Flood Mitigation Options

March 29, 2018

Shannon Jarbeau, CFM
Barnstable County, MA/Woods Hole Sea Grant

Flood Hazards &
Historic Structures

Structural Changes

- Relocation
  - Structure/site
  - Stairs/deck etc. when applicable
- Elevation
- Fill basement
- Dry floodproofing (barriers)
- Wet floodproofing (e.g. flood vents)
- Use original/new flood-resistant materials below Base Flood Elevation

Non-Structural Changes

- Start with Elevation Certificate
  - Letter of Map Amendment
- Relocate important contents
- Regrading/positive drainage
- Elevate/protect mechanicals & utilities
- Use window wells to protect against small floods
- Emergency measures (e.g. sandbagging)

Source: NFIP *Floodplain Management Bulletin on Historic Structures*

Historic Structure Considerations

- What makes the property historic?
- Which of the mitigation options will best preserve the historic nature?
- Are their other alternative mitigation options?
- Resources:
  - National Park Service's *Preservation Briefs*
  - Secretary of the Interior's *Standards for the Treatment of Historic Properties*
  - National Flood Insurance Program's *Floodplain Management Bulletin on Historic Structures*

Alternative Mitigation Study: Breezy Point, NY

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Flood Hazards & Historic Structures

Breezy Point *Home Elevation Study*

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NY RISING | GOVERNOR'S OFFICE OF STORM RECOVERY

Louis Berger

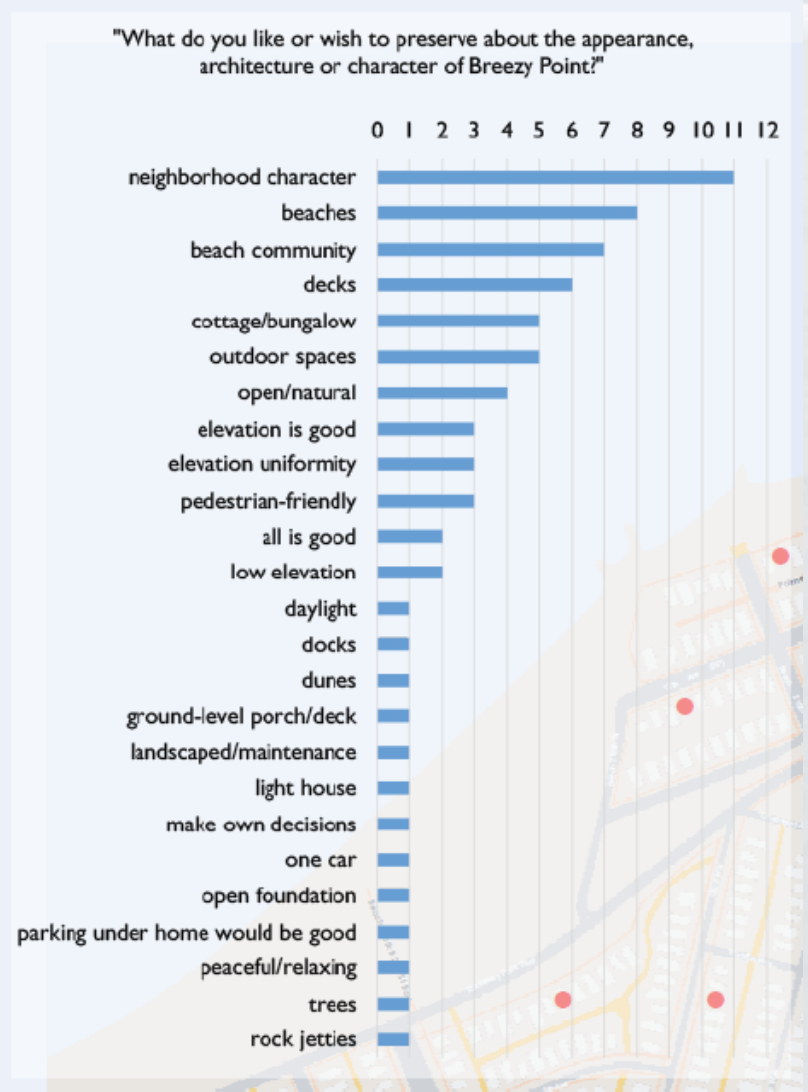
GoshowArchitects

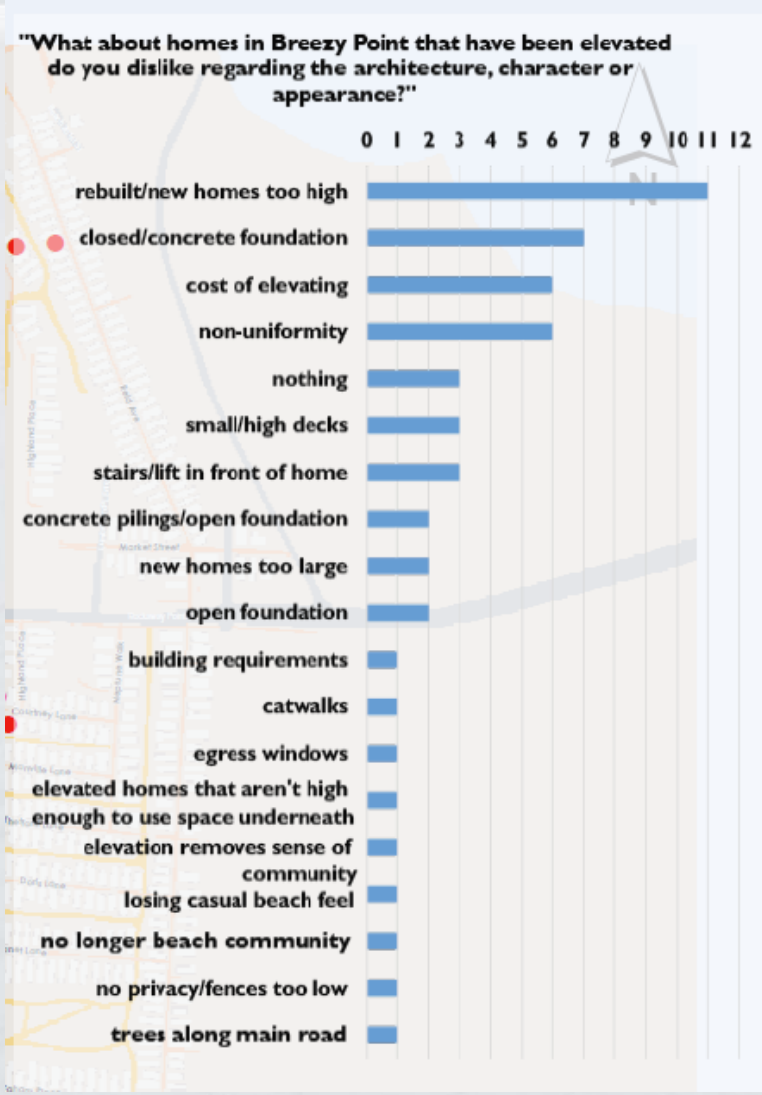
Overview

- Incorporates geographic and developmental understanding of community
- Perspectives
  - Architectural (individual homes)
  - Urban design (how individual homes function as a community)
- Impacts
  - Mitigation options/elevation on community character
  - Existing conditions on mitigation options

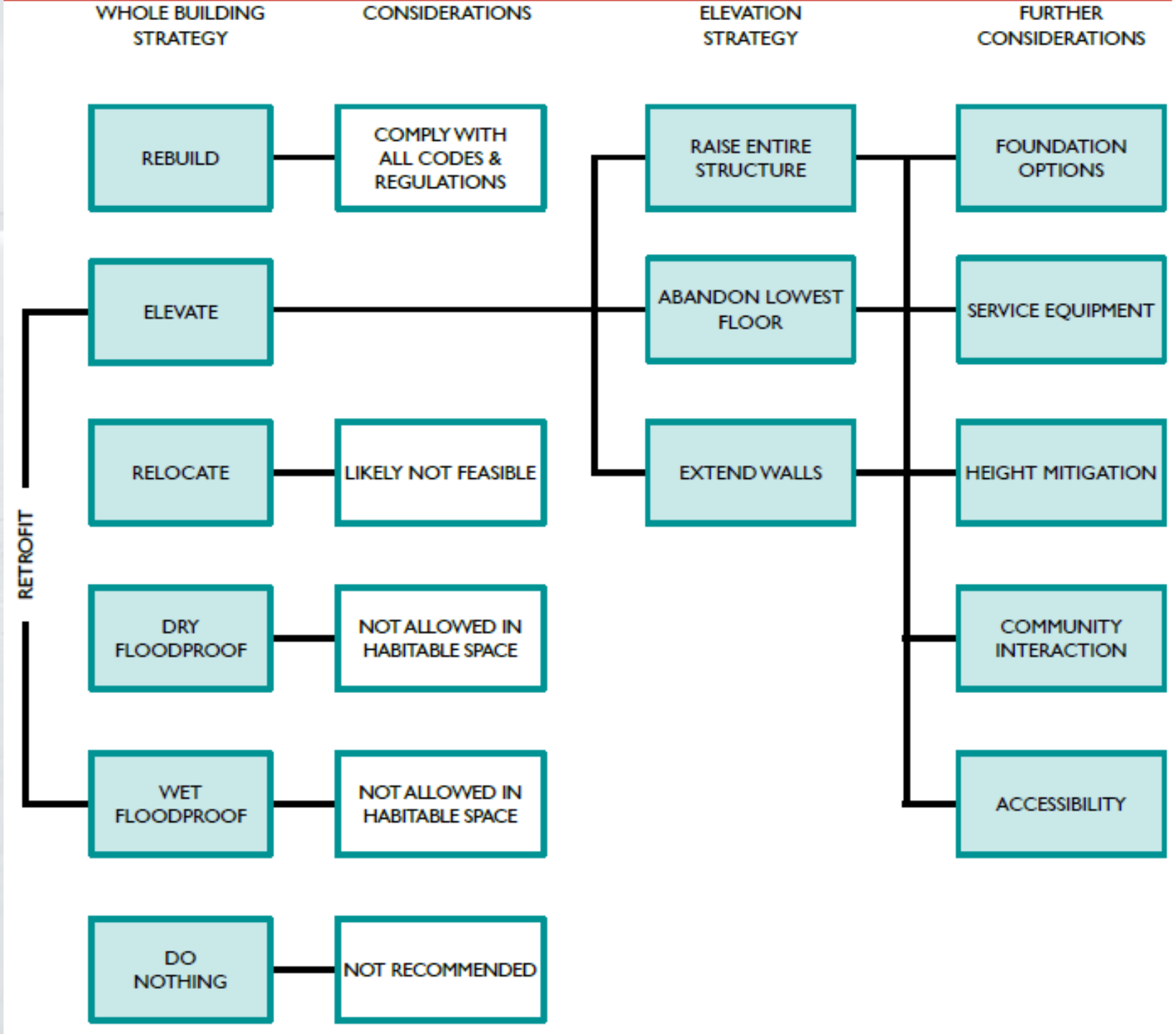
Figure 1-1. **Regional Overview.** Breezy Point and Roxbury Areas in Queens, NY. Source: ESRI Aerial Imagery, BPC

Public Input – Capturing Character





Structural Options



Costs

Table 2. Reconstruction Costs

RECONSTRUCTION COSTS		
Based on 1000 SF and 2000 SF Living Space		
	High ($)	Low ($)
Hard Costs		
Per Square Foot Living Area	400	275
1000 SF Living Space	$450,000	$275,000
2000SF Living Space	$700,000	$500,000
Soft Costs		
Survey	1,500	1,000
Homeowner relocation/temp housing	25,000	15,000
A/E Plans and Specs	20,000	10,000
Inspections	12,000	6,000
Permitting/Filing	10,000	5,500
Expediting	8,000	5,500
Energy Star Consulting	6,000	4,500
Soft Cost Total	$82,500	$47,500
RECONSTRUCTION TOTAL RANGE		
1000 SF Living Space	$532,500	$322,500
2000 SF Living Space	$782,500	$547,500

Table 1. Elevation Costs

ELEVATION COSTS		
Typical based on 1200 SF Footprint, 2 Stories, 2400SF Living Space		
	High ($)	Low ($)
Hard Costs		
Cost to Elevate	40,000	25,000
Demo	30,000	15,000
Excavation and Fill	25,000	16,000
Foundation, Piles, Caps and Piers	75,000	55,000
New Access Construction	12,000	8,500
Electrical	12,000	6,500
Plumbing	6,000	3,000
Miscellaneous Construction	15,000	5,000
Fire Protection	15,000	0
Environmental	10,000	0
Site Protection	15,000	8,000
Hard Cost Total	$255,000	$142,000
Soft Costs		
Survey	1500	900
Homeowner relocation/temp housing	25000	15000
A/E Plans and Specs	20000	10000
Inspections	9000	6000
Permitting/Filing	7500	5500
Expediting	8000	5500
Soft Cost Total	$71,000	$42,900
ELEVATION TOTAL RANGE	$326,000	$184,900
ELEVATION TOTAL RANGE ($/FOOTPRINT SF)	$272	$154

Street/ Neighborhood Approach (rather than structure only)

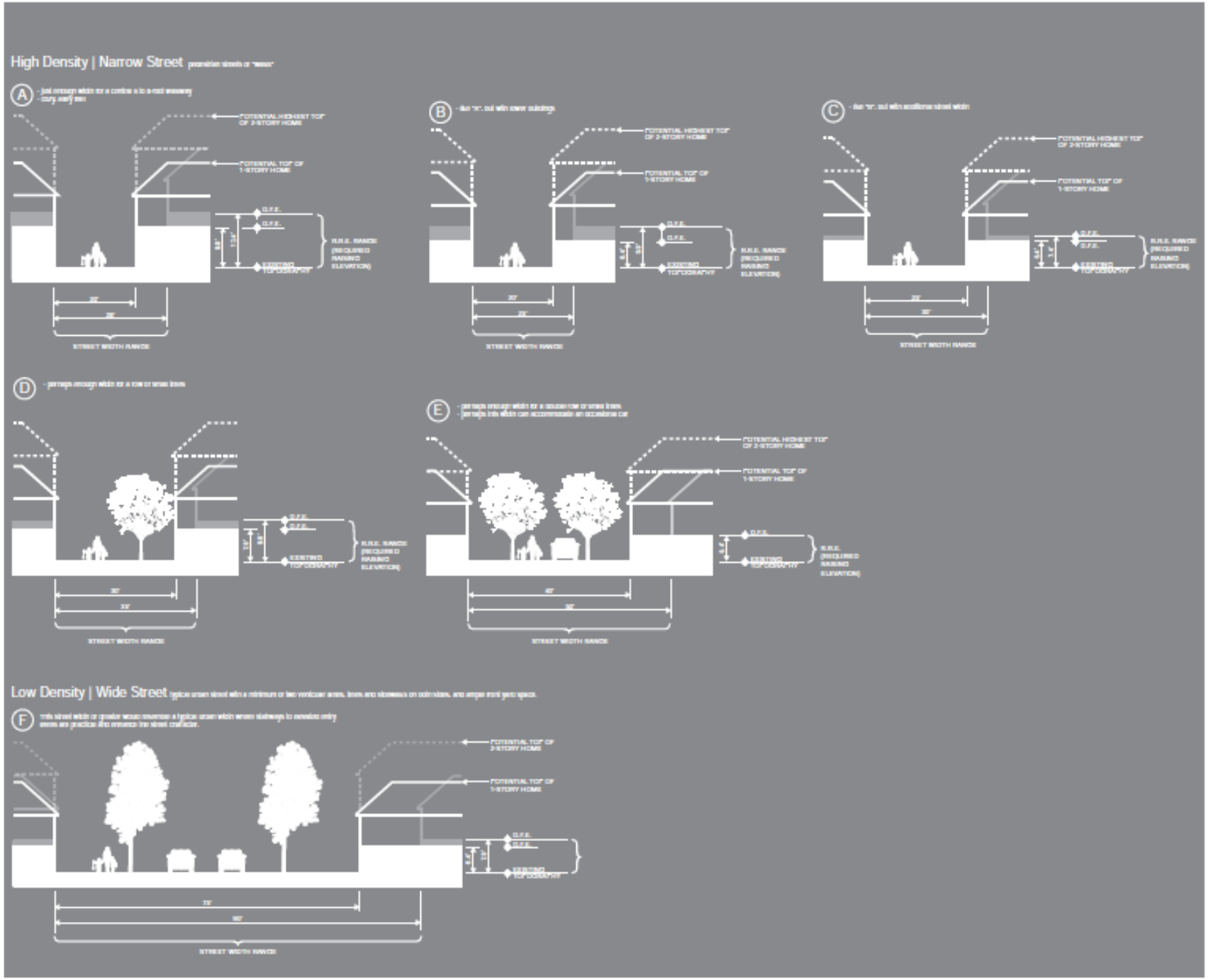


Figure 4-3. **Street Section Typologies.** Typical sections based on Neighborhood Character Types.

HEIGHT MITIGATION OPTIONS

Height Mitigation Options Chart

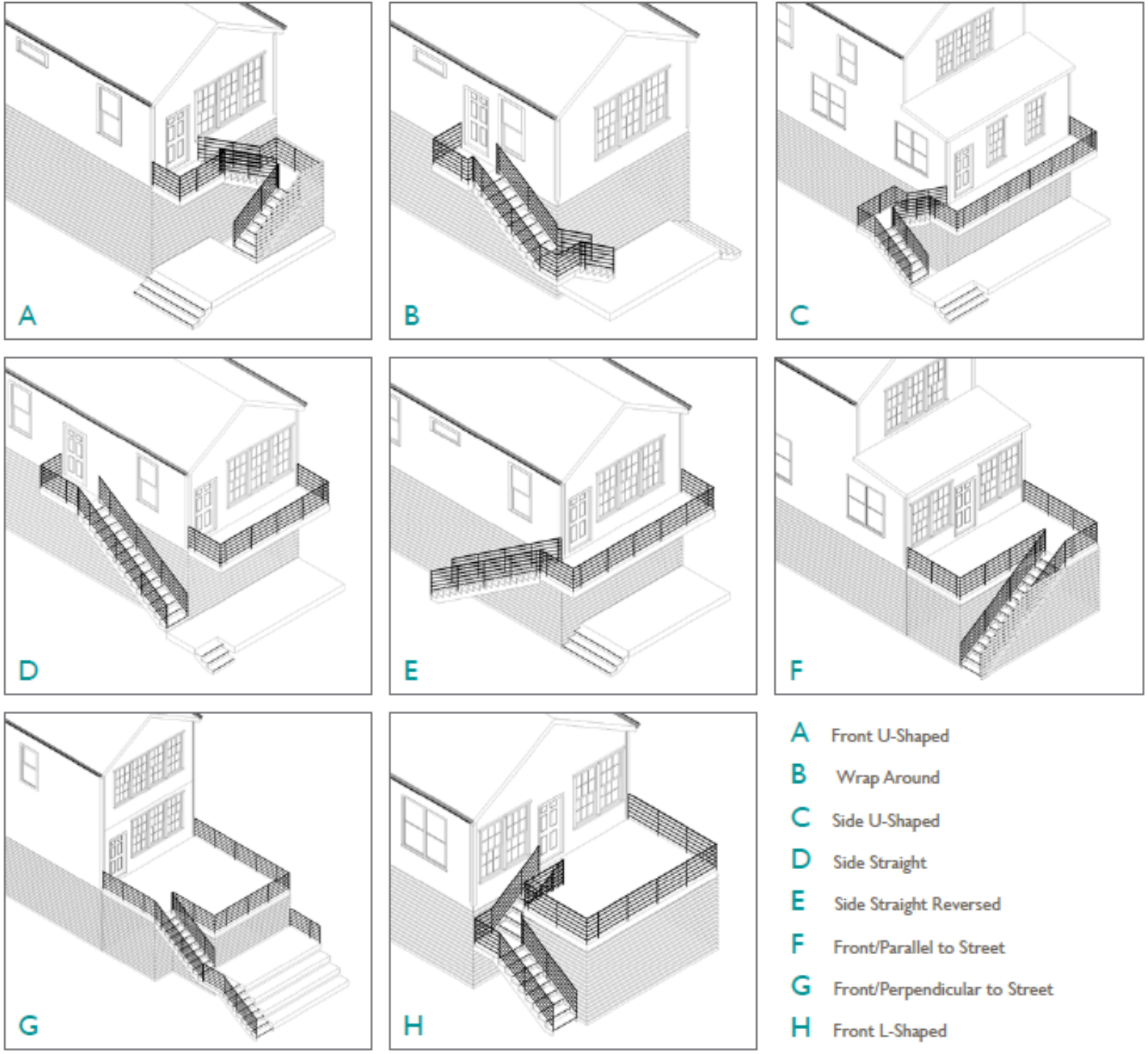
NYC Zoning and Breezy Point Co-Op Regulations require that elevated homes have additional architectural elements at the street level to promote a pedestrian friendly and engaging streetscape.

Level of First Floor After Elevation:	Number of Height Mitigation Elements Required:
0 ft. - 5 ft. Above Grade	0
5 ft. - 9 ft. Above Grade	1
9'+ Above Grade	2

	Porch/Deck	Stairs With 90 Degree Turn	Plantings	Raised Yards
Type Of Height Mitigation				
Counts towards Height Mitigation for Zoning	✓	✓	✓	✓
Applicable in Breezy Point	✓	✓	✓	X
Details and Additional Information	See pages 62-63 for design requirements	See Page 64 for design requirements and possible stair layouts.	See Page 65 for design requirements. See NYC Zoning, 64-A50 for regulations for homes on corner lots, or with excessively narrow front yards.	N/A

NOTE: No Height Mitigation is required where more than 50 percent of the street wall of the building is within three feet of the street line. However, it is still suggested that all homes employ height mitigation elements.

Stairs


A
B
C
D
E
F
G
H
A Front U-Shaped
B Wrap Around
C Side U-Shaped
D Side Straight
E Side Straight Reversed
F Front/Parallel to Street
G Front/Perpendicular to Street
H Front L-Shaped

Community Character & Social Interactions

Figure 6-12. Community Interaction Elements

Neighborhood 1

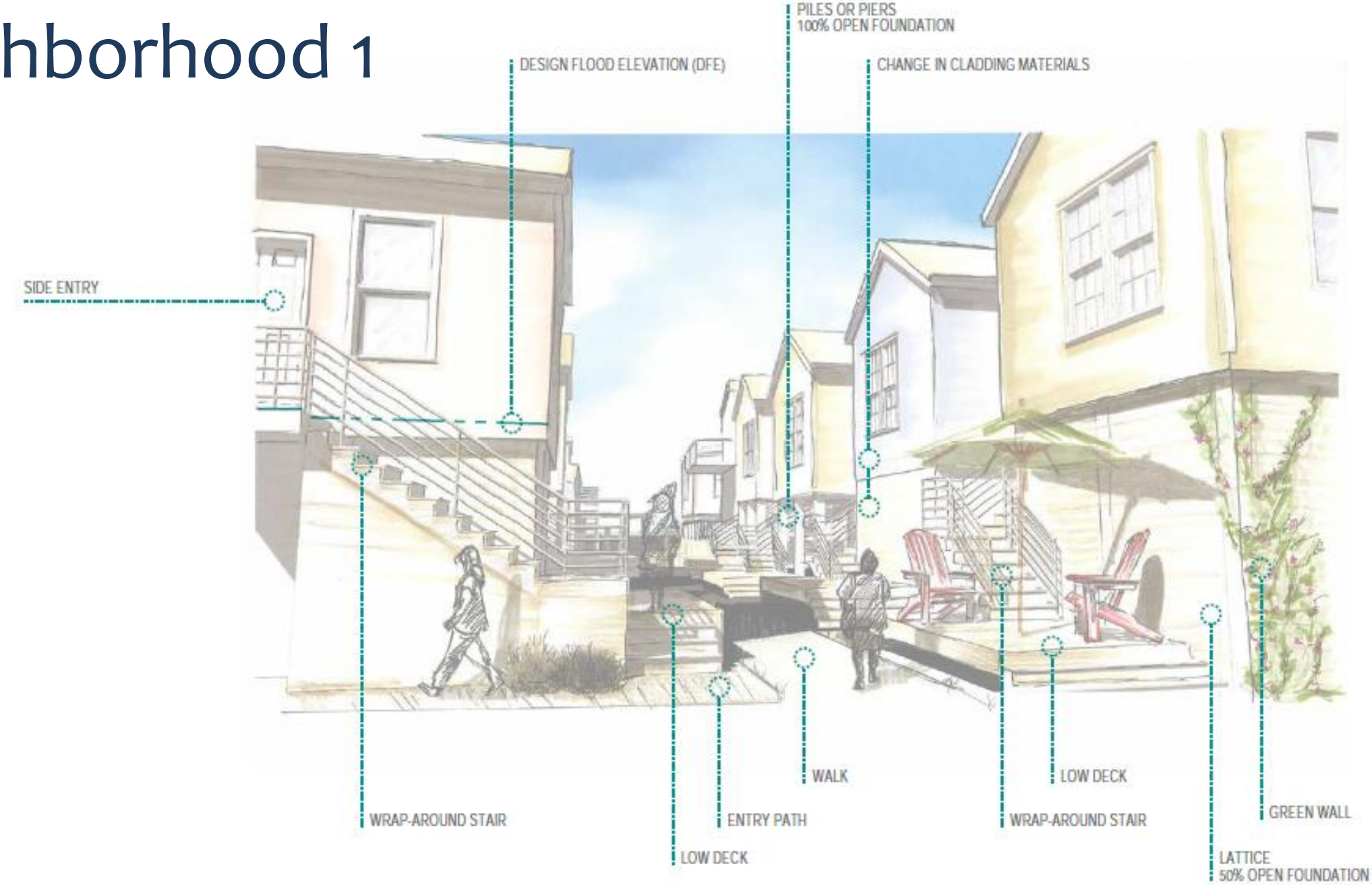


Figure 7-13. Architectural standards, concepts and terminology as visible in the conceptual illustration.

Neighborhood 2

Figure 7-28. Architectural standards, concepts and terminology as visible in the conceptual illustration.

Neighborhood 3

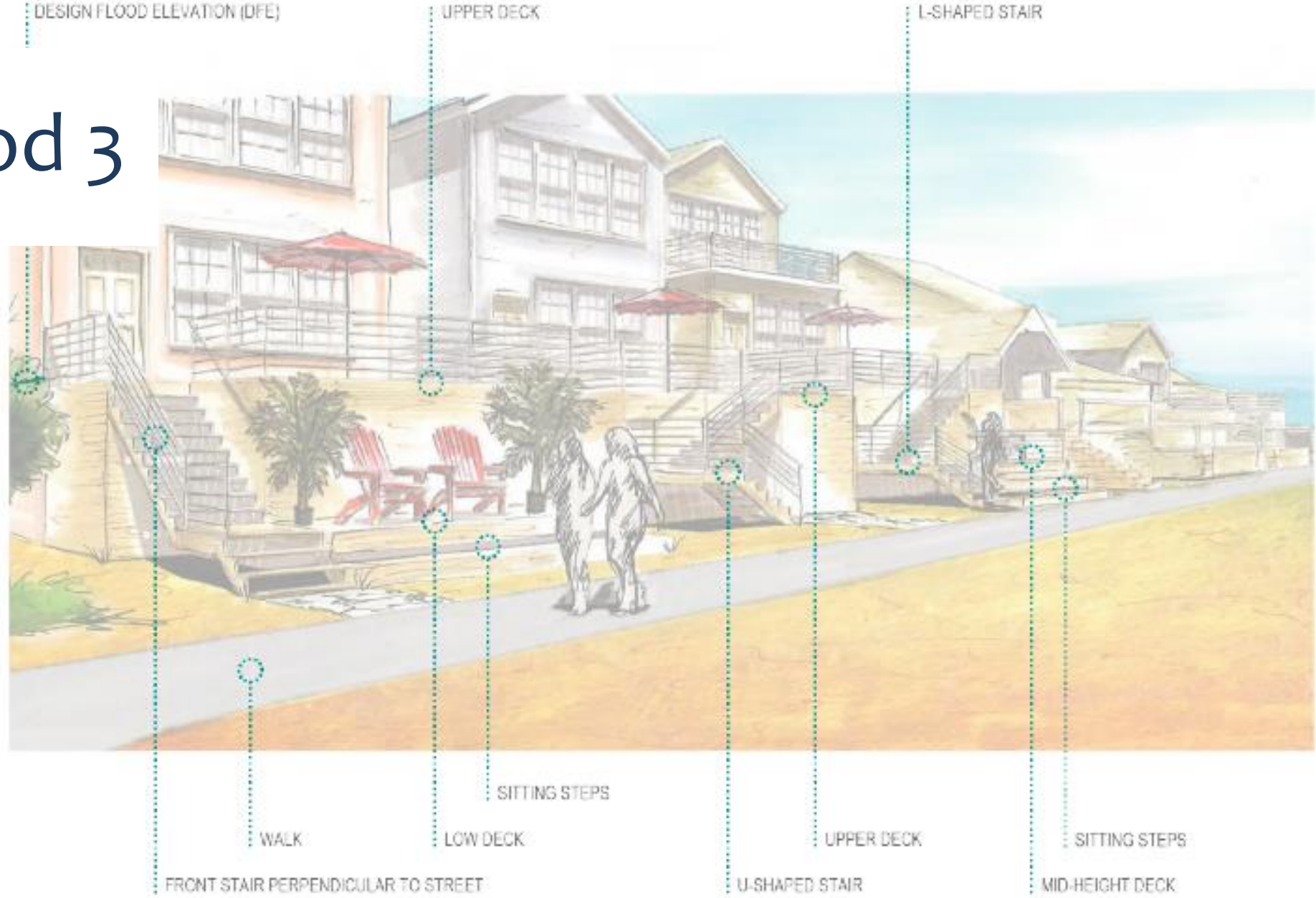
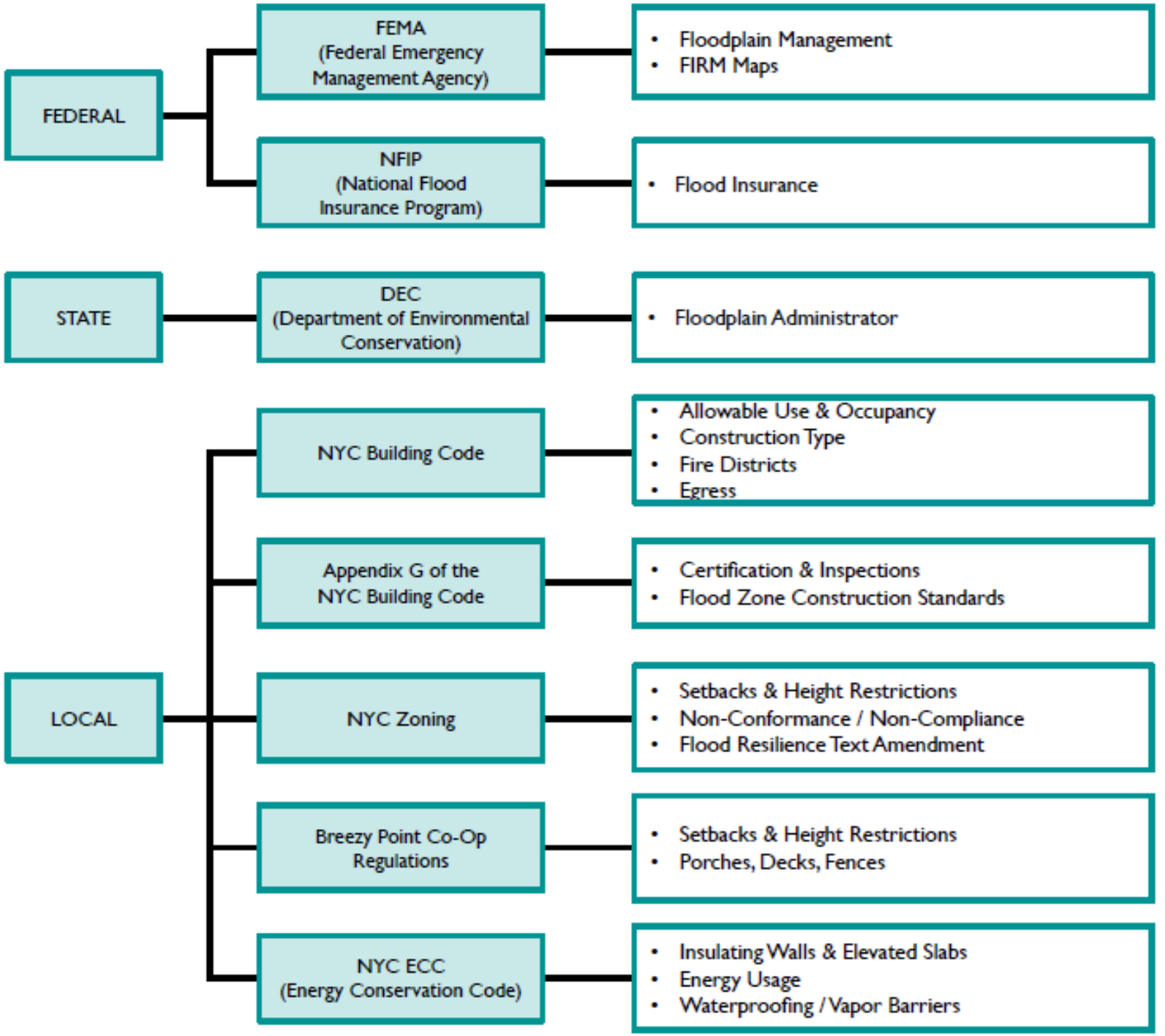


Figure 7-57. Architectural standards, concepts and terminology as visible in the conceptual illustration.

Regulatory Framework



Questions?

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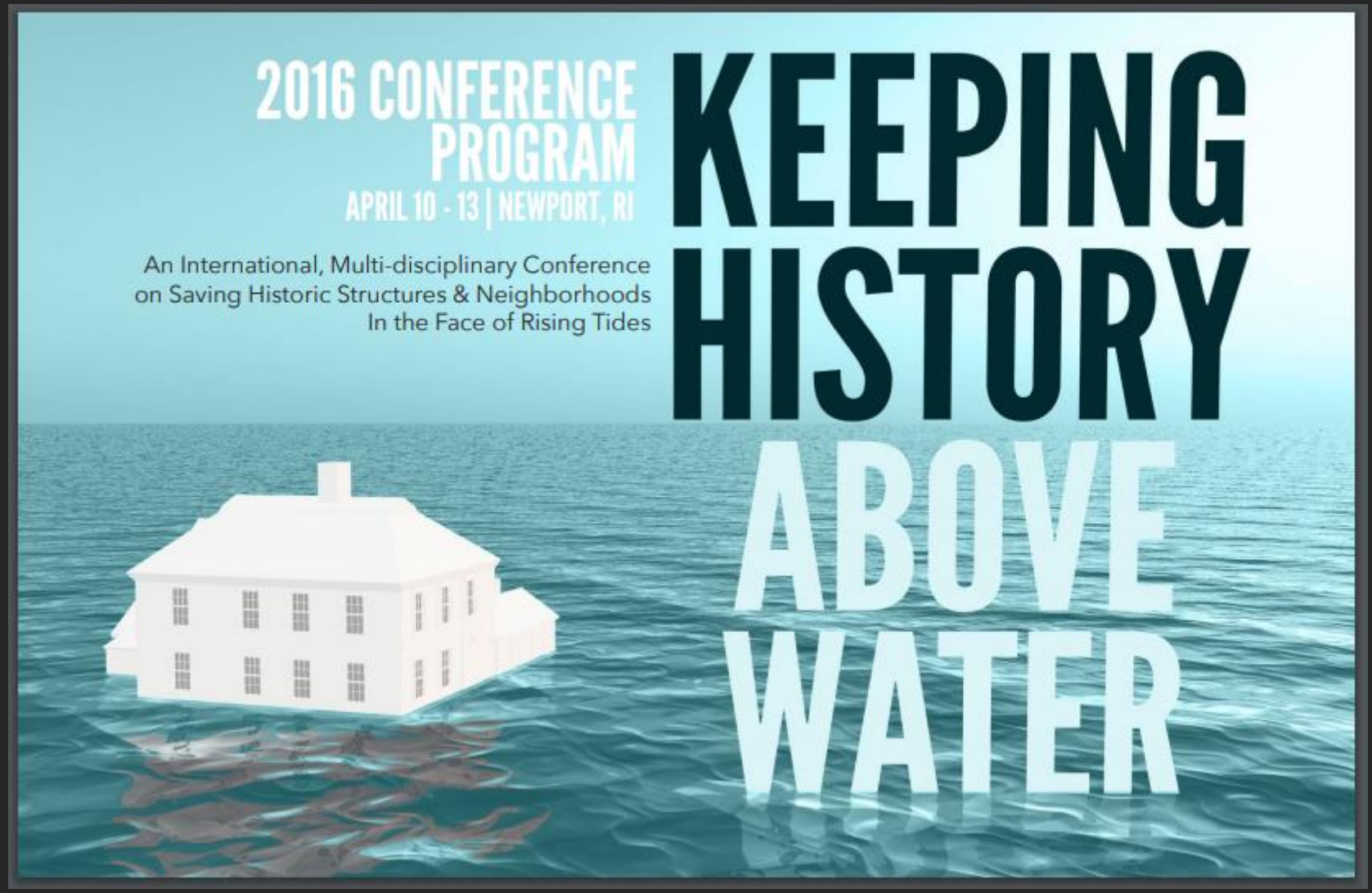
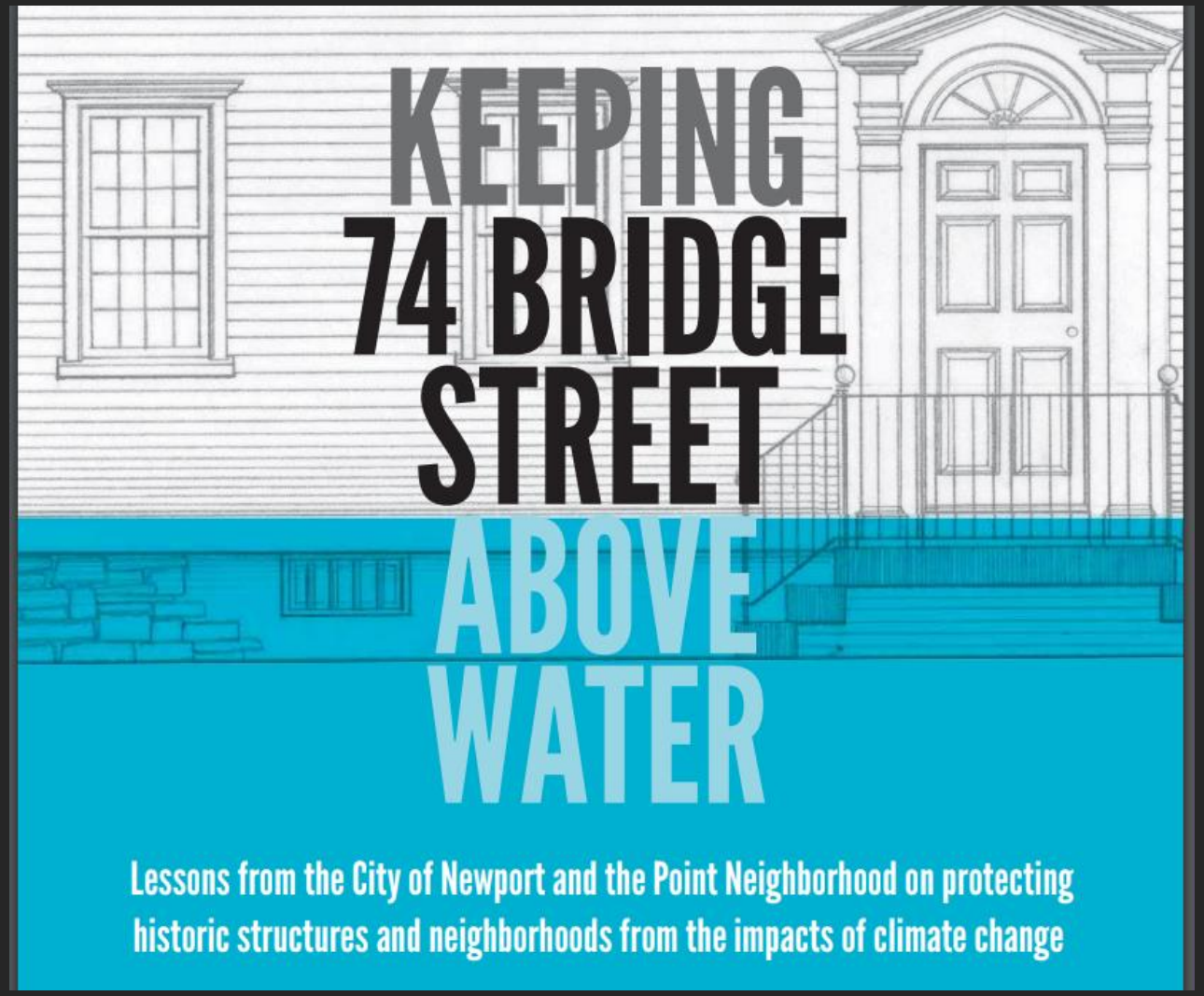
MITIGATION OPTIONS AND ALTERNATIVES



CAPE COD COMMISSION

MITIGATION OPTIONS AND ALTERNATIVES



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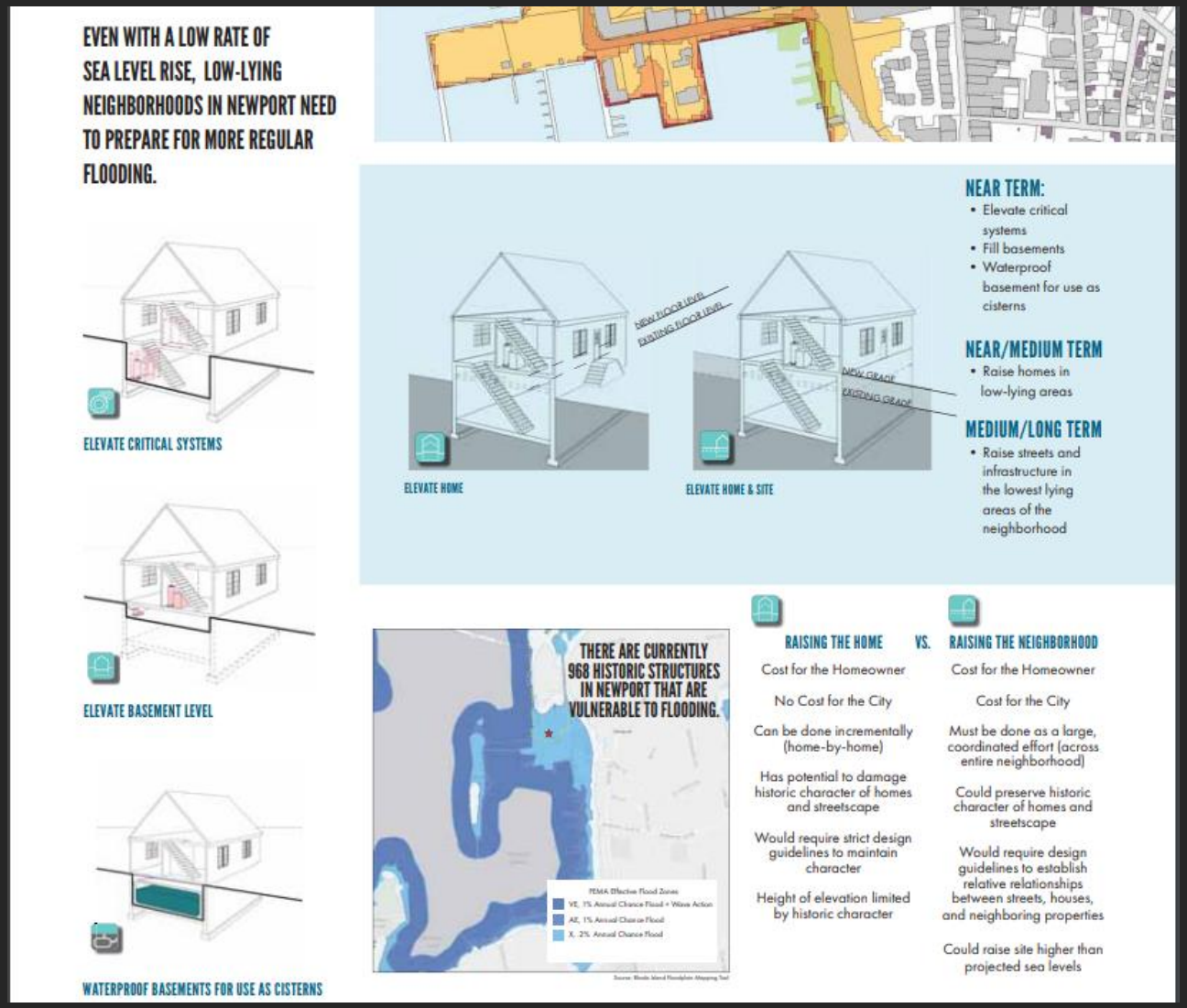

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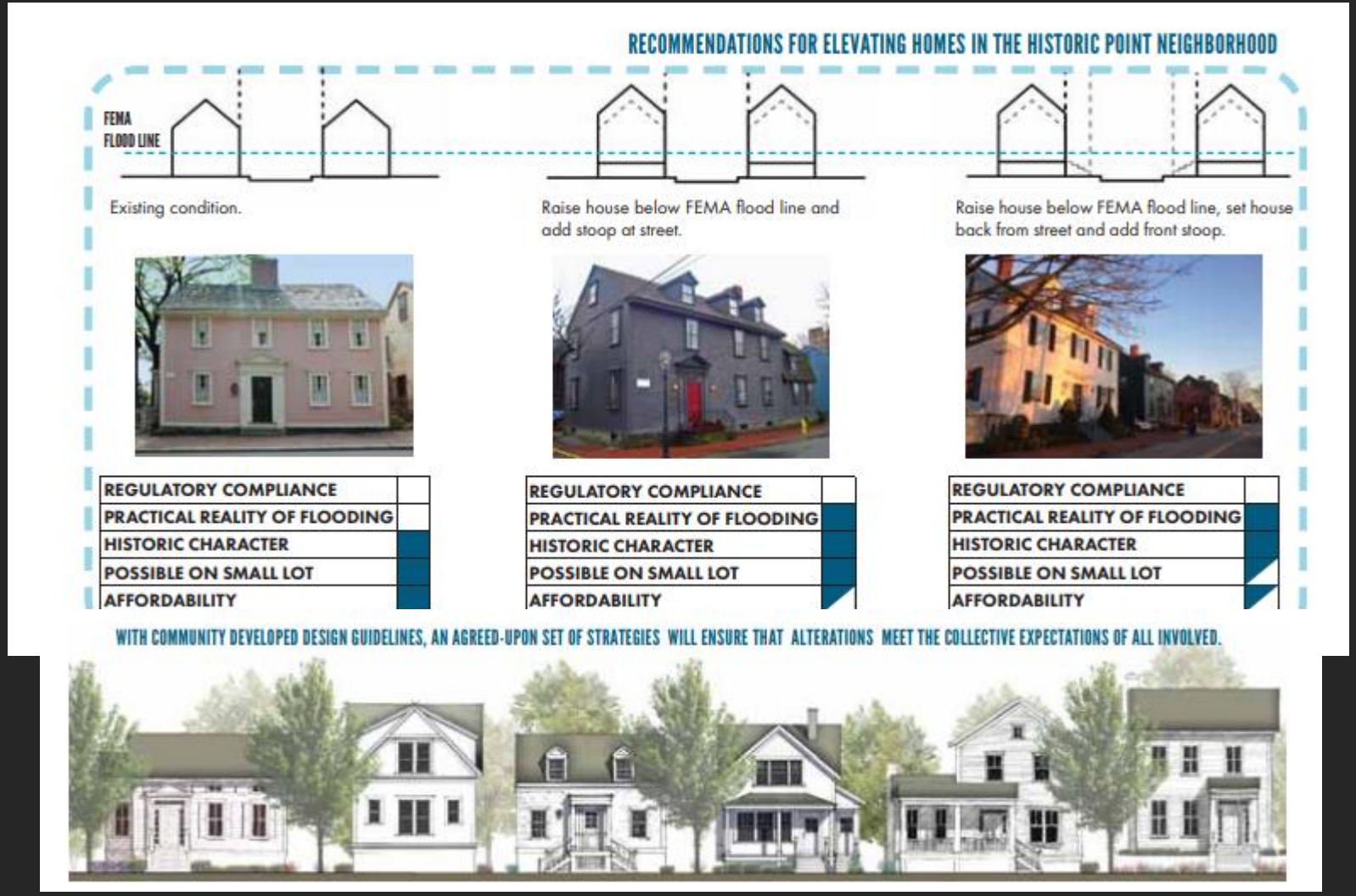

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