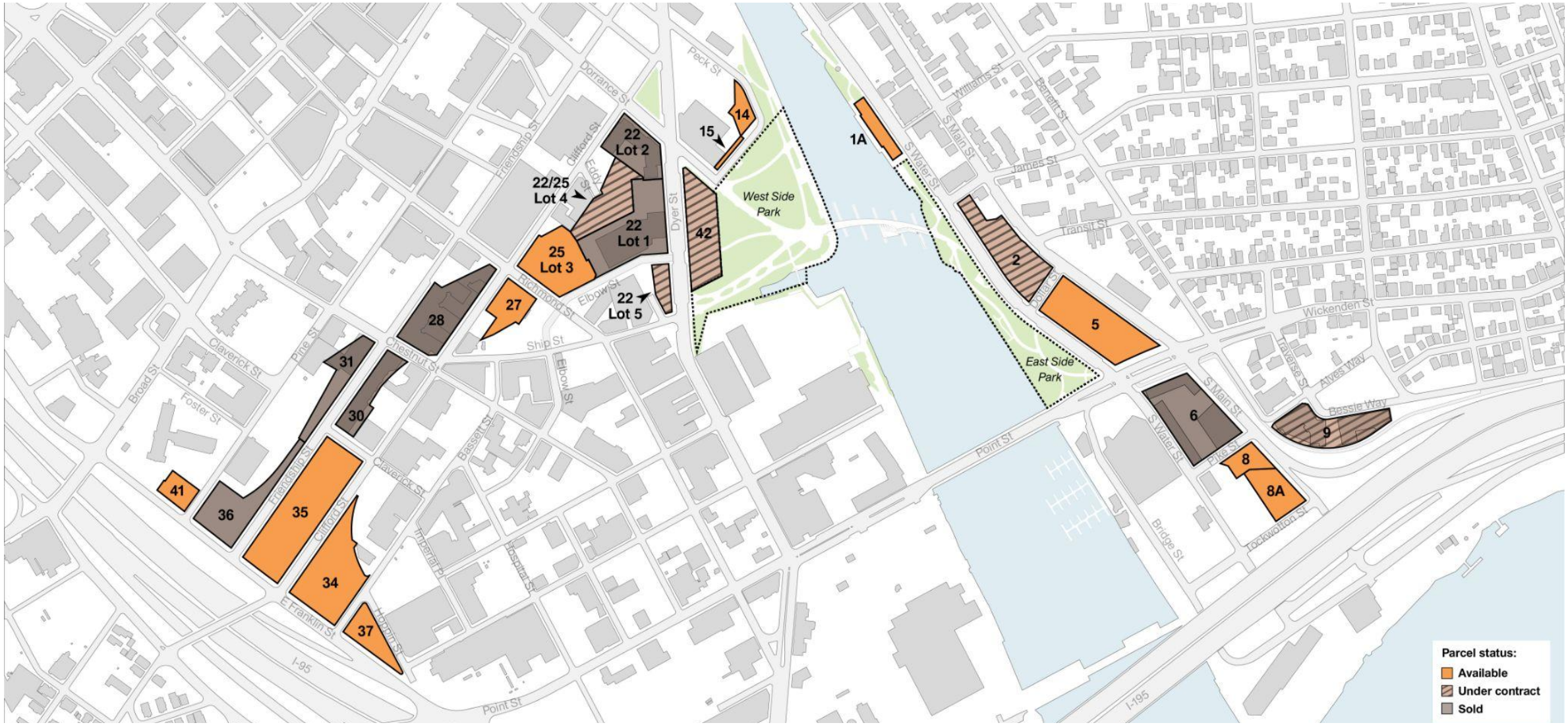
Consultant Team:
- Utile
- Fuss & O'Neill
- Goode Landscape Studio

Partners:
- Providence Resilience Partnership
- University of Rhode Island
- Rhode Island Coastal Resources Management Council

1. Background & Goals

Development Parcels

Adopting an approach specific to District parcels



Resilience Initiatives

The Guidelines and Park improvements are part of a multi-layered approach.

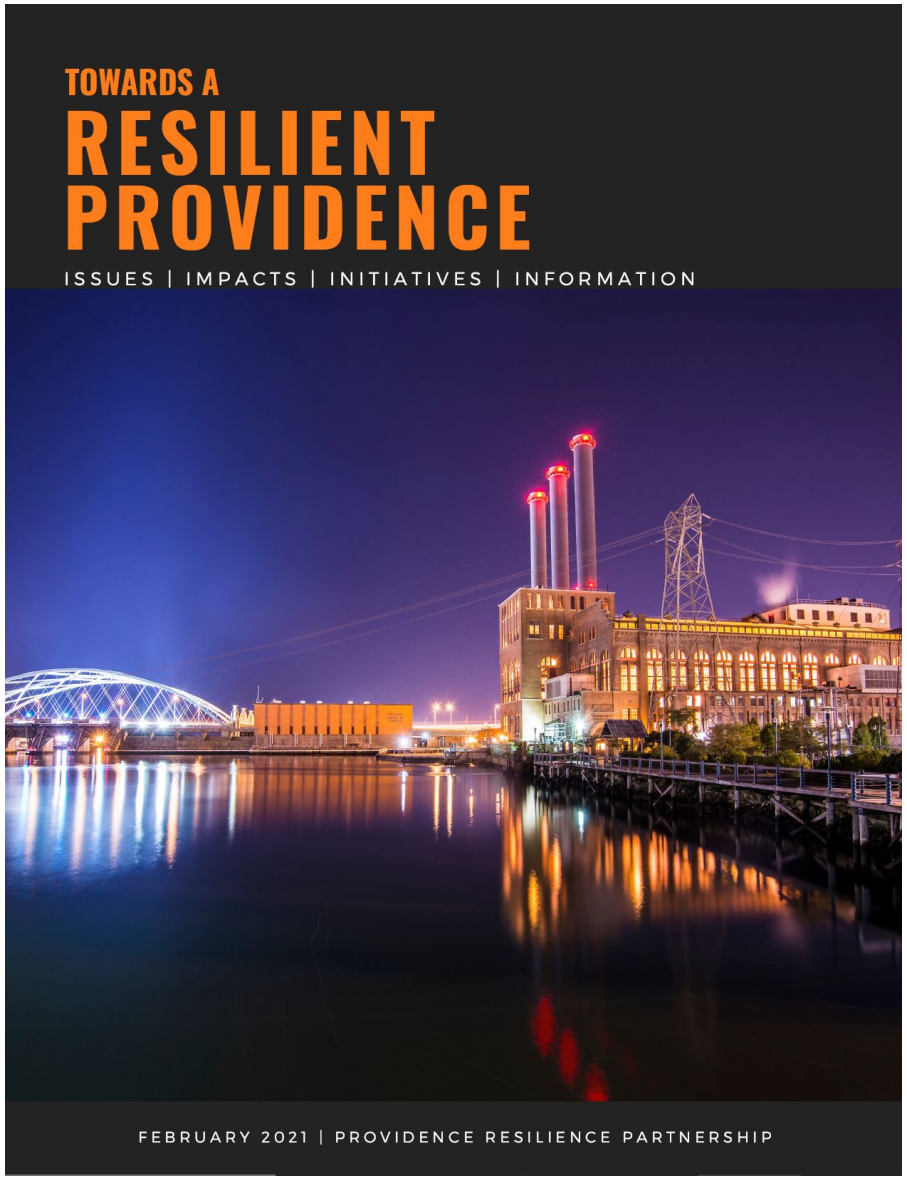
Source: Climate Ready Boston

Hurricane Carol, 1954

Providence Resilience Partnership Recommendations for Downtown

Building an approach from local studies

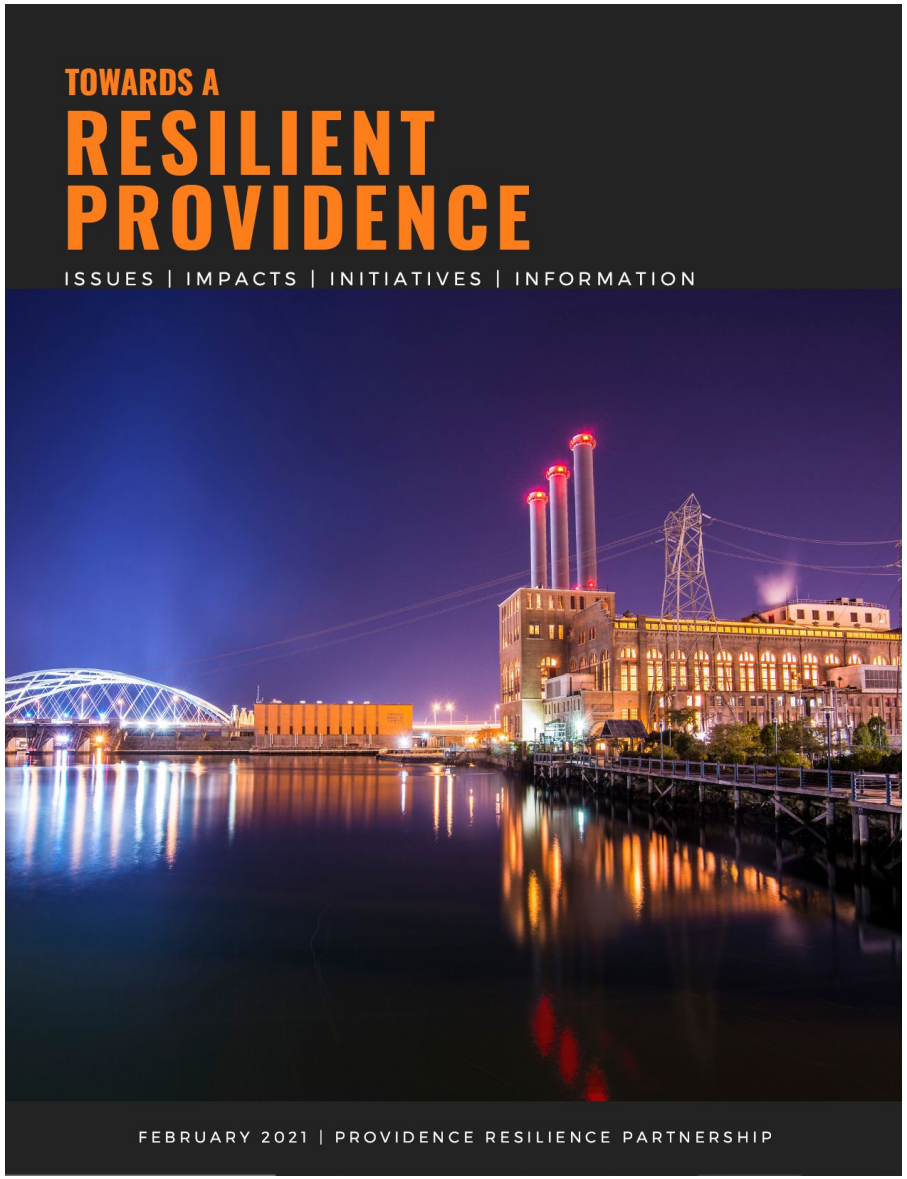
- **Encourage Planning to Exceed State Standards**
  - Consider developing design standards based on risk from future storms and rising seas (*Planning, Collaboration, and Decision Making p.113*)
- **Keep Deadline in Mind**
  - A decision around the Hurricane Barrier must be made around 2050 (*Planning, Collaboration, and Decision Making p.113*)



Providence Resilience Partnership Recommendations for Downtown

Building an approach from local studies

- **Update and Expand Modeling, Assessment and Valuation of Risks**
  - Expand modeling and assessment of future risks to built environment from combined flooding from updand, riverine, and coastal storm surge. (*Research p.114*)



2. Baseline Risk Analysis & Opportunity Assessment

- **Identify Risk Analysis Method**
  - With best existing models: STORMTOOLS, NOAA
- **Identify district-specific issues**
  - Identify opportunities for enhanced resilience
- **Park-Specific Modeling**
  - Based on post-construction topography
  - Opportunity to consider district-wide approaches

Natural Hazard *	Likelihood to Occur	Average Severity of Impact			Pre-planning Preparedness Level	Relative Threat (2019) (*Scale: 0-100%*)
		Human	Property	Business		
Hurricane	High	High	High	High	Moderate	69%
Riverine Flooding	Highly Likely	N/A	High	High	Moderate	67%
High Winds	Highly Likely	Low	Moderate	Low	Moderate	50%
Dam Inundation	High	Moderate	Moderate	Moderate	Moderate	50%
Sea Level Rise	Highly likely	Low	Low	Low	Moderate	42%
Extreme Heat	Highly likely	Low	Low	Low	Moderate	42%
Severe Thunderstorm	Highly Likely	N/A	Low	Low	Low	42%
Flash Flooding	Highly Likely	N/A	Low	Moderate	Moderate	42%
Heavy Rain, Inland/ Urban Flooding	High	N/A	Moderate	Moderate	Moderate	38%
Drought	Moderate	Low	Low	Low	Moderate	21%
Coastal Flooding	Moderate	N/A	Low	Low	Moderate	17%

* Selected hazards assessed over a five-year planning horizon do not account for medium- and long-term threats.

Figure H-1. Relative Threat from Wind, Flood, and Drought-related Hazards in Providence over a Five-year Planning Horizon. Sea level rise was assessed for the short term and, therefore, may not fully reflect change in decades to come (adapted from PEMA, 2019).

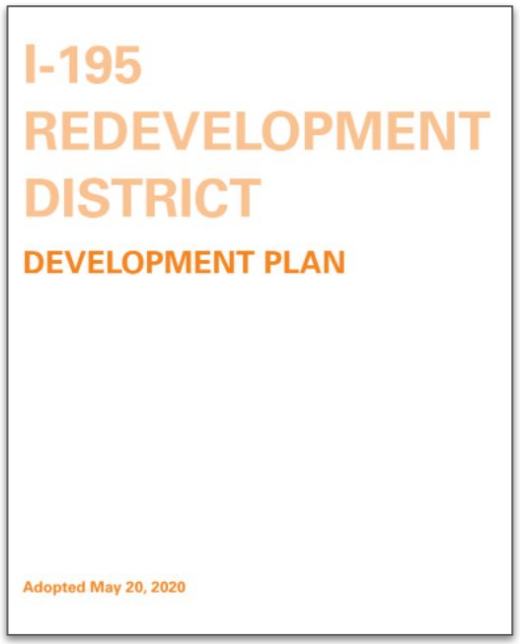
Towards a Resilient Providence

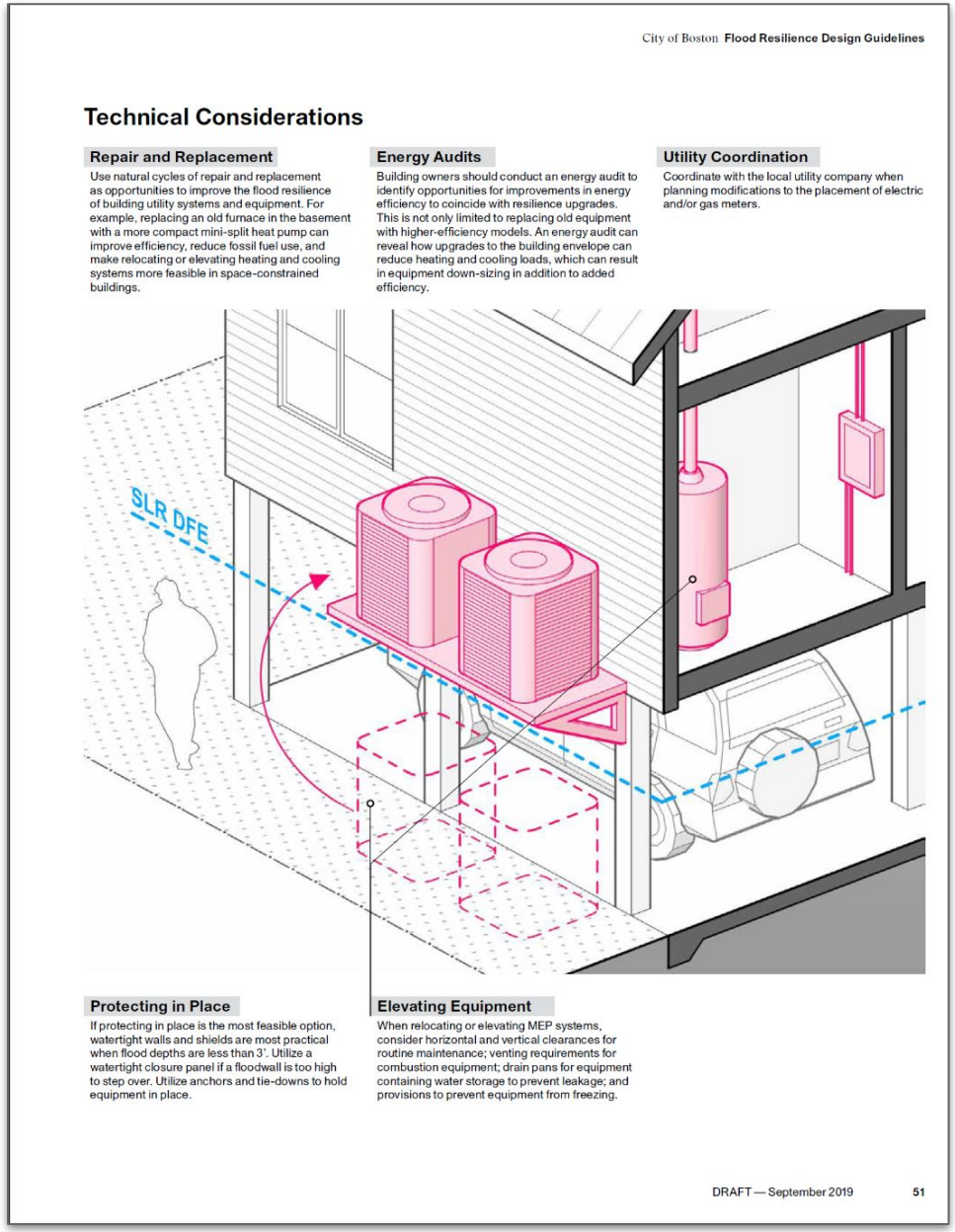
3. Implementation Process for Increased Resilience for Development Parcels

Phased guidance and review to promote parcel-specific approaches

- **Amend Development Plan to update design guidelines with a mix of requirements and recommendations**
- **Review and update procurement and disposition process**
- **Review permitting process**

Update Development Plan with Resilience Guidelines

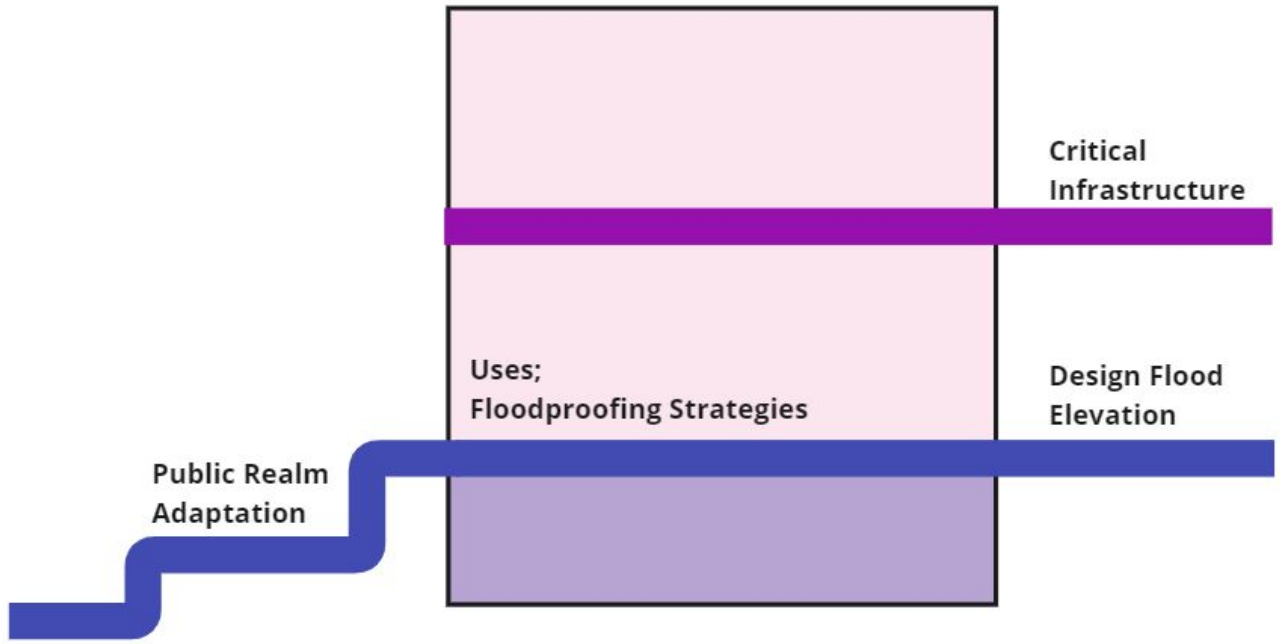




Example from Boston Flood Resilience Design Guidelines

Components of Resilient Development Guidelines

- Design Flood Elevation (DFE)
- Critical building systems protection
- Appropriate uses
- Appropriate floodproofing standards
- Adaptation elements for the public realm
- Identify areas for future adaptability



Example of elevated lobby: exterior approach

Elevate Lowest Interior Floor with Exterior Circulation to DFE

Circulation to reach the elevated first floor level is provided outside the building through exterior walkways, ramps, or stairs. Design measures like planted areas, seating, lighting, and contextually appropriate materials are used to contribute to visual interest, break up the scale of larger surfaces, and add to neighborhood character.

To avoid disrupting visual connectivity and interest along the streetscape, designers should carefully consider the public realm when elevating a building's first floor above the SLR-DFE for flood protection.

Applicability

Project Scale	Non-Art. 80 renovations, Art. 80 renovations and new construction
Building Type	Triple decker, Townhouse, pre-war mixed use, contemporary mixed use
Location	Buildings outside of FEMA AE zones

Cost and Insurance Considerations

$ | $$ | **$$$** | **$$$$**

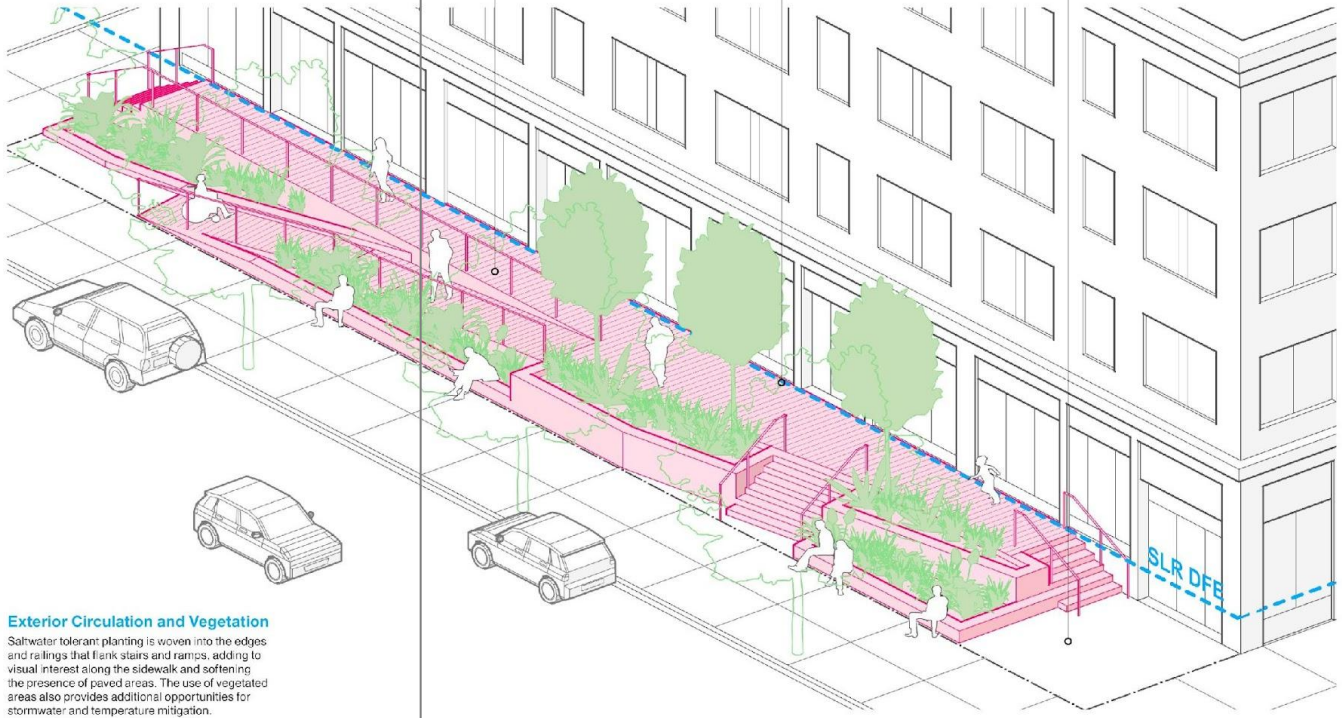
- For projects within Article 25 (FEMA zone), the elevation of structures insured under the NFIP may be eligible for FEMA Hazard Mitigation Assistance grants and flood insurance premium reductions.

Public Realm Considerations

- This strategy can enhance the public realm if designed to add visual interest and to incorporate additional amenities such as landscape and seating.
- The design of exterior circulation elements should pay careful attention to universal design and accessibility. For example, ramps should be designed to be appealing to all users.

Additional Resources

- FEMA P-1037, Reducing Flood Risk to Residential Buildings That Cannot Be Elevated



Exterior Circulation and Vegetation

Saltwater tolerant planting is woven into the edges and railings that flank stairs and ramps, adding to visual interest along the sidewalk and softening the presence of paved areas. The use of vegetated areas also provides additional opportunities for stormwater and temperature mitigation.

Technical Considerations

Alternatives for Access

If a front yard ramp is not possible, an accessible exterior ramp may be provided within the side yard or rear yard.

Resisting Flood Loads

Stairs, ramps, and walkways must be designed to structurally resist design flood loads.

Floodproofing below the DFE

This strategy should be combined with floodproofing measures below the DFE to protect against flood damage. This would include either wet floodproofing to allow automatic entry and/or exit of floodwaters or dry floodproofing.

Consider the Public Right-of-way

Exterior ramps and stairs may not encroach into the public right-of-way. If a building has intentional setbacks that provided publicly accessible private space, that space may be used for accessible external ramps.

Furthermore, such additions added onto existing historic buildings will need to observe design guidelines within landmark districts.

Example of elevated lobby: interior approach

Elevate Lowest Interior Floor with Interior Circulation to DFE

For buildings that have high first floor ceilings, a portion of the first floor may be elevated or reconstructed at or above the SLR-DFE to protect that floor from flood risk. Circulation to reach the elevated first floor level from an at-grade entry area may be provided by internal ramps and stairs.

Elevating a new or existing building's ground floor above the DFE can protect against flood damage; however, a change in ground plane may lead to the unintended consequence of disrupting the visual connectivity between pedestrians and building interiors. One way to avoid this disruption is by providing a carefully designed interior circulation area that mediates an at-grade entry area with an elevated main floor.

Applicability

Project Scale	Non-Art. 80 renovations
Building Type	Triple decker, Townhouse, Post-war mixed use, Contemporary mixed use
Locations	Appropriate for buildings located outside of FEMA AE zones

Cost and Insurance Considerations

$ | $$ | $$$ | **$$$$**

- For projects within Article 25 (FEMA zone), the elevation of structures insured under the NFIP may be eligible for FEMA Hazard Mitigation Assistance grants and flood insurance premium reductions.
- Similarly, if the building is located within a FEMA zone, elevating the lowest floor may trigger a Substantial Improvement declaration.

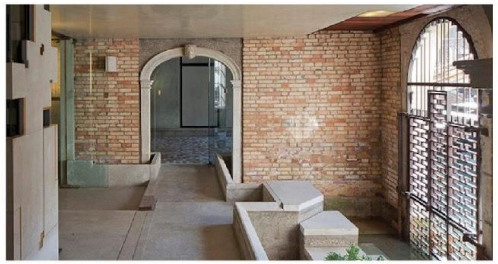
Public Realm Considerations

- In new construction, to maintain visual connection at the sidewalk and an active streetscape, circulation from at-grade lobbies (wet or dry floodproofed) can lead to elevated areas above the DFE.
- This strategy may be an advantageous technique for maintaining the front facade of an historic building while enhancing the resilience of the structure.

Additional Resources

- FEMA P-1037, Reducing Flood Risk to Residential Buildings That Cannot Be Elevated
- FEMA P-467-2, Floodplain Management Bulletin - Historic Structures

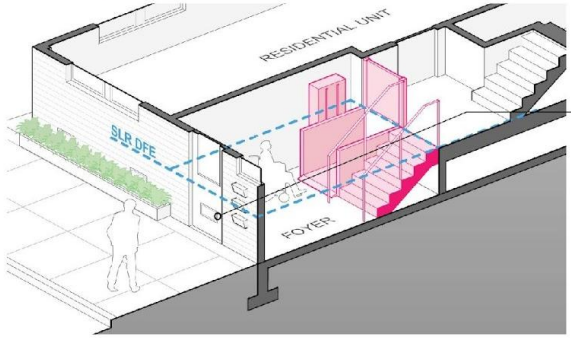
Retrofitted stairs lead to an elevated first floor in a retail shop in Darlington, Wisconsin. *Photo: FEMA. 2013. Floodproofing Non-Residential Buildings.*



Floodable entryway with stairs that lead to an elevated lobby at the Querini Stampalia in Venice, Italy. *Photo: Architectours / "The renovation of the Fondazione Querini Stempalia is a great example of how Master Carlo Scarpa integrated the new with the old"*

Technical Considerations

Small Building Strategy



Openings

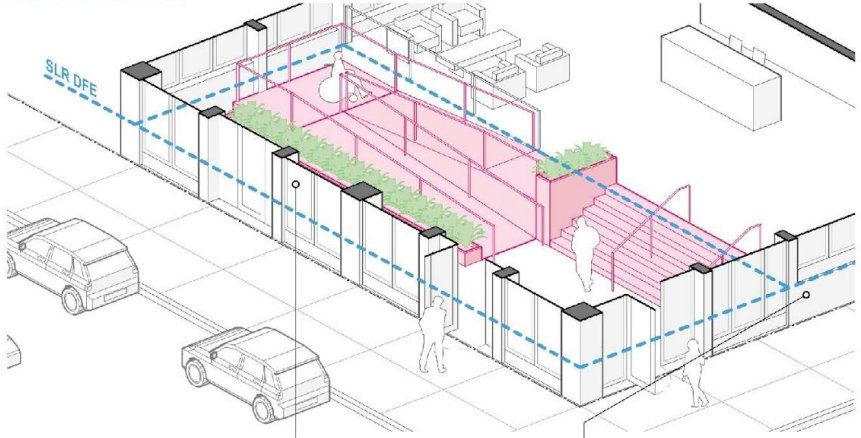
All penetrations, such as openings for HVAC, electrical, and plumbing systems, should be removed and relocated above the design flood elevation.

Floodproofing below the DFE

The resulting space below the elevated interior floor should be filled to create a stem wall or retrofitted with flood openings (see Wet Floodproofing, p44 for details.) Below-grade spaces for storage or parking may be maintained only if dry floodproofed in coordination with review and approval by an engineer for resistance to flood-related loads on the structure (see Dry Floodproofing, p46 for details.) Spaces below the SLR-DFE are non-habitable.

Wet floodproofing of the entry area allows water to enter and exit through vents in the storefront wall or entry door, equalizing hydrostatic pressure. The wet floodproofed vestibule uses flood damage resistant materials.

Large Building Strategy



Ground Floor Height

The floor-to-ceiling height of the ground floor must be high enough to accommodate a reduced ceiling height. While many existing buildings may have this height capacity, an elevated floor may disrupt the way windows and doors relate to the first floor, so this strategy must be coordinated with the character of the existing facades and remain integrated with the public realm.

Dry Floodproofing

Dry floodproofing may be utilized in a limited way to seal and reinforce the interior surfaces of the entry area and/or providing internal flood shields to prevent the seepage of water further into the building. Spaces below the SLR-DFE are non-habitable. This strategy allows for an at-grade connection between the sidewalk and the building to preserve the character of the building's exterior (see Dry Floodproofing, p46, for details).

Park Resilience Planning

- **Analysis**
  - Update modeling with new topography
  - Opportunity Assessment

- **Recommendations**
  - Identify areas of opportunity for increased resilience
  - Recommendations to inform infrastructure investments, including food and beverage pavilion
  - Selection of resilient plant material able to withstand inundation

Goals for the Guidelines

1. Balance best practices for flood protection with reasonable development feasibility and public realm benefit.

2. Identify an appropriate Design Flood Elevation (DFE) and approach based on existing conditions and models and time frame, addressing both storm surge and regular tidal flooding.

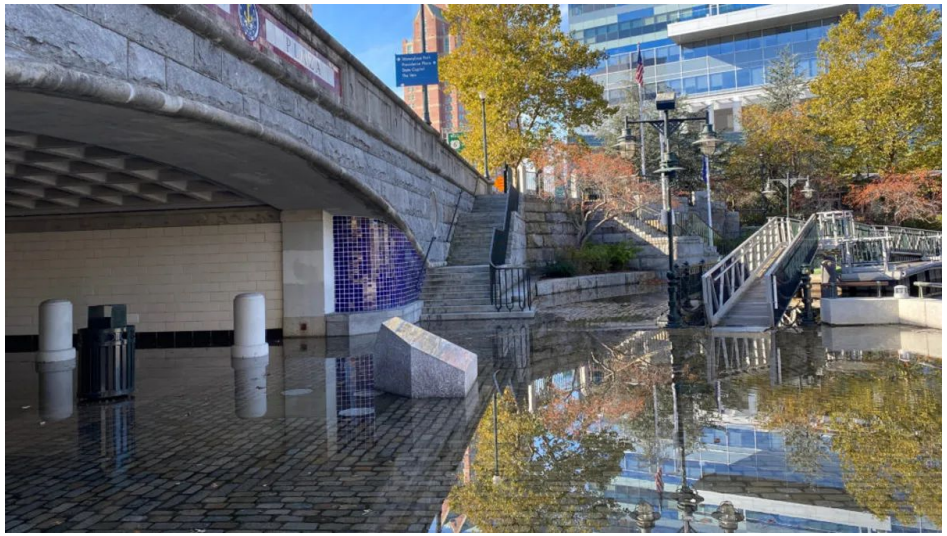
3. Tailor the guidelines to address both area-wide concerns as well as site-specific ones.

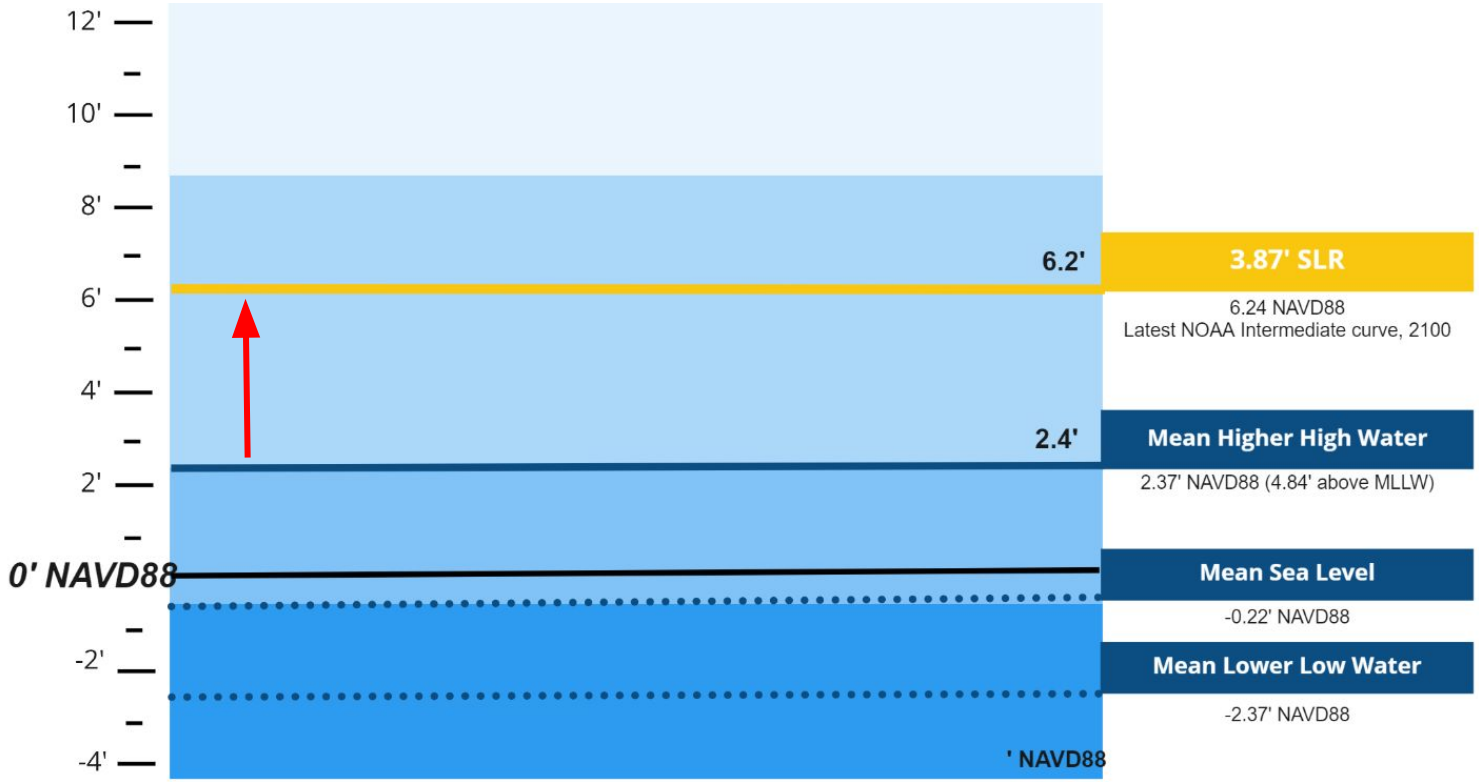
Relevant Findings
Storm Events

- STORMTOOLS projections for 0’ and 3’ of SLR
- *https://stormtools-design-elevation-sde-maps-crc-uri.hub.arcgis.com/*

Relevant Findings
Tidal Flooding

- NOAA 2022 SLR Projections for 2100 (Newport RI)
- Intermediate Curve
- *https://sealevel.nasa.gov/task-force-scenario-tool?psmsl_id=351*





Process & Next Steps

1. **Complete baseline analysis**

2. **Draft recommendations for updating the Development Plan**

3. **Discussion/public comment** at future Commission meeting prior to any update to Development Plan