Resilient Density in Cambridge

BSA Urban Design Workshop, *A Quarter More: Exploring Density in Metro Boston*

Final Pinup

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The City of Cambridge needs to **add density** to address current and future housing needs.

At the same time, the City has set **ambitious sustainability and resiliency goals.**

The problem as we see it is **not only how and where to build additional density**, but how to **build it right**, in the context of the changing climate.

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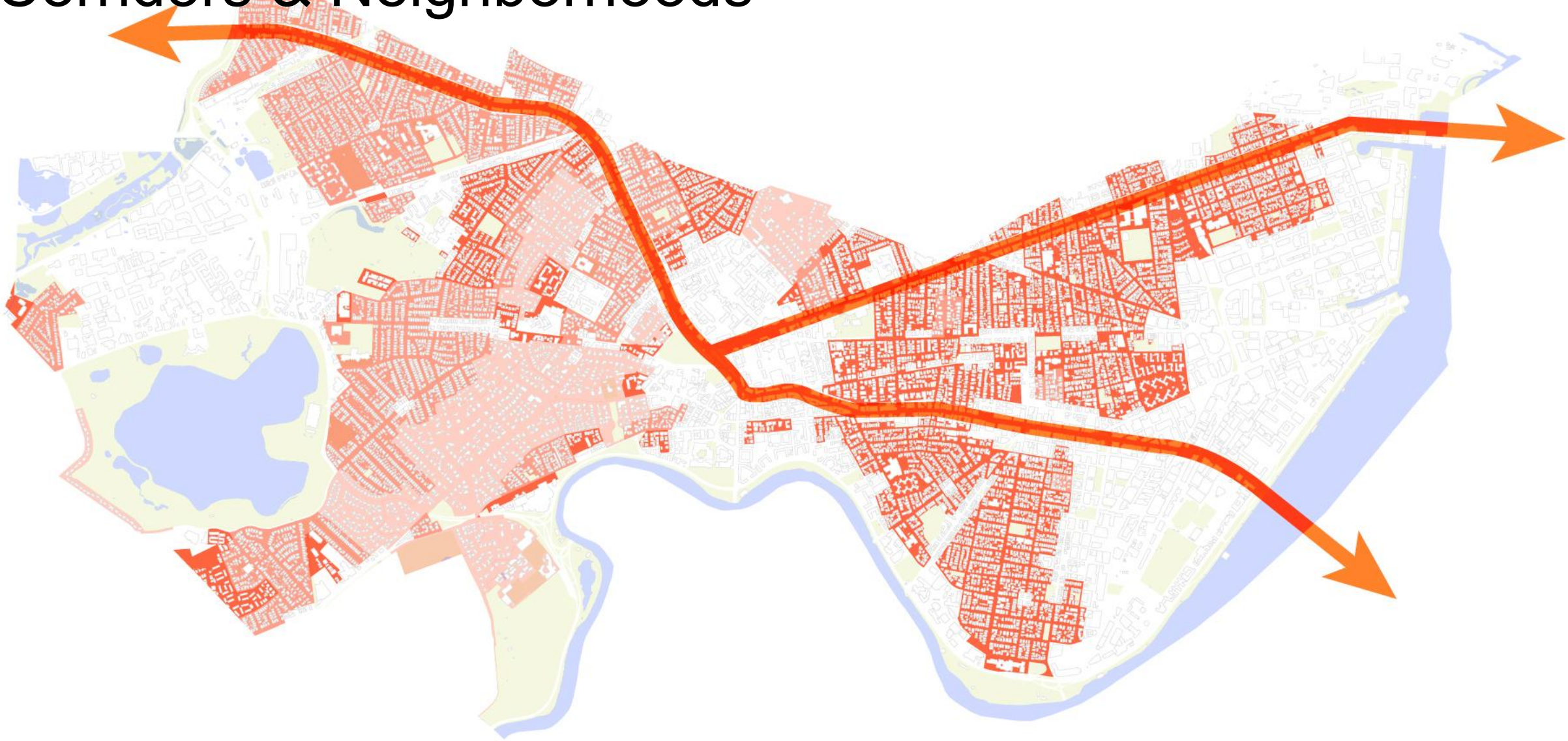
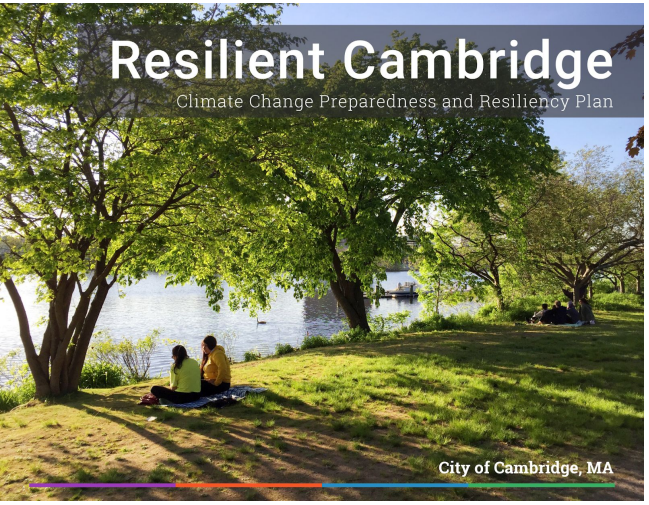
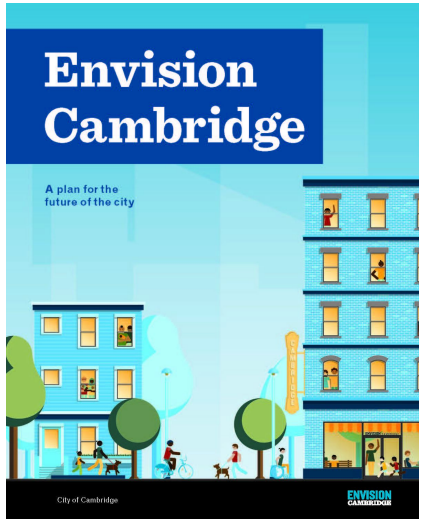
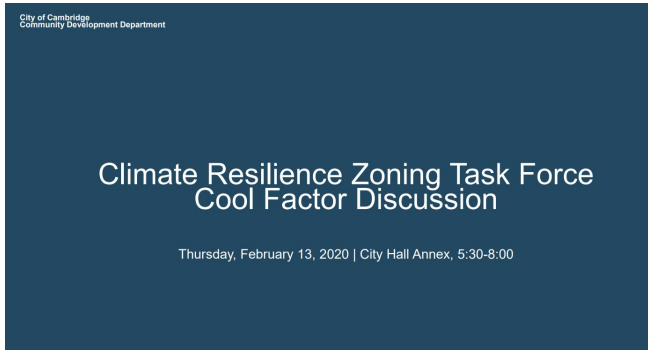
Corridors & Neighborhoods



Resilience Reports







Resilient Cambridge Plan

- Closer Neighborhoods
- Better Buildings
- Stronger Infrastructure
- Greener City

Urban Forest Master Plan

- Healthy urban forest available to all in Cambridge
- Predicated on understanding of present existing conditions

Envision Cambridge

- Climate Action
- Climate Change Preparedness
- Ecological Protection
- Water Quality
- Waste Management
- Environmental Justice

Cooling Factor

- Focus on cool factor, not flooding
- Zoning Changes
- Open Space Requirements
- Understanding SRI

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Six Resilience Themes

1. Flooding
- Planning for storm surge/sea level rise
- Rainwater management
- Building ground level

2. Extreme Heat Days
- Extreme heat days will triple by the year 2030
- Increase urban tree canopy
- Require passive building design
- High albedo surfaces

3. Open Space Requirements
- Ecological preservation
- Cambridge has lost 16 acres of coverage since 2009

4. Zoning Changes
- Mixed-use density near transit
- Eliminate parking minimums
- Accessible green roofs
- Shaded structures

5. Stronger Infrastructure
- Mitigate flooding
- Adapt energy and telecom infrastructure facilities
- Support resilient mobility
- Protect drinking water supply (Fresh Pond)
- Preserve material resources

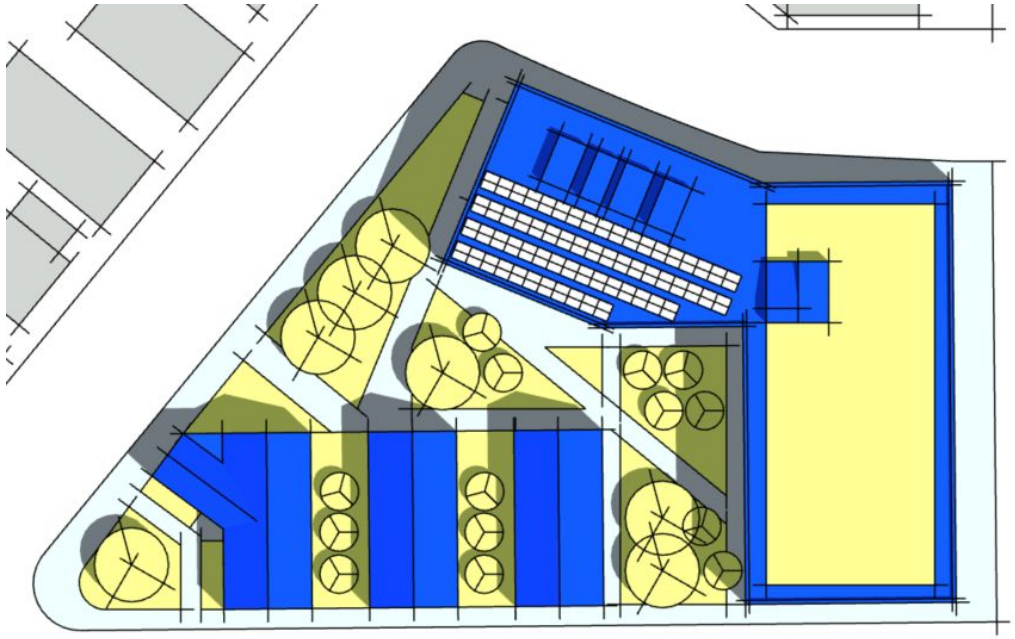
6. Social Resiliency
- Create shared amenities in both housing and open space

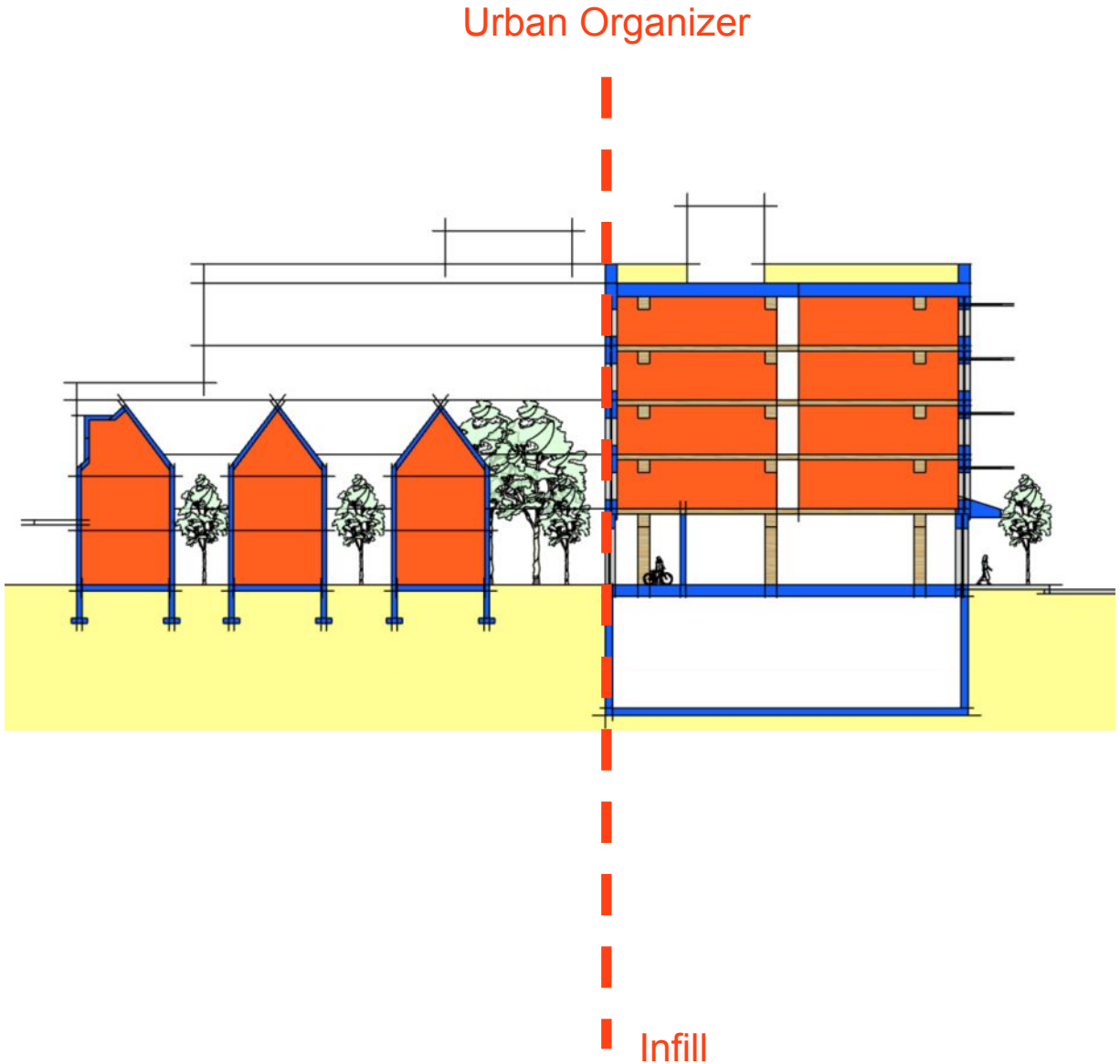
		PROPOSAL CATEGORIES				
		Corridor – Organizer/Infill	Corridor – Infill	Neighborhood – Major Alteration	Neighborhood – Minor Alteration	Neighborhood – Green Infrastructure
RESILIENCE THEMES	FLOODING	Storm Chambers. Elevated 2nd Floor	Rainwater management, maintain water table	Housing raised and "wash-away" program used to avoid flooding	Ground floor amenity space, Pervious surfaces, Rain gardens	Ecologies used to hold rainwater
	EXTREME HEAT DAYS	CLT, Passive House, Greenery	High albedo paving materials, Street trees and plantings, Embodied and operational carbon	House as shading structure and tree coverage, High albedo materials	Passive design, High albedo surfaces, Shading	Shading Structures and Tree Canopies employed
	OPEN SPACE REQUIREMENTS	Concentrated higher density to create open space, rooftop	Location of open space consistent with urban surroundings, Sense of place	Open Space increased to 60% Minimum	Green roof, shared open space	Additional 118,000 SF of additional open parkland
	ZONING CHANGES	Parking, Building Height and F.A.R	Transportation-oriented development	Green Roof, Open Space, Eliminate parking, Cohabitation	Ground floor use, Green roof for density, Green roof as open space, Eliminate parking minimums	Change of zoning from business to open space
	STRONGER INFRASTRUCTURE	Electric/Energy Grid Support, Transportation Alternatives	Net-zero buildings, All-electric systems, Renewable on-site solar energy	Housing raised to prevent flooding main living spaces	Preserve and adapt existing buildings, micromobility	"Green Infrastructure" employed throughout
	SOCIAL RESILIENCY	Various building types bring different uses and residents	Inclusive to the existing community, socially just and ecologically restorative	Cohabitation and shared living spaces throughout	Co-housing, shared amenities	Additional Open Space as extension of Fresh Pond

Corridor –
Organizer/Infill

Overall

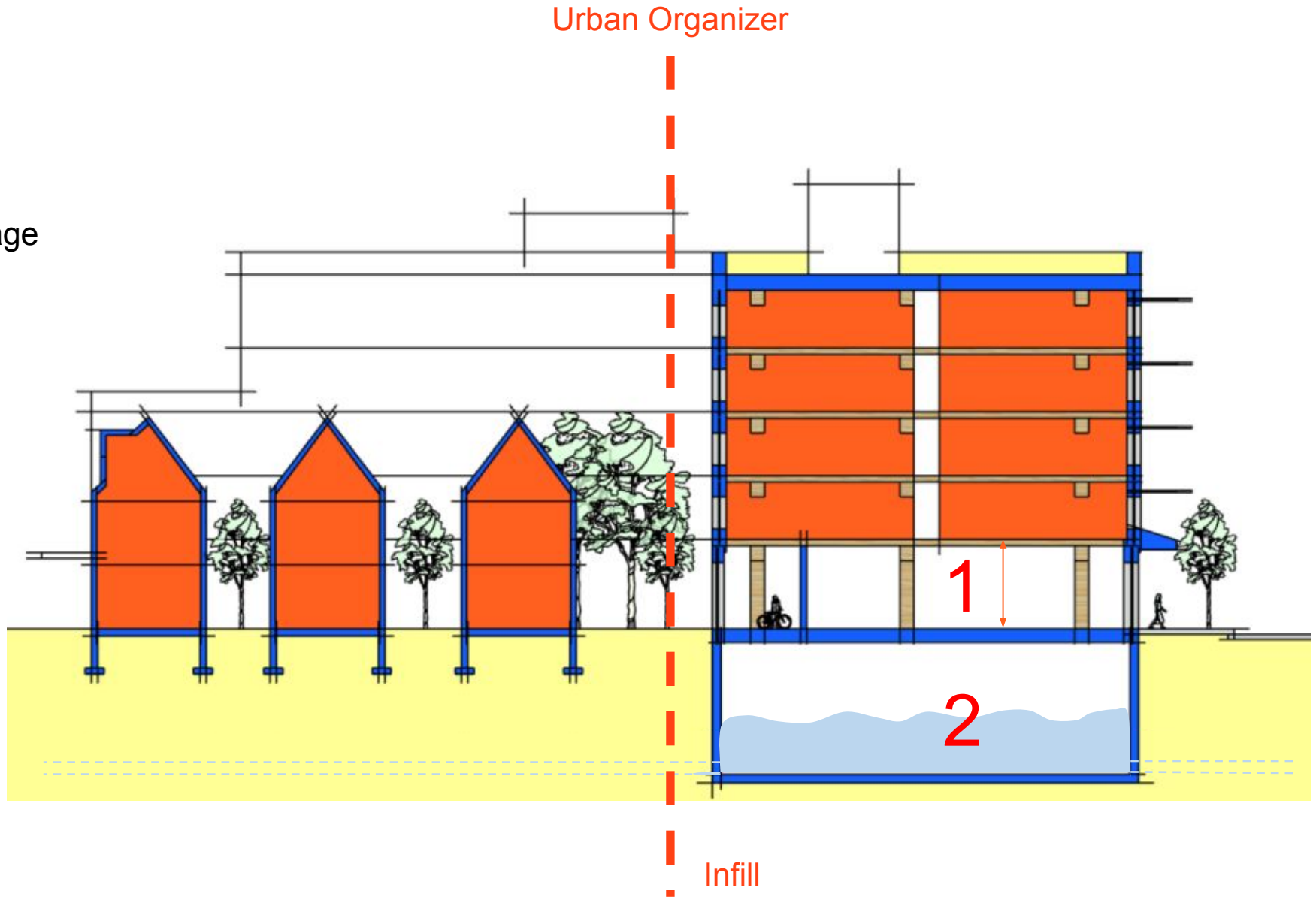
- ‘Pre-war’ building type scale with smaller residential structures; wide range of residents
- Higher density allows for more open space
- Basement as storm chambers
- Cross-laminated timber construction and Passive House design
- Support alternative energy and transportation infrastructure





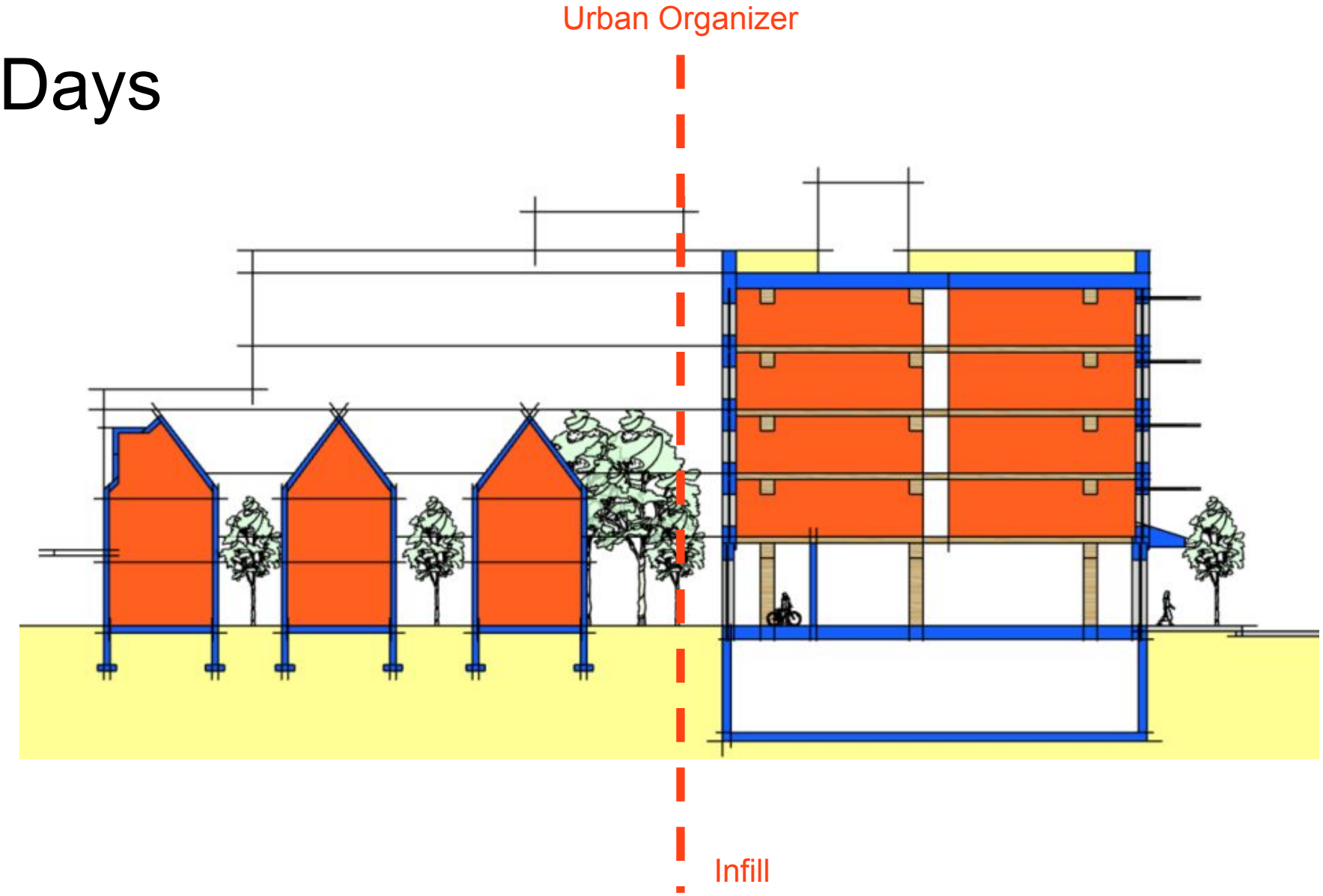
Flooding

1. 2nd Floor 14’ above ground
2. Basement as floodwater storage



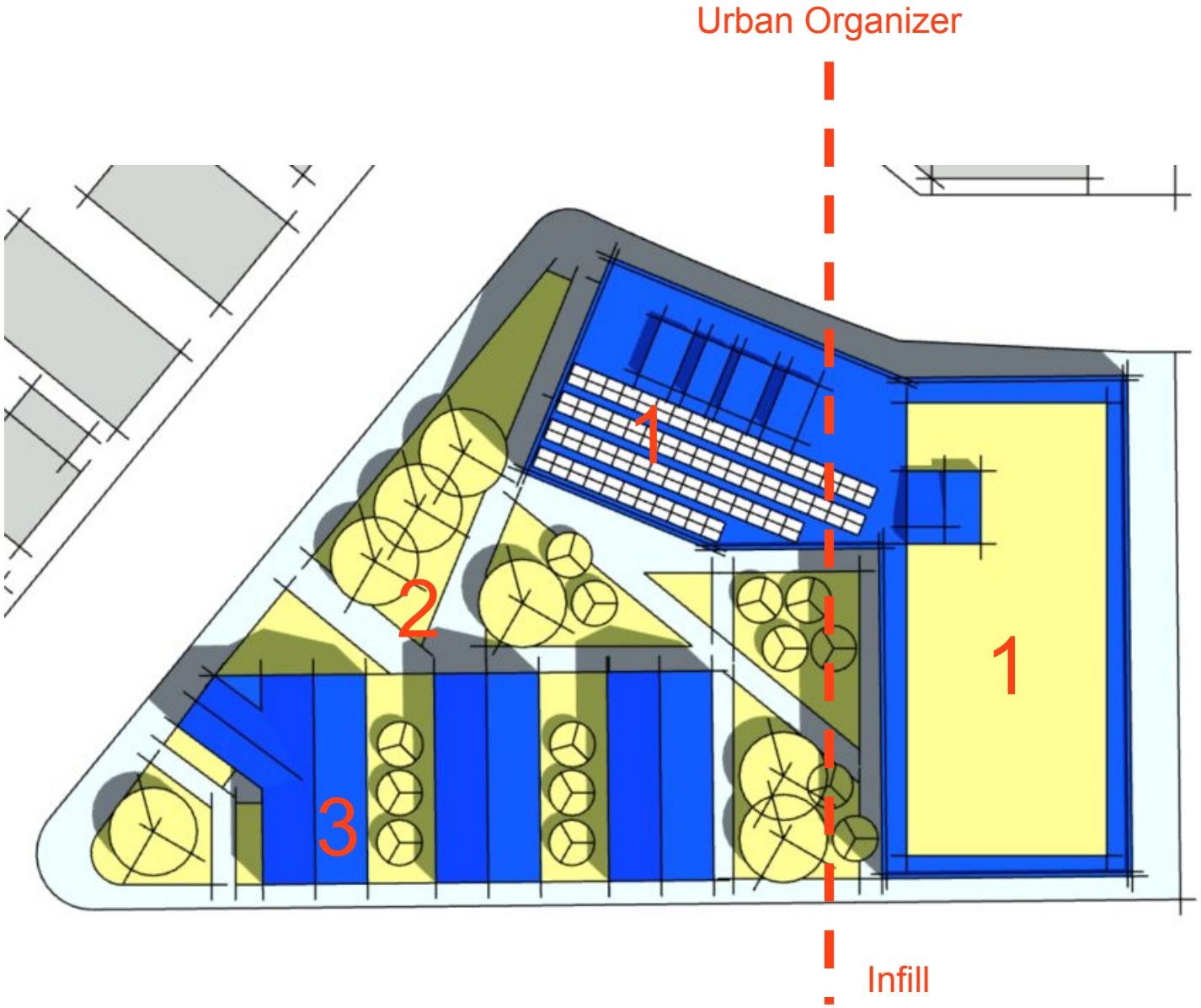
Extreme Heat Days

- CLT Construction
- Passive House
- Shading Devices
- Greenery



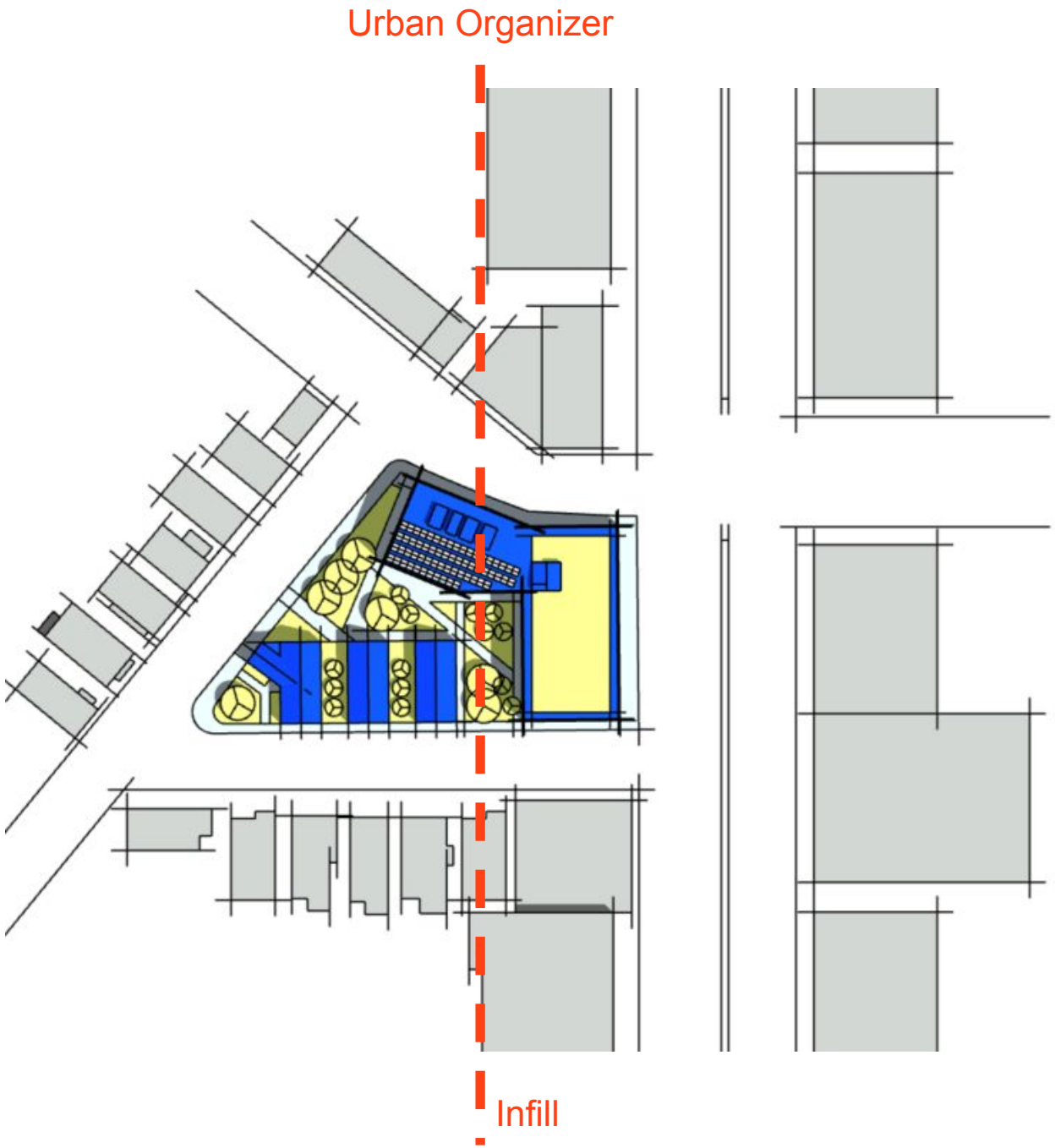
Open Space

1. Green Roof & Infrastructure Roof
2. Open Space/ Community Space
3. Smaller structures over repurposed material from existing buildings



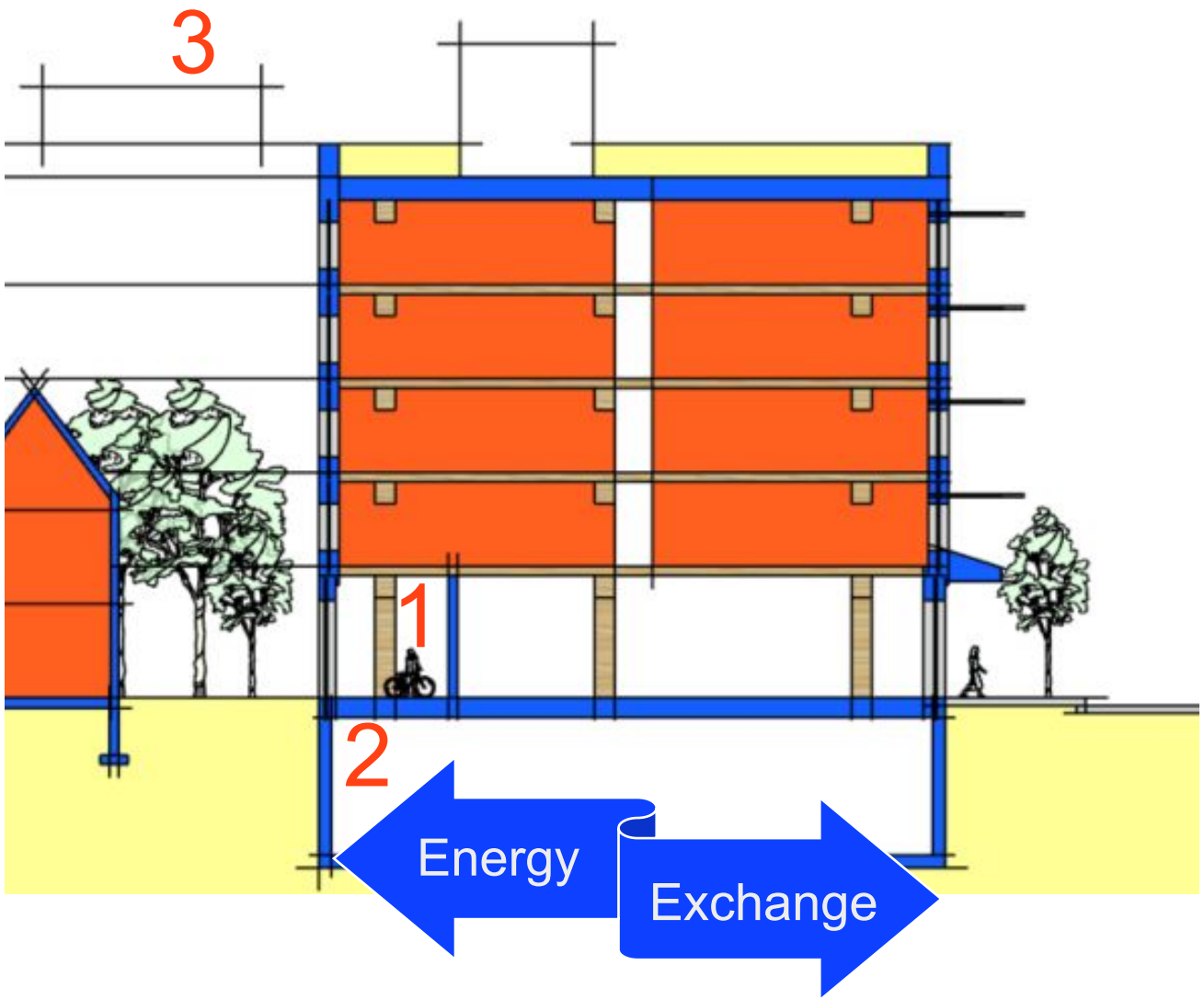
Zoning Changes

- ‘Pre-war’ building type scale with smaller residential structures. Wide range of residents.
- Green Roof
- Trees and permeable surfaces on larger parcels
- Connectivity



Stronger Infrastructure

1. Shared micromobility parking and e-charging
2. Infrastructure basement
3. Infrastructure Roof

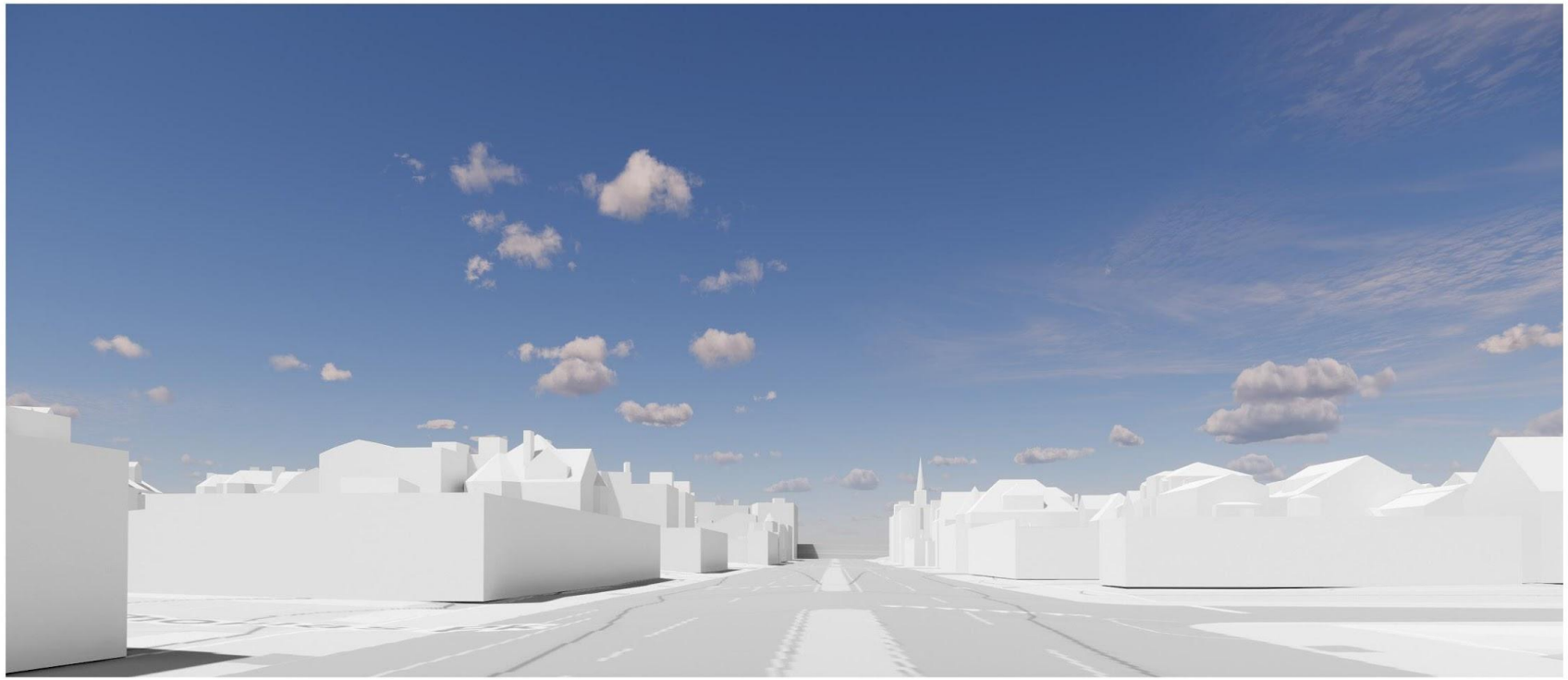


Corridor

– Infill

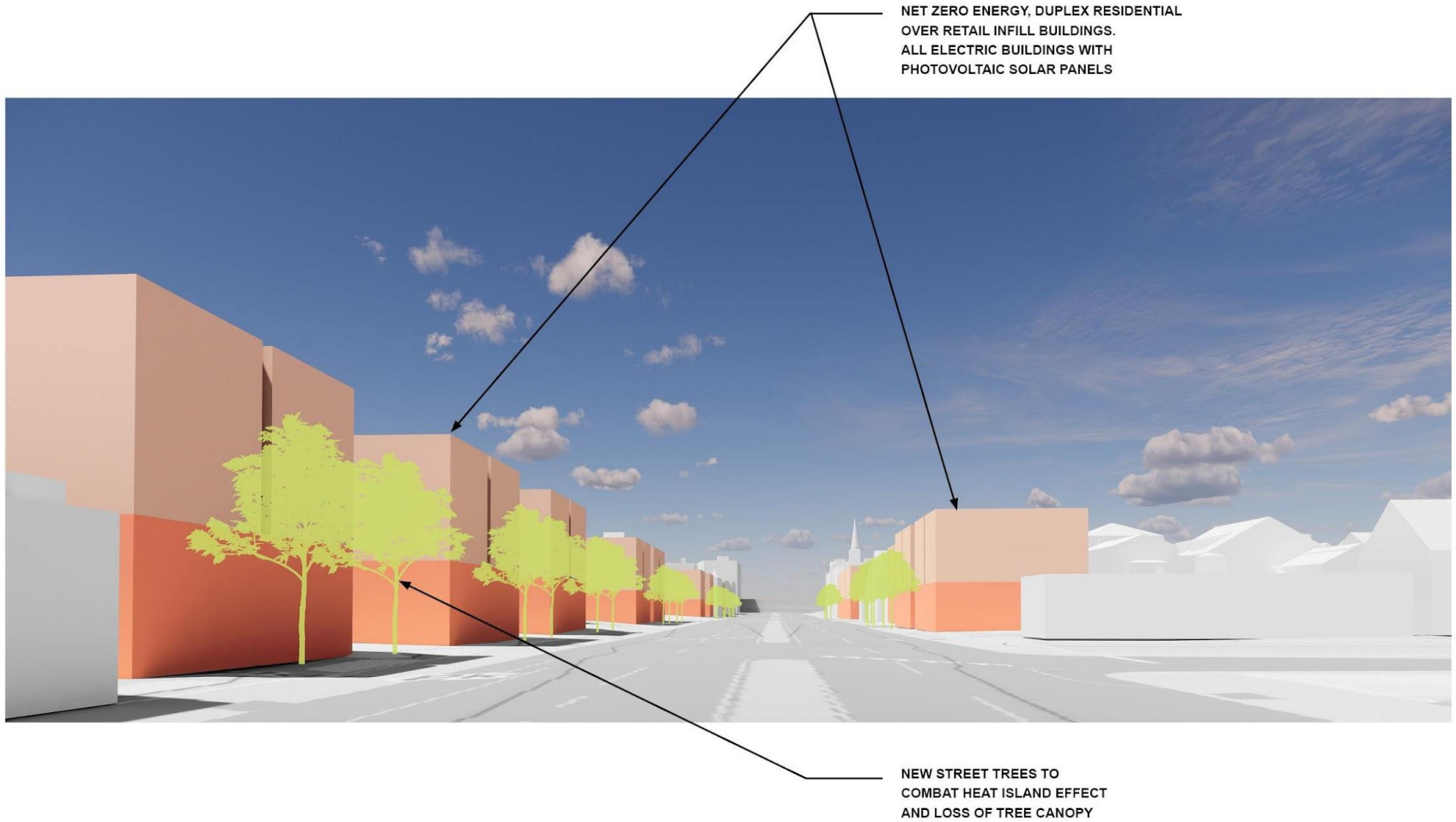
Existing

- Single-story commercial storefronts



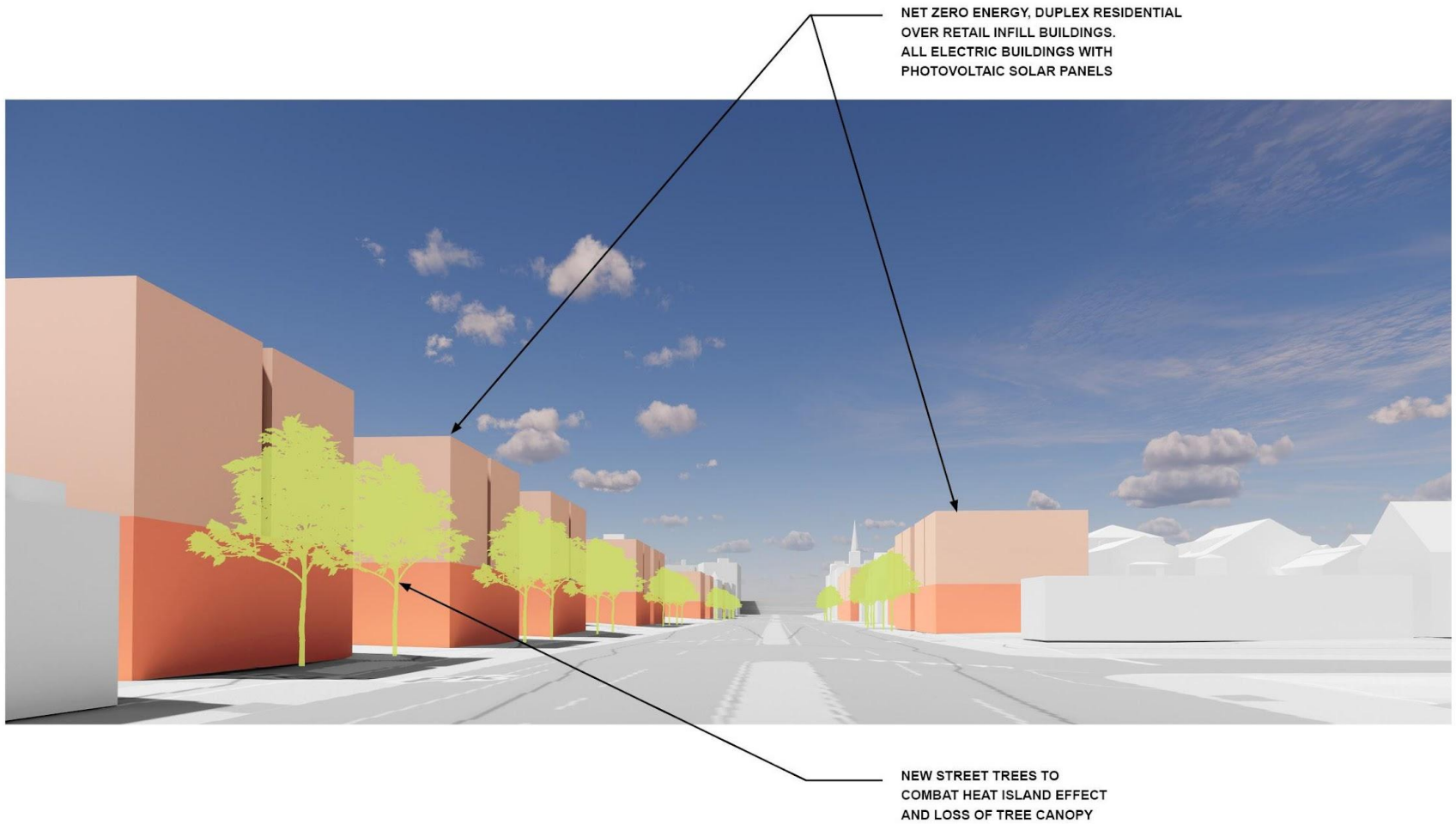
Overall

- Net zero energy, duplex residential over retail infill buildings
- All electric with PV solar panels
- New street trees to combat heat island effect



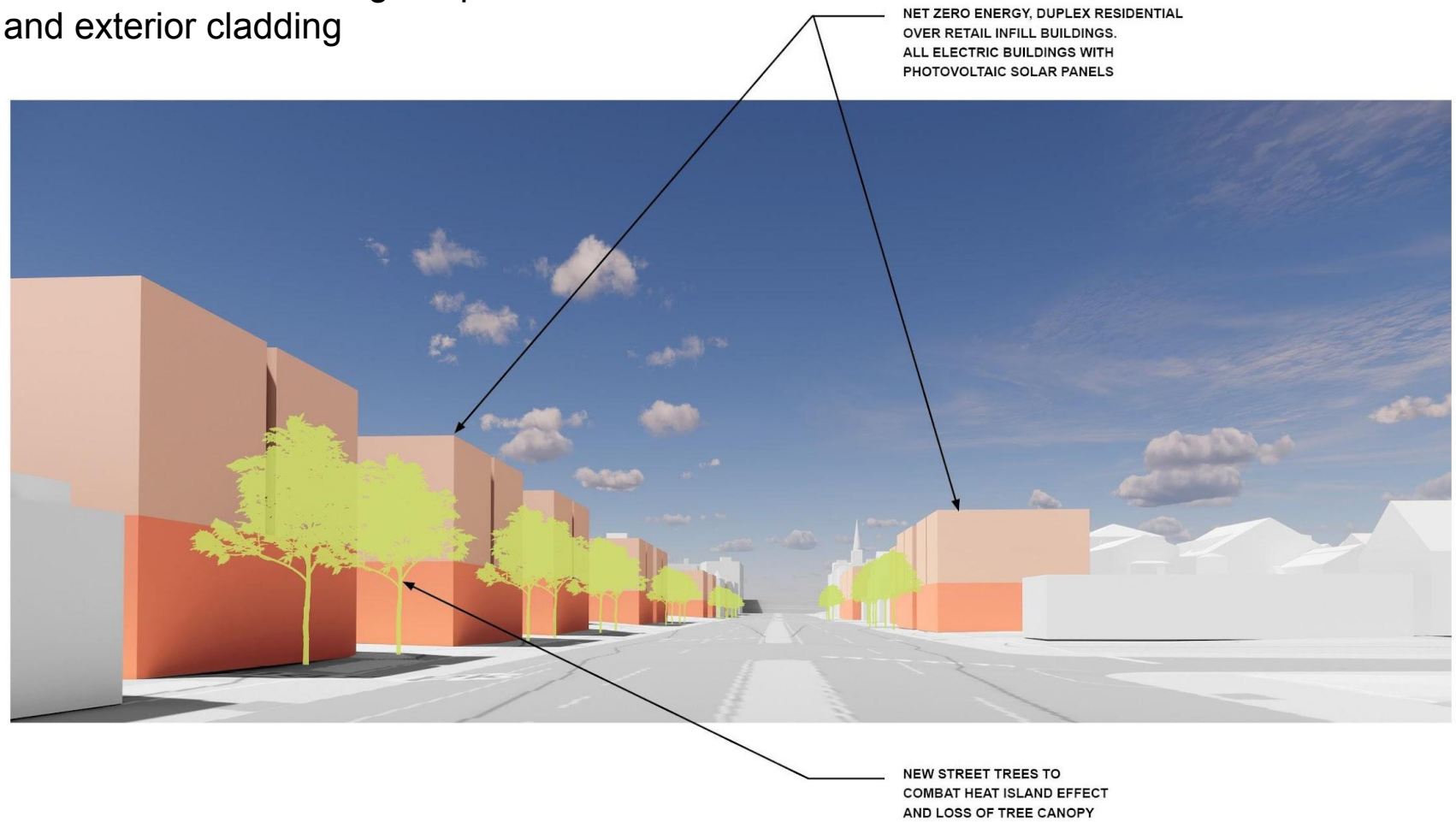
Flooding

- On-site rainwater management and recharge
- Maintain water table & supporting ecological systems



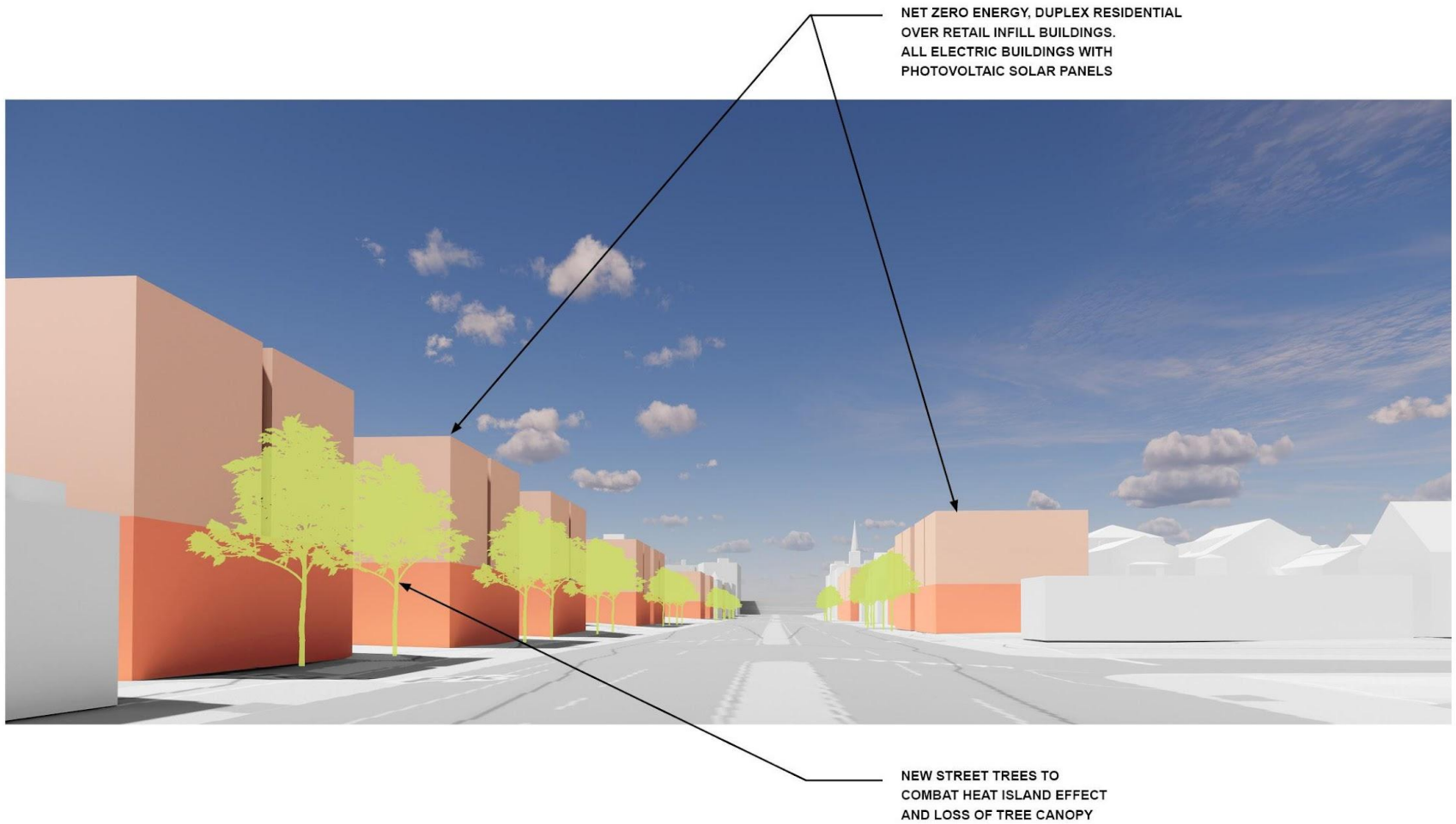
Extreme Heat Days

- Reduce heat island effect with high albedo roofing and paving materials
- Enhance the urban tree canopy with street trees and plantings
- Consider embodied and operational carbon in the high-impact materials; structural systems and exterior cladding



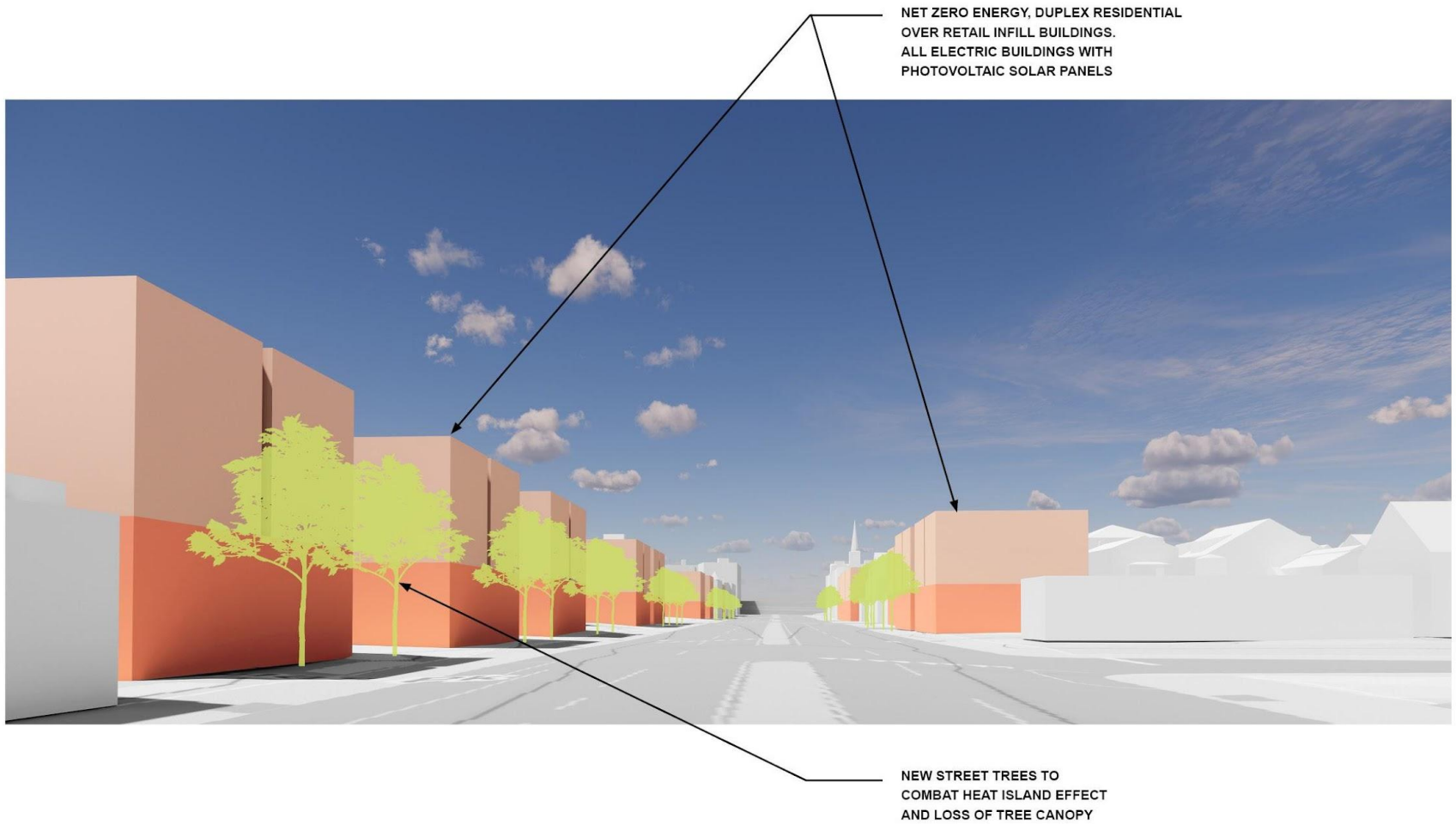
Open Space

- Location of open space that is consistent with the urban surroundings
- Neighborhood with an enhanced sense of place



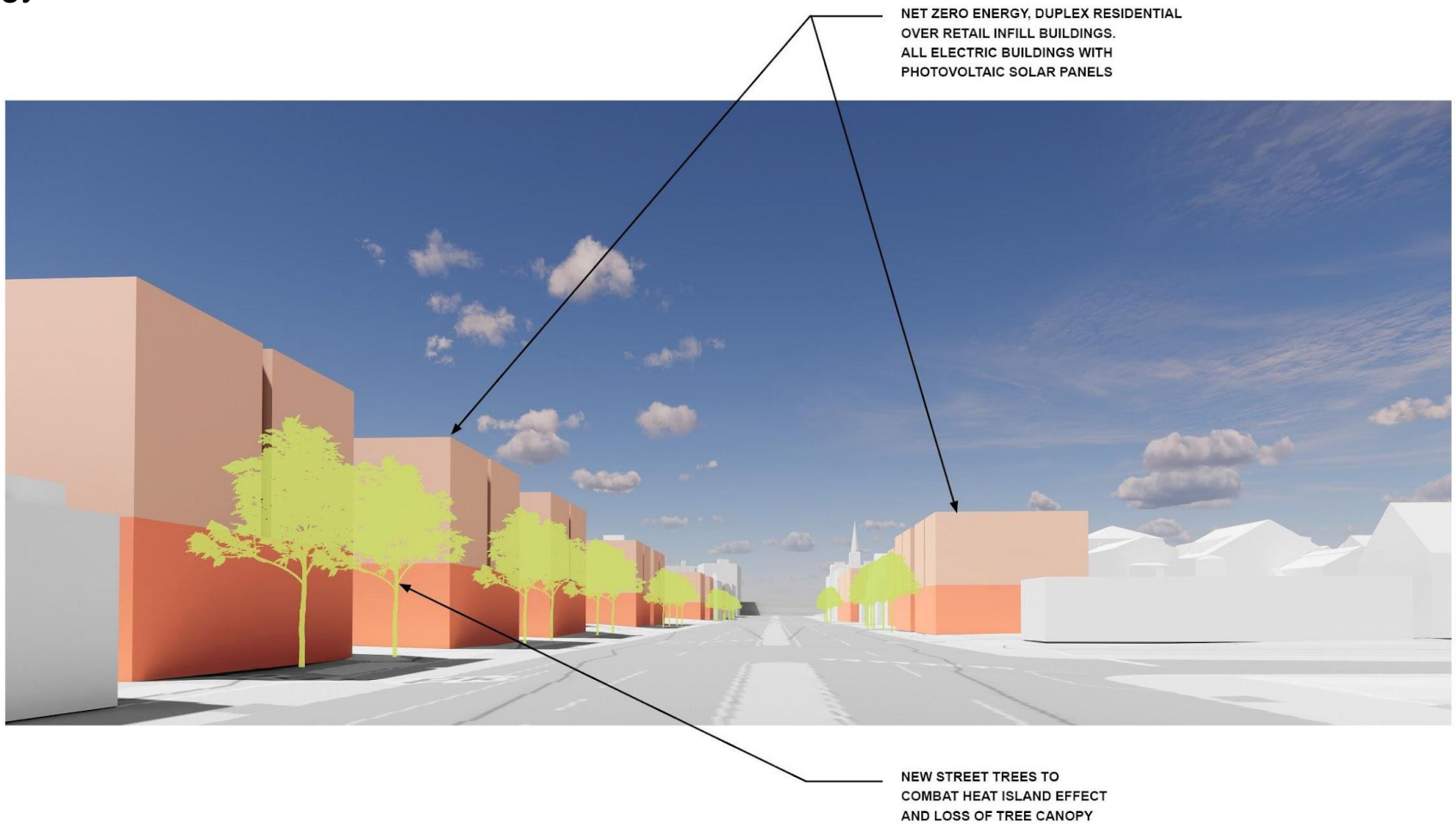
Zoning Changes

- Add density to an existing property within a dense urban area, close to public transportation – transportation oriented development



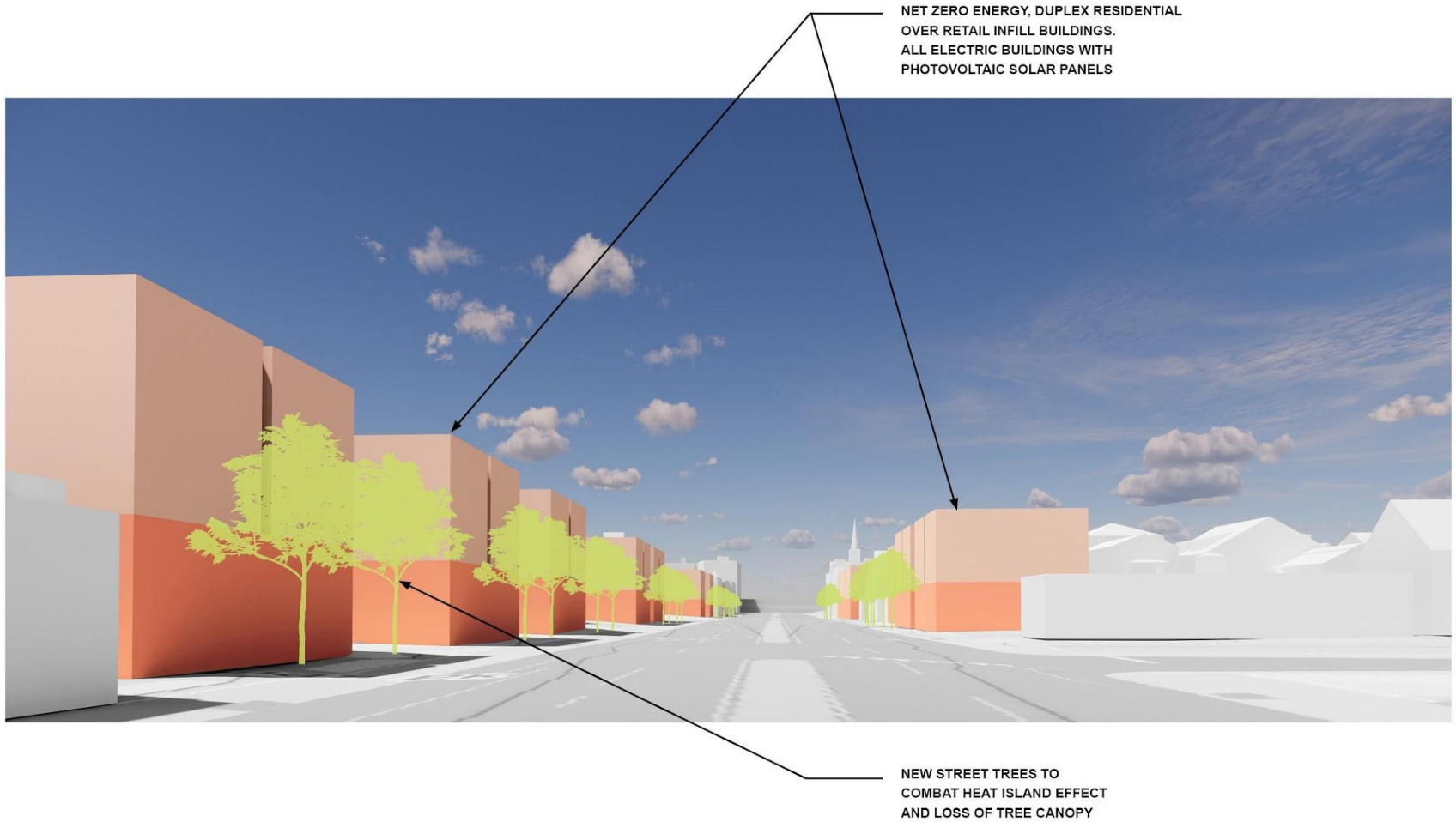
Stronger Infrastructure

- Net-zero buildings
- All-electric systems
- Renewable on-site solar energy



Social Resiliency

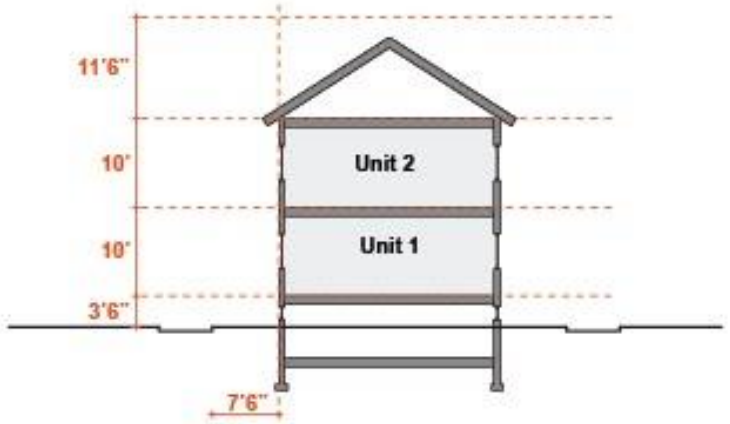
- Development inclusive to the existing community
- Places that are socially just and ecologically restorative

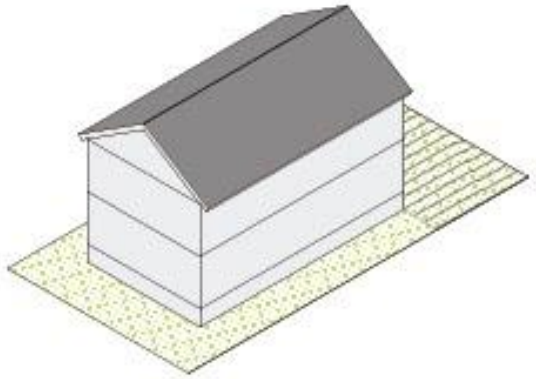


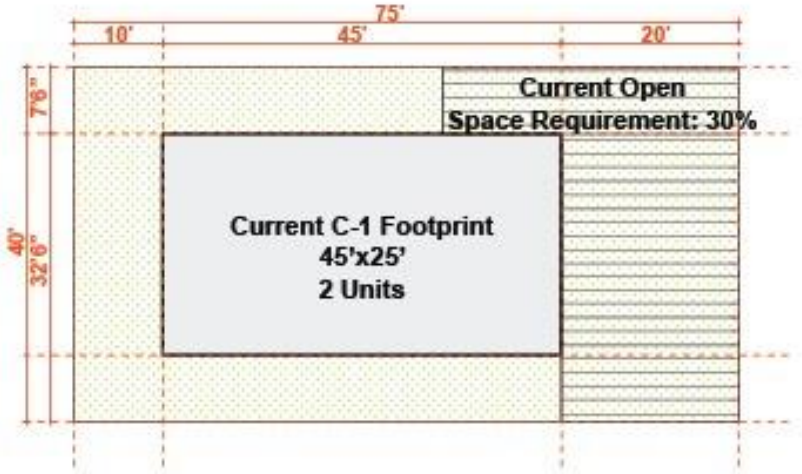
Neighborhood –
Major Alteration

Existing

- Currently zoned for C-1
- Current zoning calls for minimum lot areas based on number of units
- 30% open space is required, which excludes parking

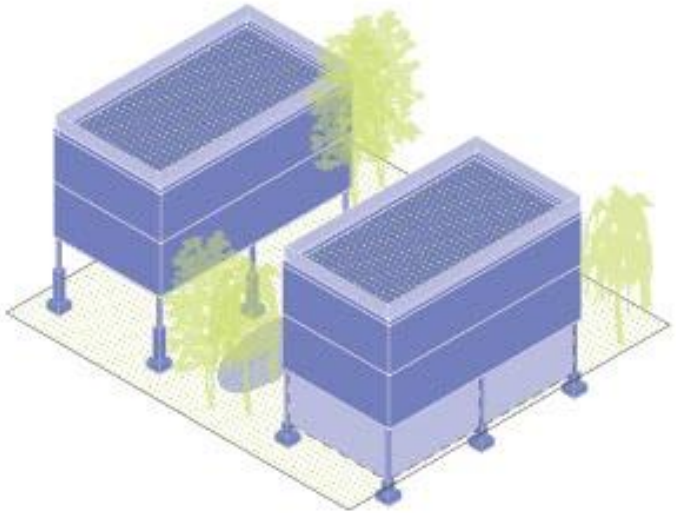


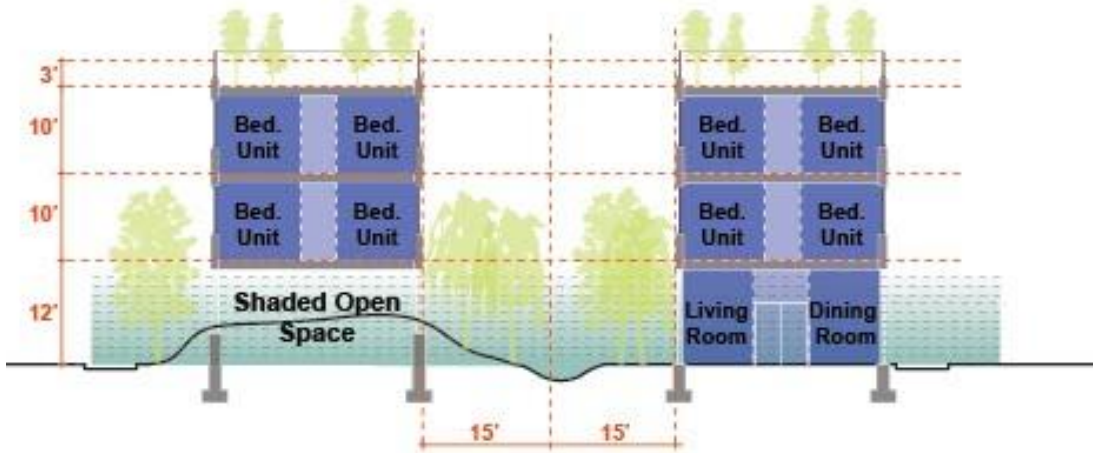


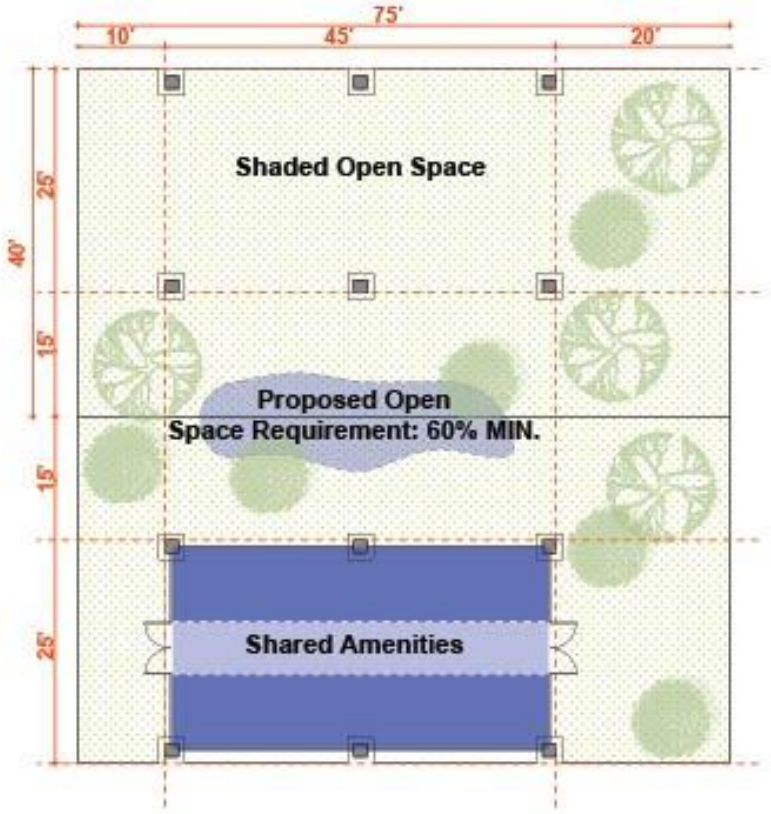


Overall

- Creates a new typology for the city of Cambridge
- Creates resiliency within each residential parcel
- Creates open space on the ground floor for communal areas

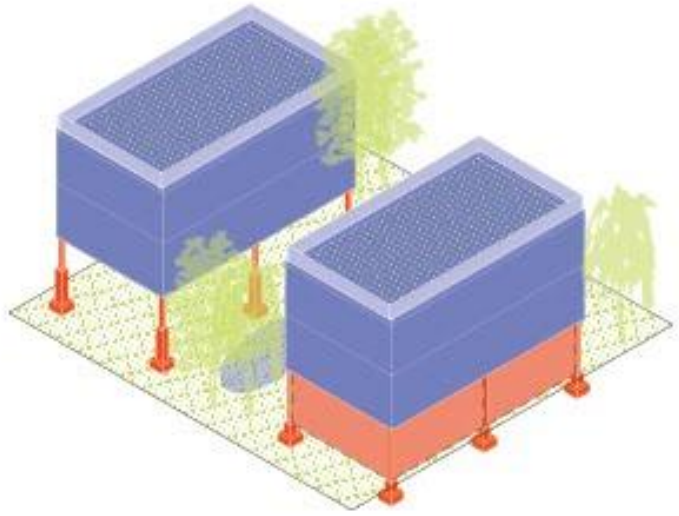


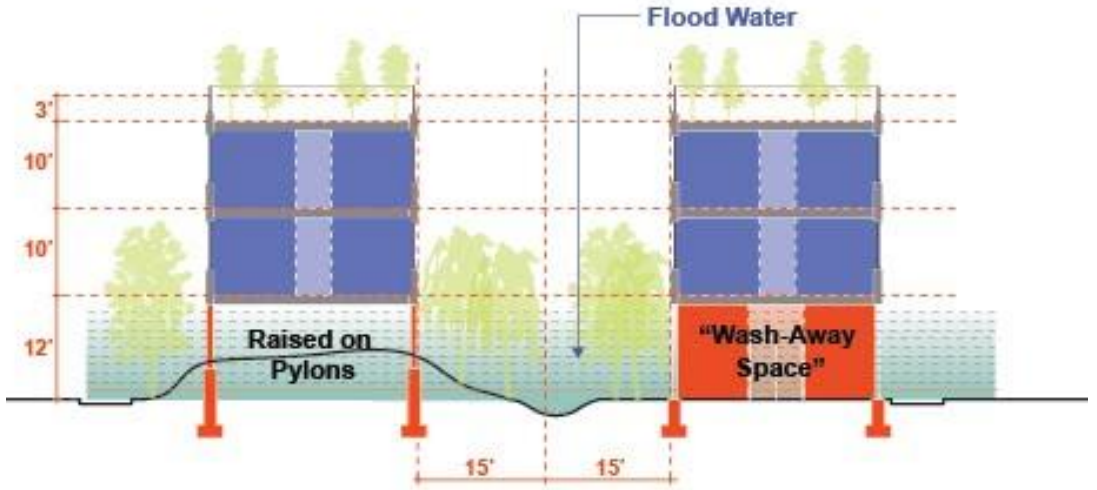


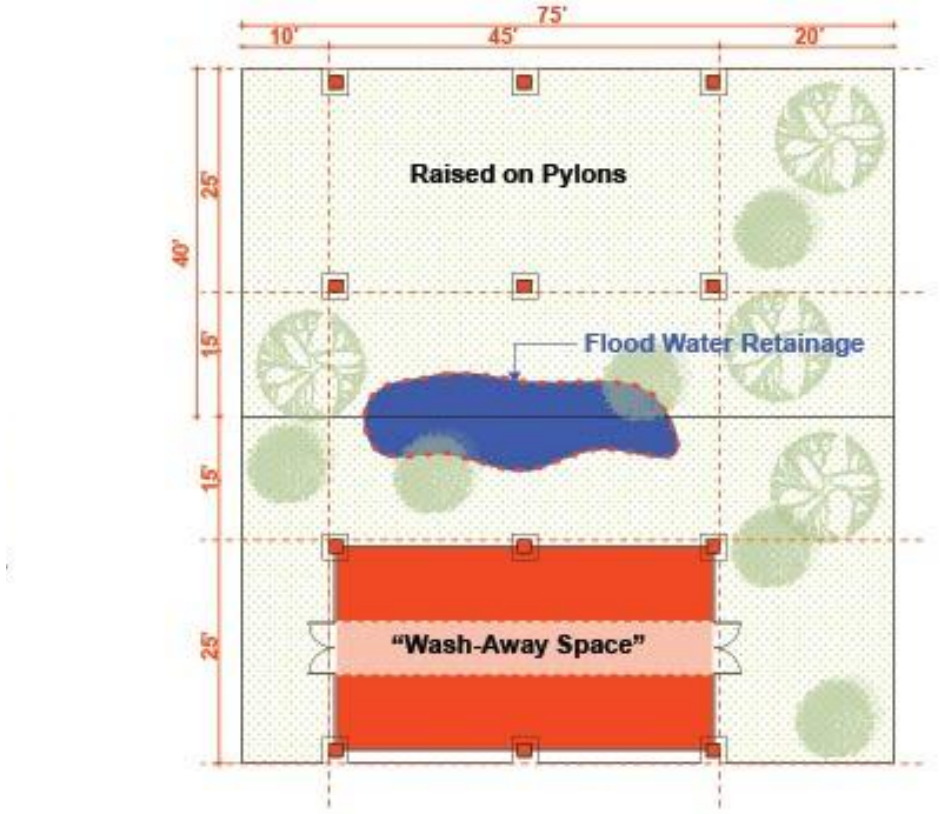


Flooding

- Pervious surfaces
- Rainwater collection within each lot area
- Homes either raised on pylons or set up to have “wash-away programs” on the ground floor

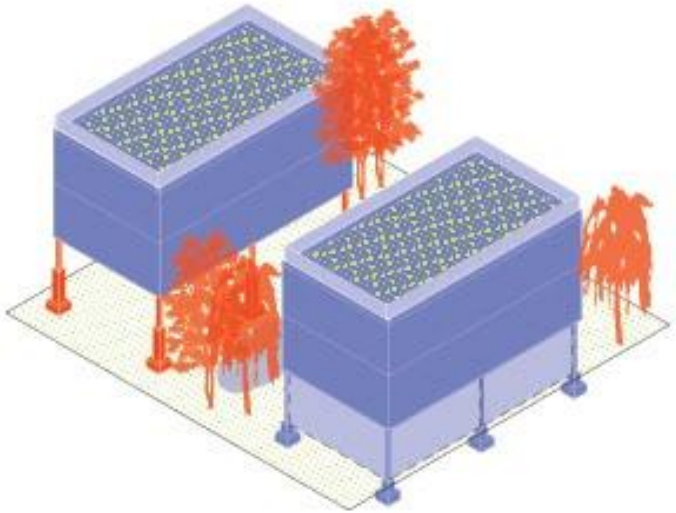


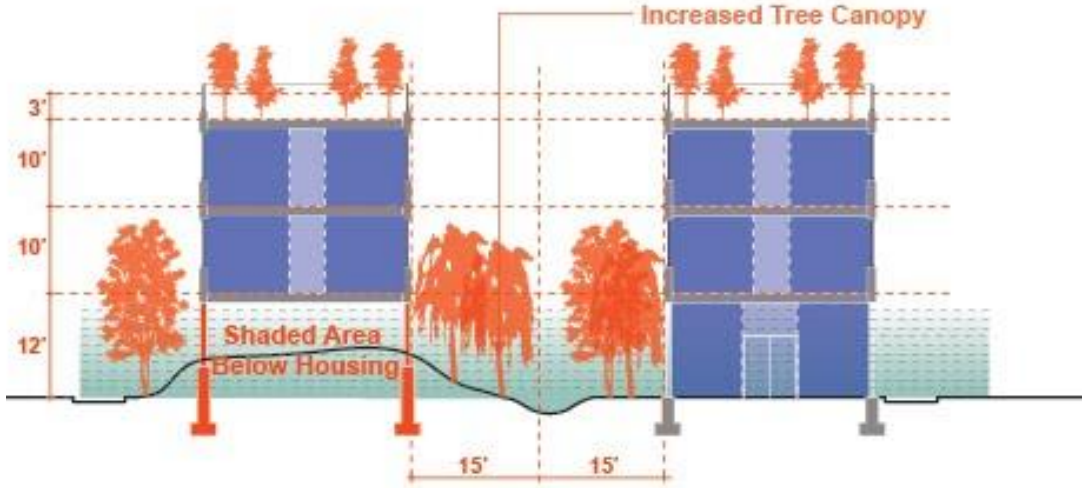




Extreme Heat Days

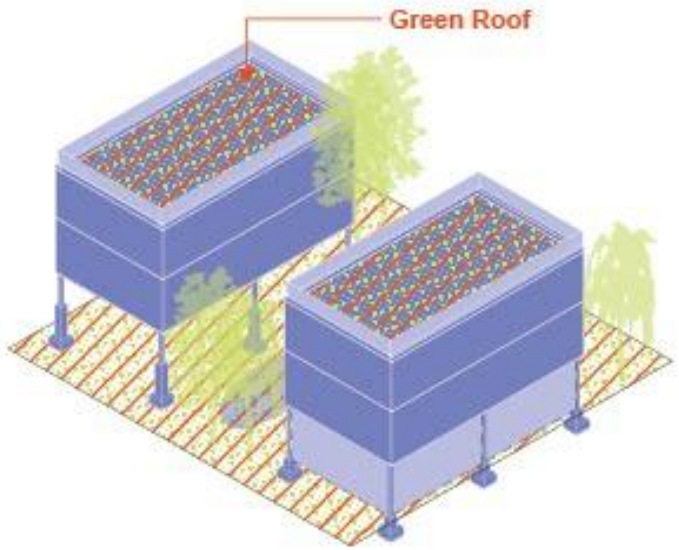
- Tree coverage creates shading throughout
- Raised home to act as shading structure
- High Albedo Surfaces
- Green Roof

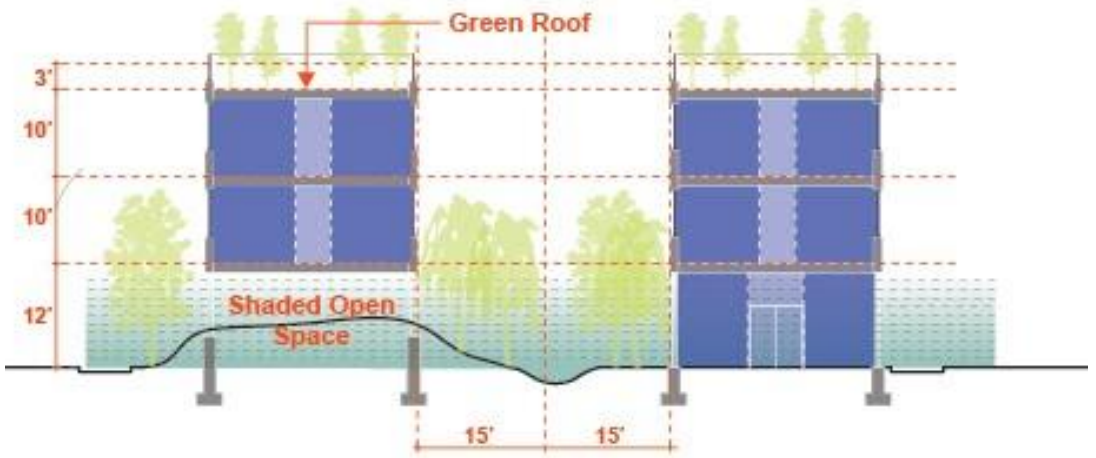


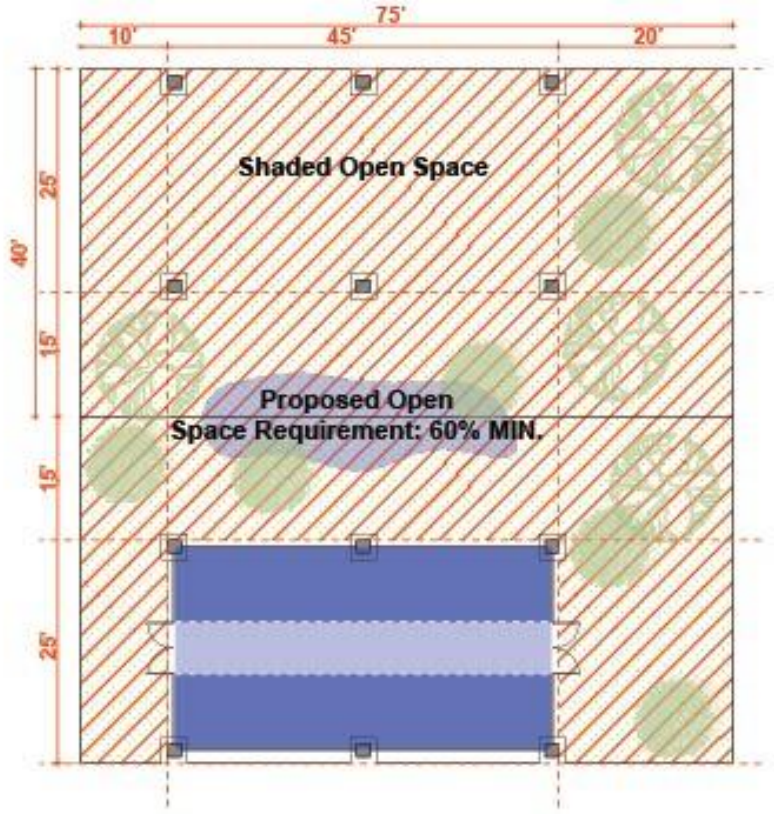


Open Space Requirements

- Reorganize housing communities in such a way to allow for maximum amounts of shareable open space
- Minimum of 50% open space required on each parcel
- Green Roof
- No parking requirement

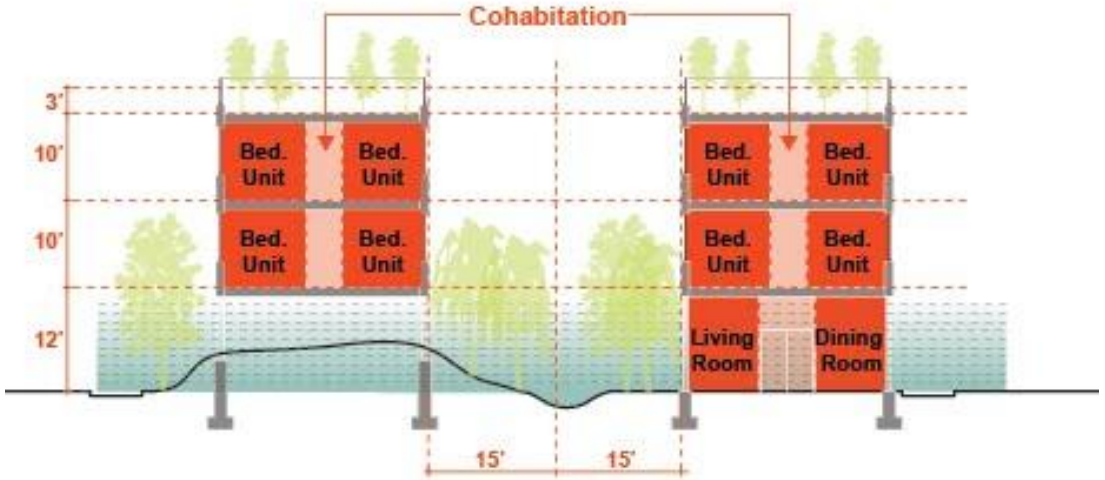


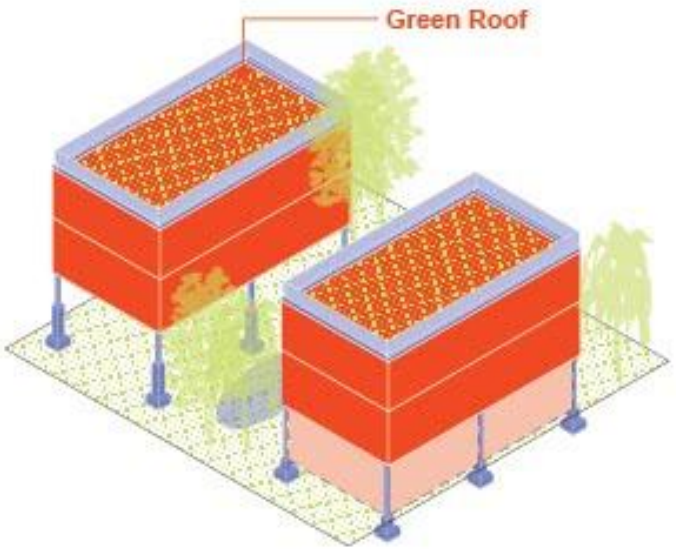


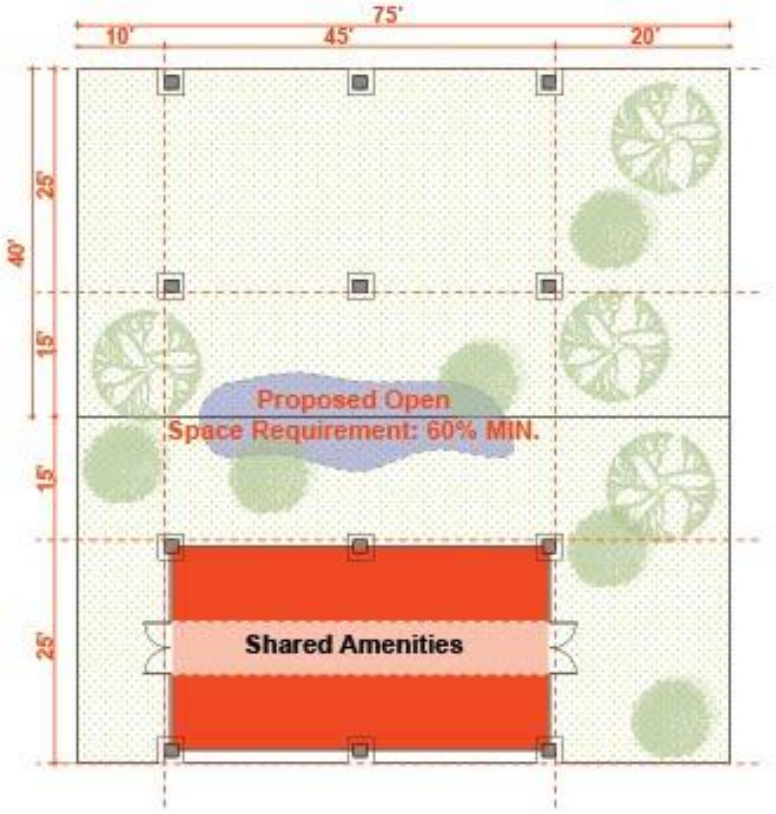


Zoning Changes

- Zoning to remain C-1 Residential
- Minimum Lot Areas calculations to be updated (no longer based on number of units)

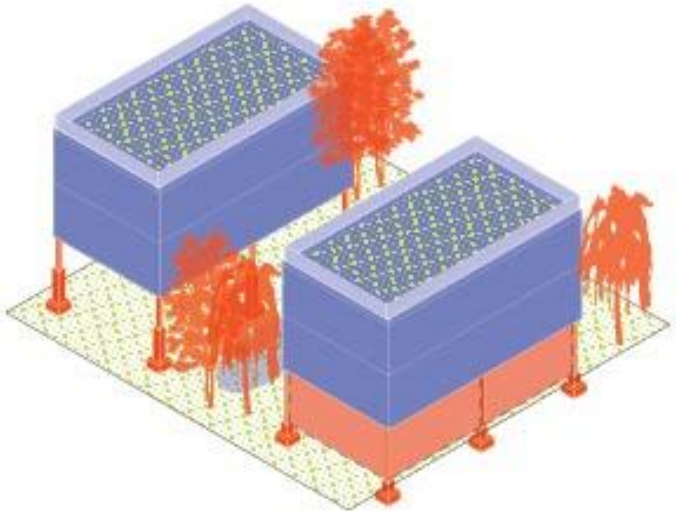


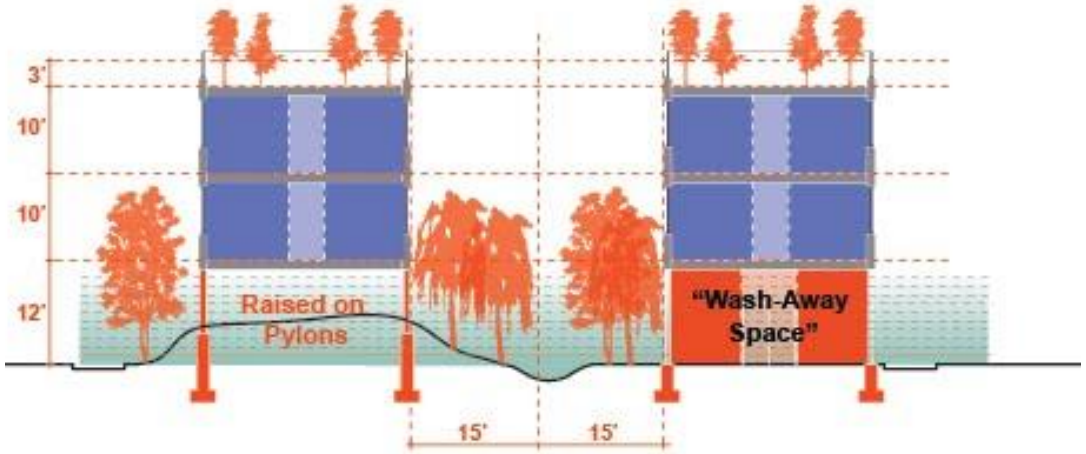


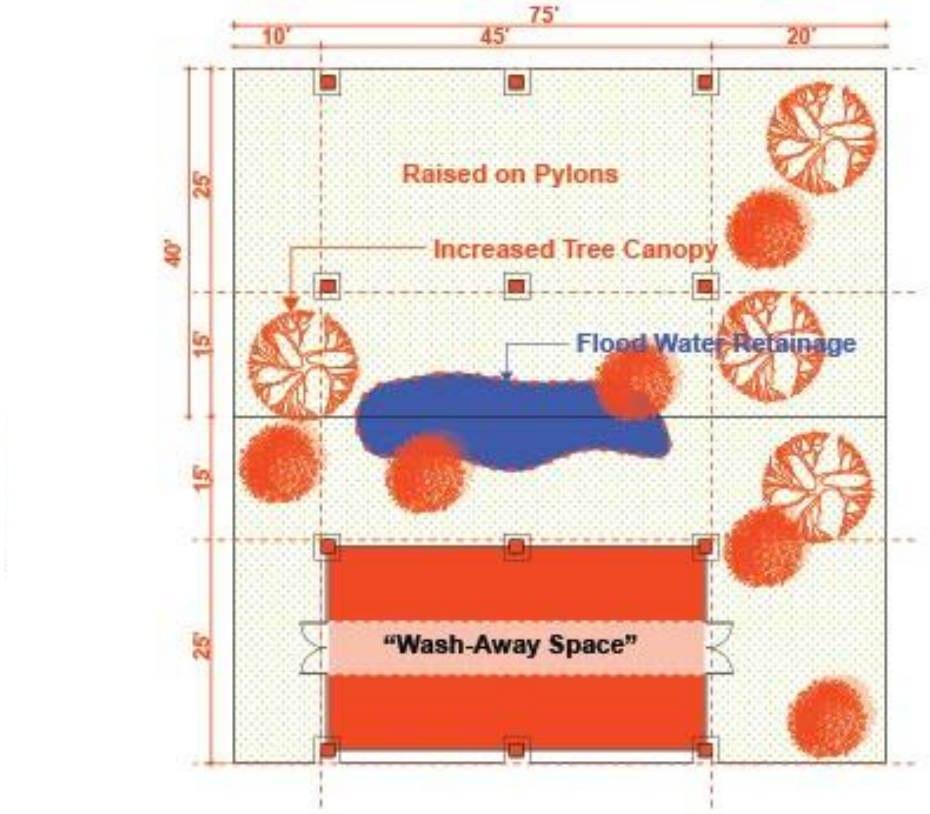


Stronger Infrastructure

- Houses raised on pylons to prevent flooding from storm surge
- “Wash away” program located on the ground level (IE – Living spaces, light storage)

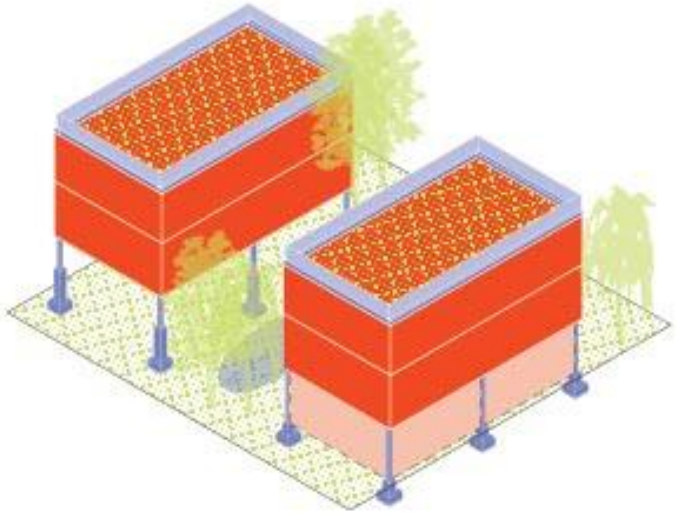


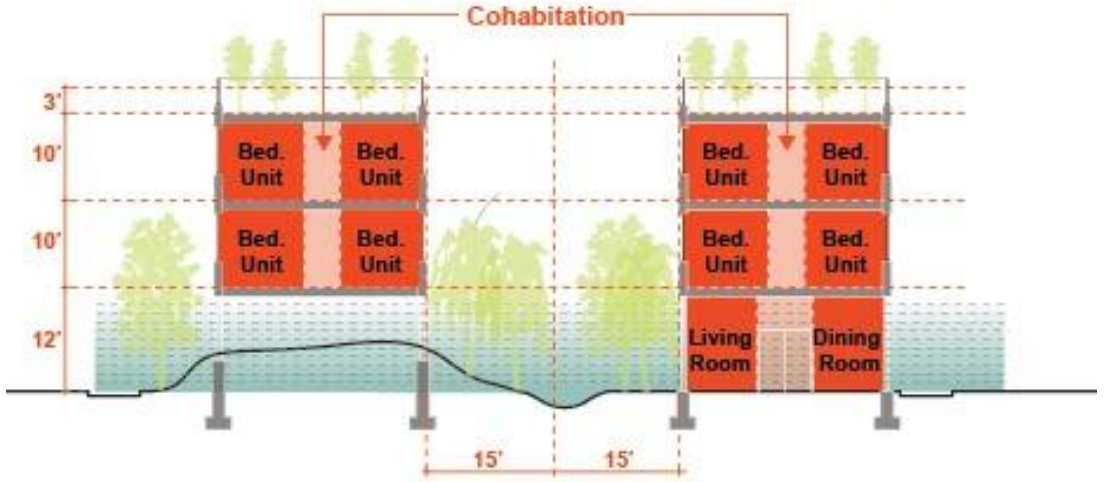


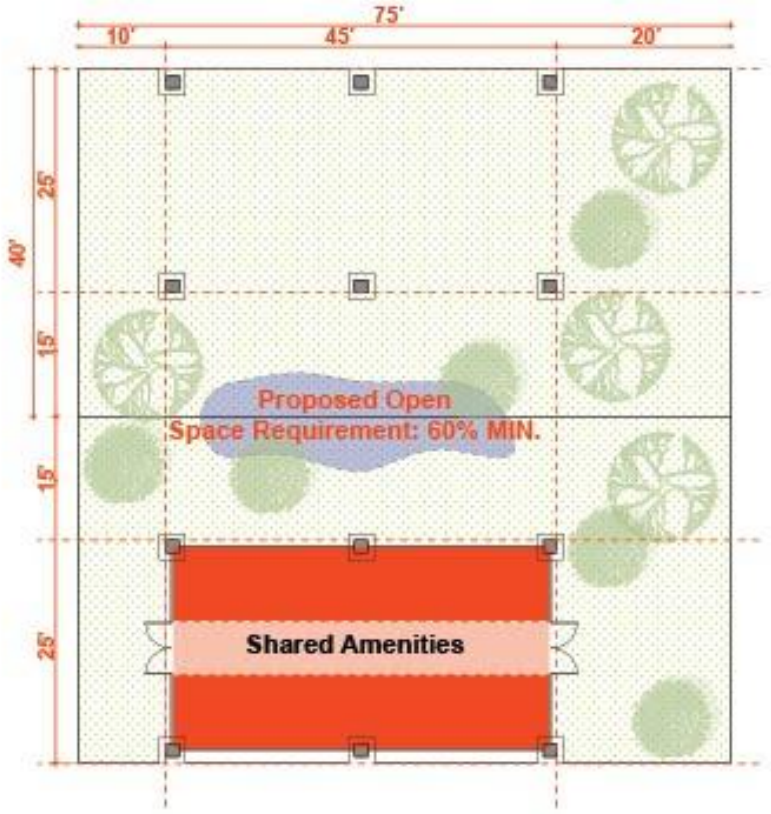


Social Resiliency

- Open space
- Cohabitation
- Shared amenities co-located on the ground floor

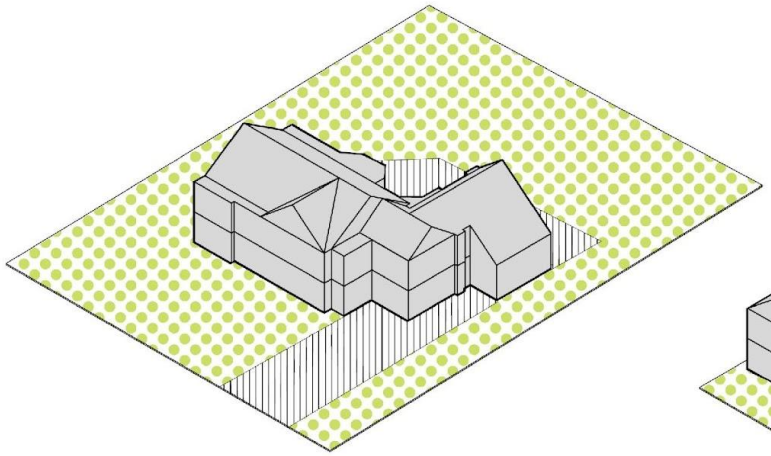




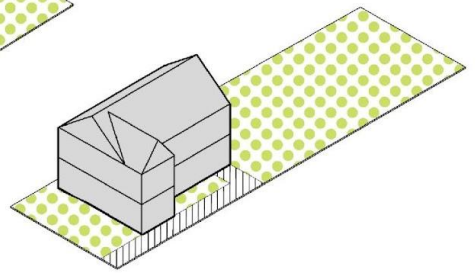


Neighborhood – Minor Alteration

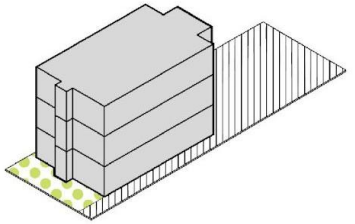
Existing Density



Single-family
Lot area: 27,700 sq ft
Building footprint: 3,850 sq ft
FAR: ~ 0.35



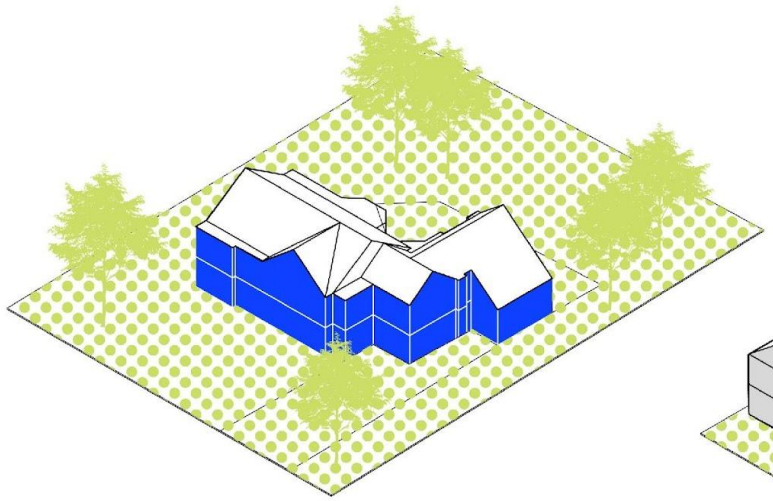
Two-family
Lot area: 7,200 sq ft
Building footprint: 1,470 sq ft
FAR: ~0.5



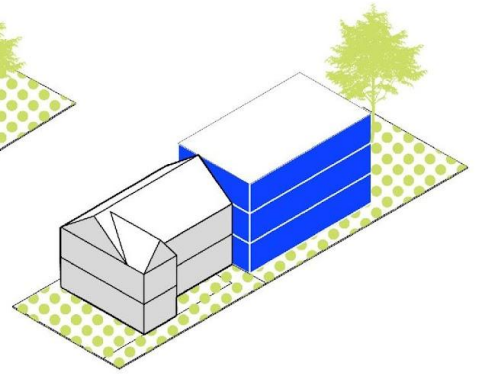
Triple-decker
Lot area: 4,210 sq ft
Building footprint: 1,550 sq ft
FAR: ~1.1

Overall

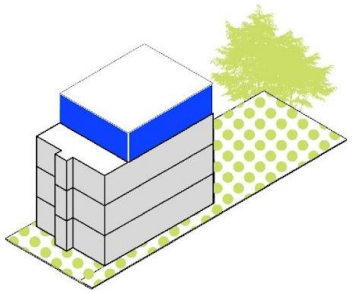
- Preserve and adapt existing structures, resulting in material conservation
- Promote co-habitation, shared amenities and open spaces
- Make use of ground and building surfaces to mitigate flooding and prevent heat
- Reduced or eliminated parking presents opportunity for resilient open space strategies



Conversion to multi-unit
Units: 4-6
Building footprint: 3,850 sq ft
FAR: ~ 0.35



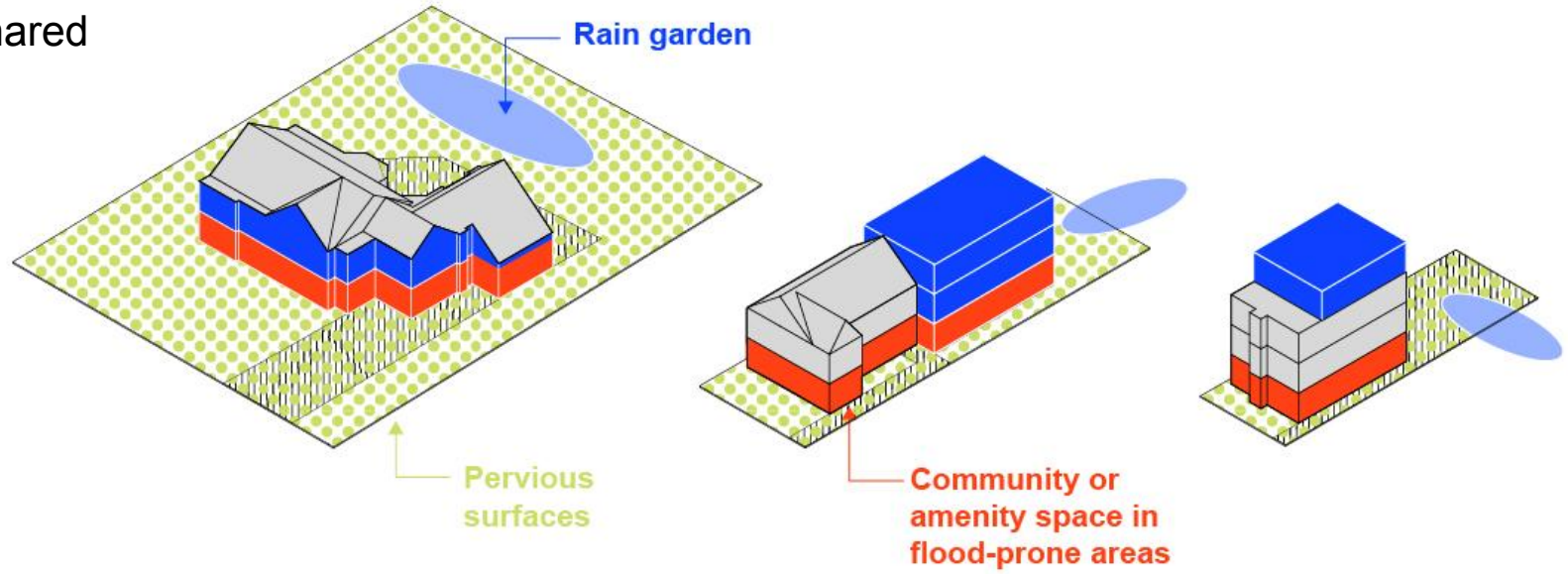
Rear addition
Units: 5
Building footprint: 3,000 sq ft
FAR: ~1.2



Floor addition
Units: 4
Building footprint: 1,550 sq ft
FAR: ~1.4

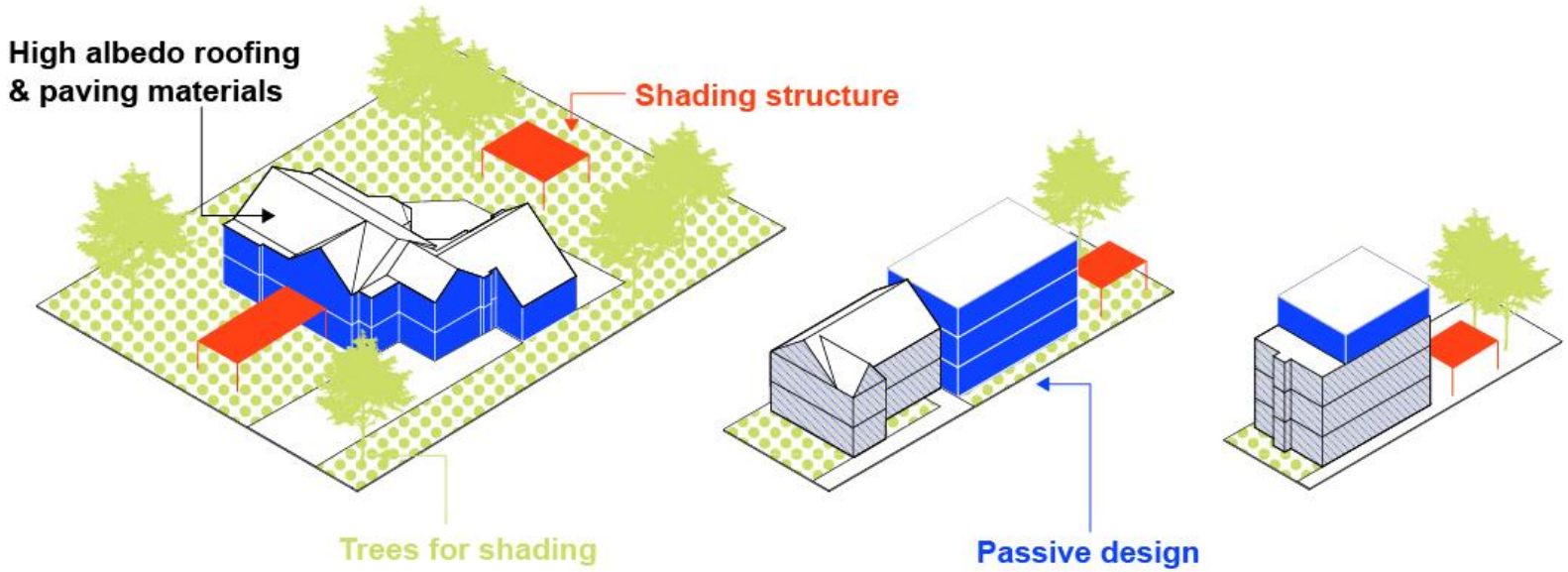
Flooding

- Community or amenity space on ground floor/no bedrooms
- Pervious surfaces
- Rain gardens on larger sites or shared between parcels within a block



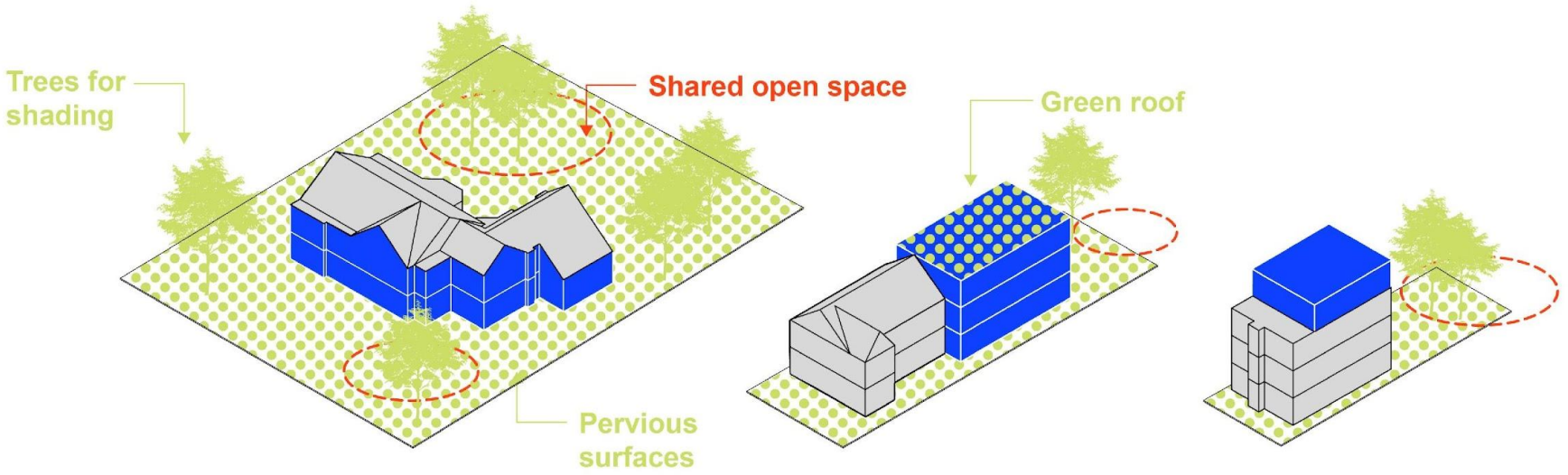
Extreme Heat Days

- Passive design
- High-albedo surfaces
- Shading



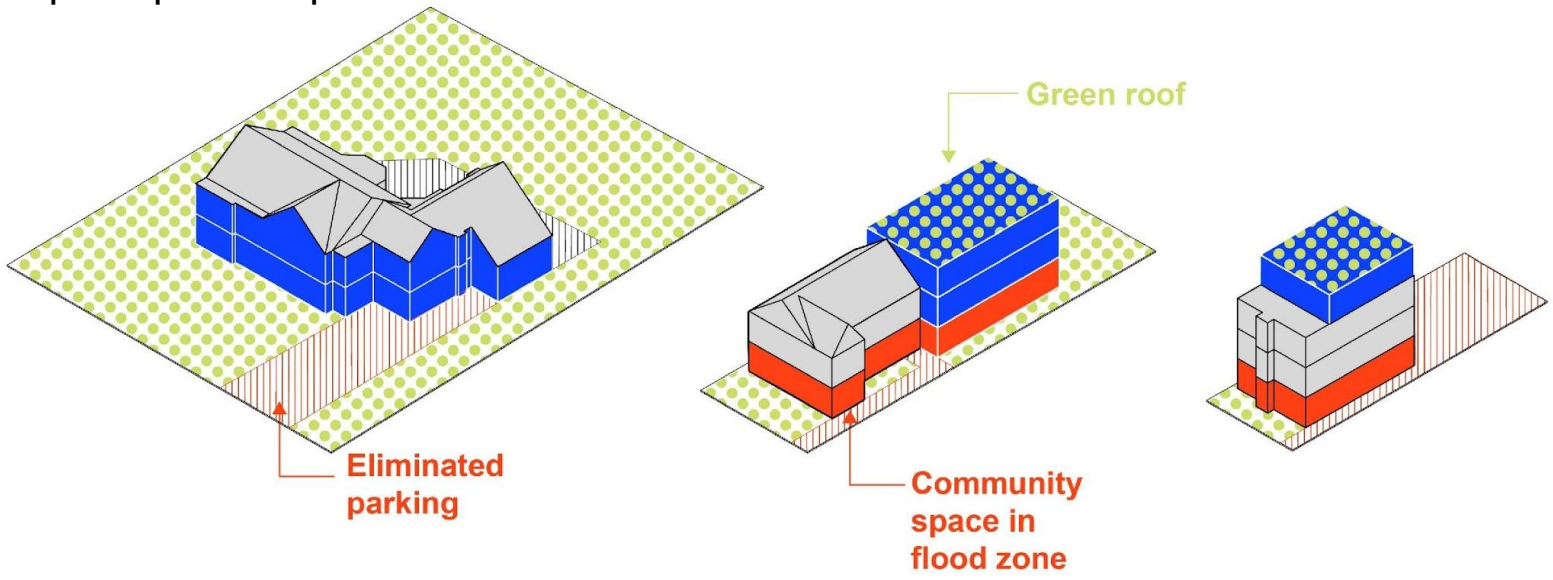
Open Space Requirements

- Green roofs
- Shared open space



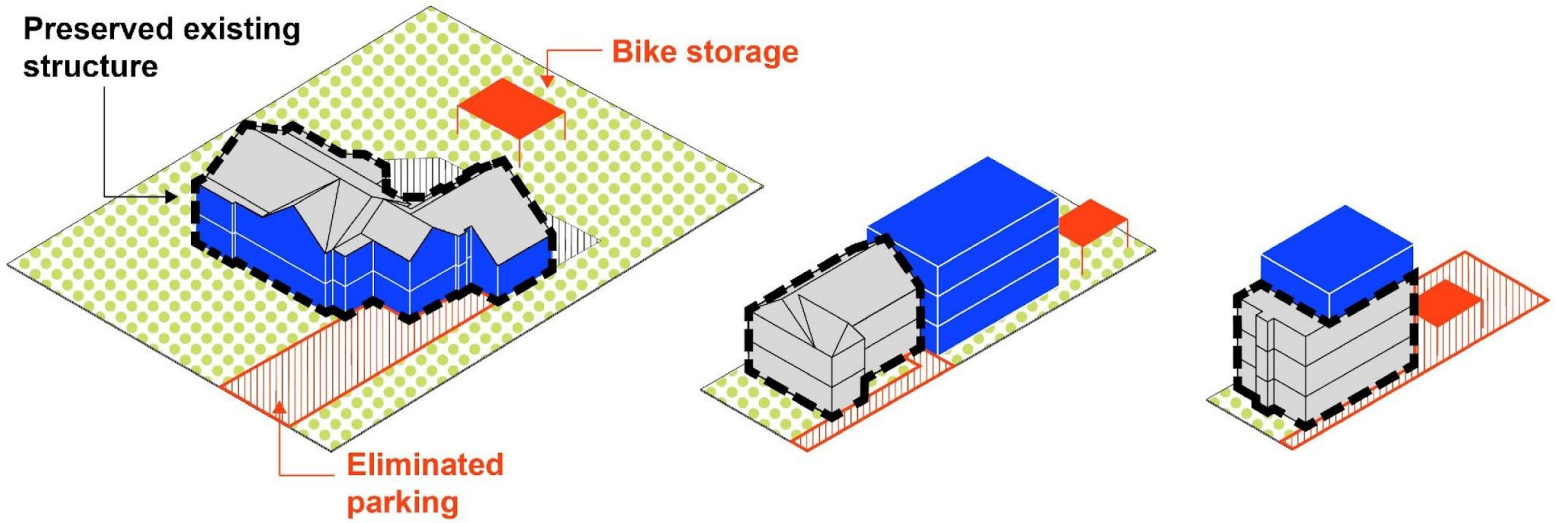
Zoning Changes

- Allow for community spaces on ground floor
- Require a green roof for density bonus
- Allow green roofs to count towards open space requirement
- Eliminate parking minimums



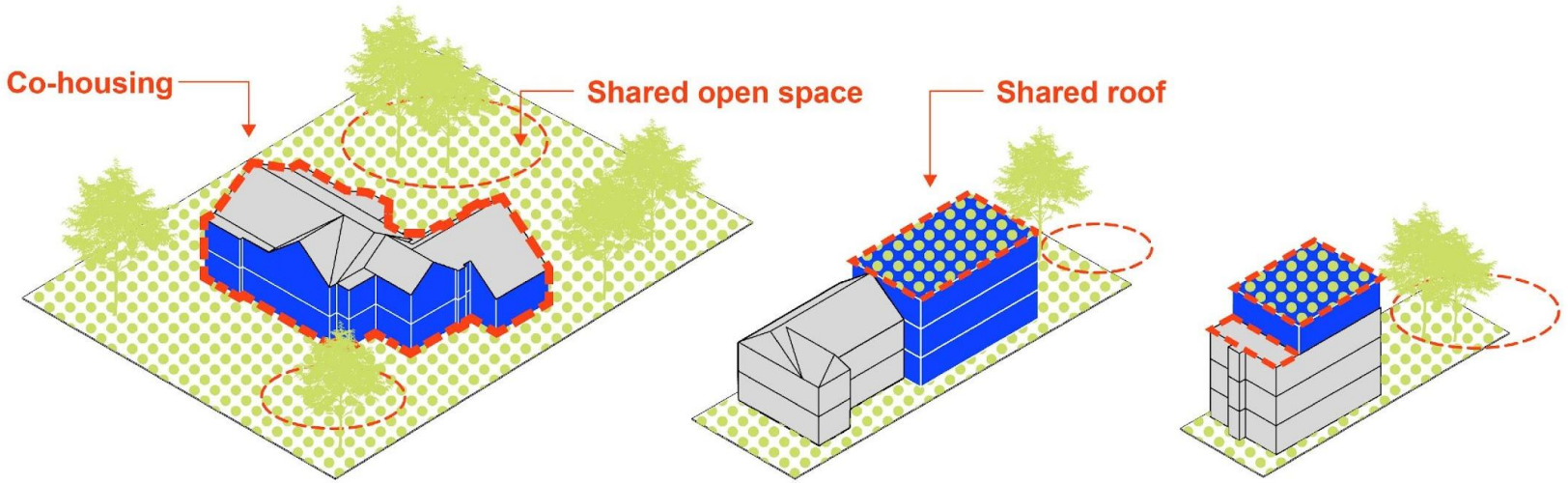
Stronger Infrastructure

- Preserve and adapt existing buildings to reduce material resource extraction
- Provide opportunities for micro-mobility
- Encourage alternative transportation



Social Resiliency

- Co-housing
- Shared amenities



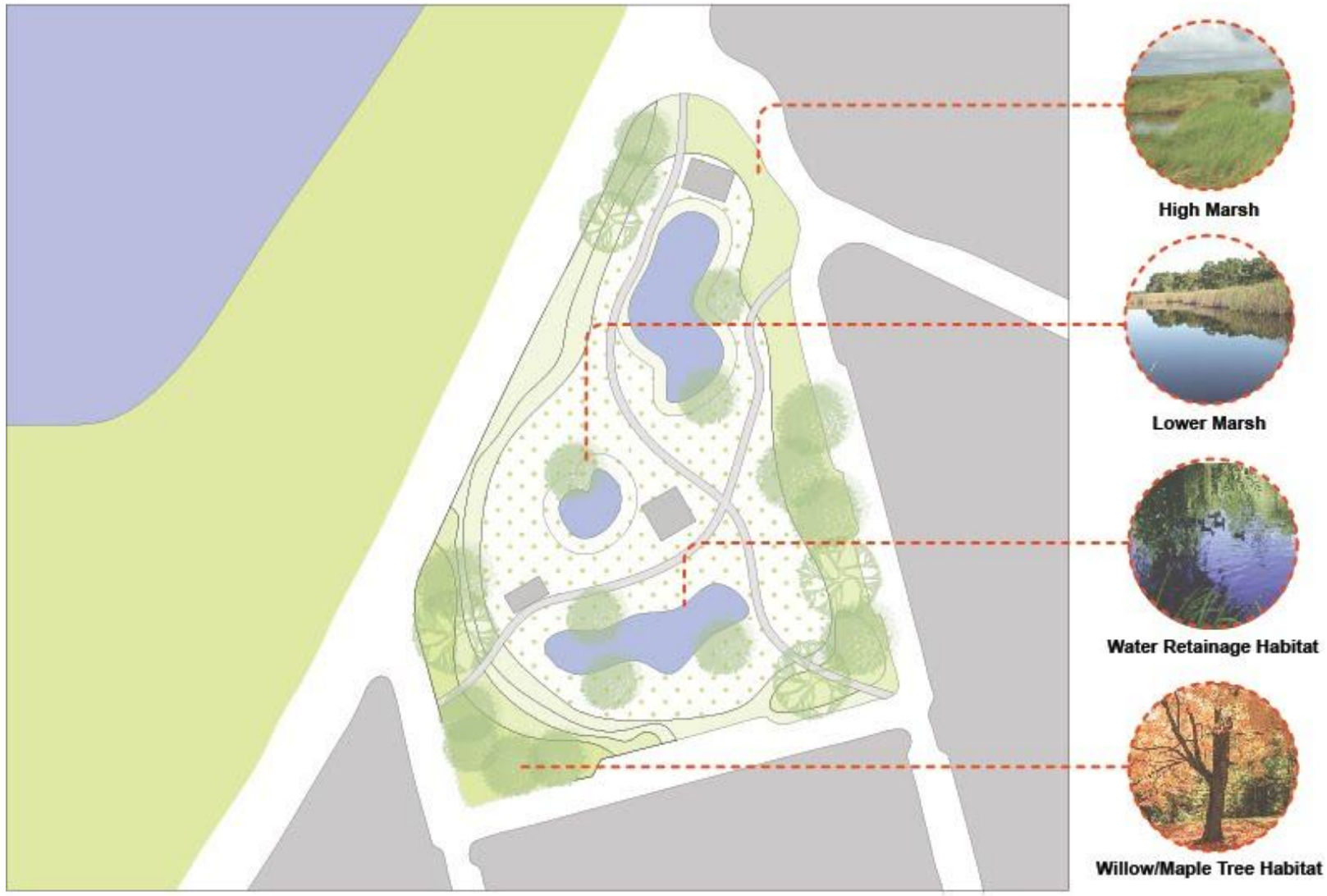
Neighborhood –
Green Infrastructure

Existing

- Currently zoned for business use
- Impervious Materials
- Large Parking Lot

Overall

- Returning the area around Fresh Pond to its natural state
- Serves as a barrier for storm surge
- Ecologies protect the communities around Fresh Pond

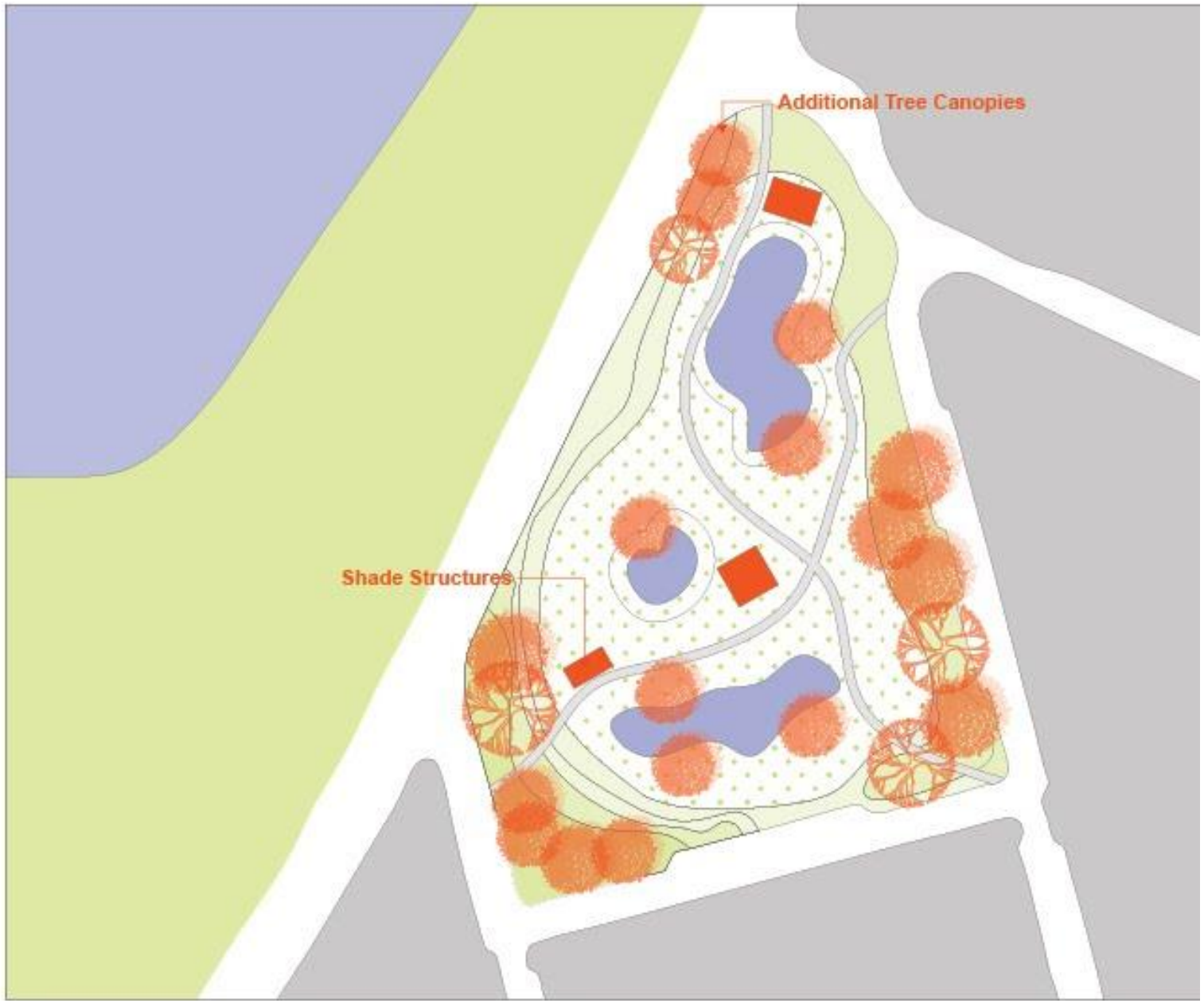


Flooding

- Pervious surfaces; Ecologies work as water mitigation strategy
- Rainwater collection; Area around Alewife to flood more often by 2070
- Protection to existing residential neighborhoods beyond

Extreme Heat Days

- Tree coverage creates shading throughout
- Natural materials as opposed to parking/asphalt

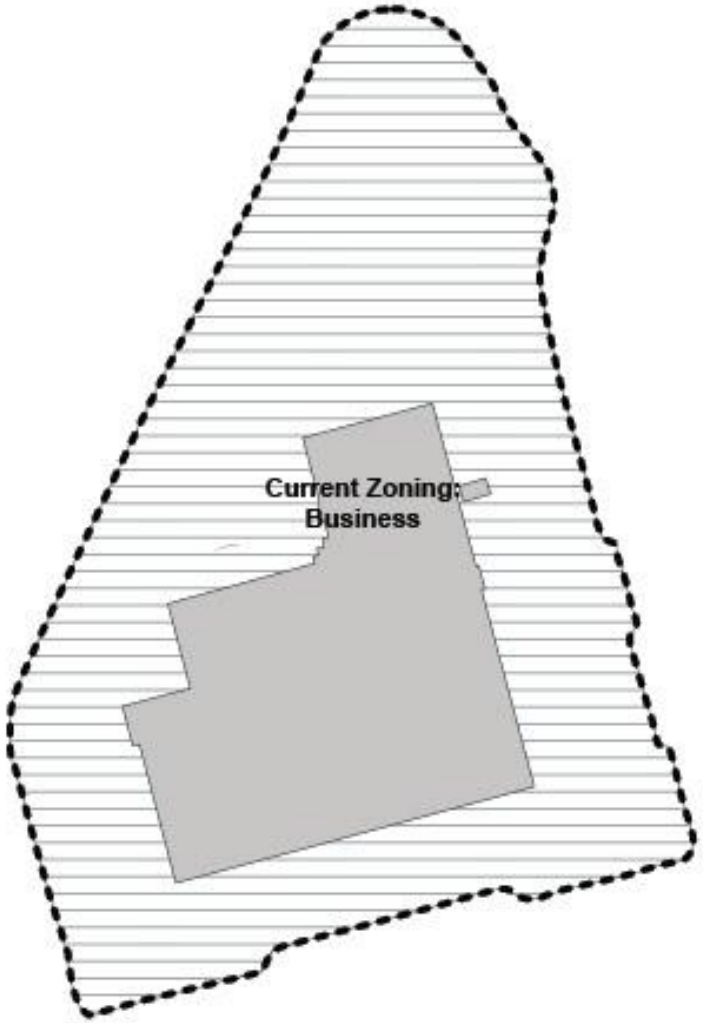


Open Space Requirements

- Turning an existing parking/car dealership into a public park
- Creation of new habitats for trees, birds, plantings, etc.
- Urban Forest Master Plan: tree coverage in Cambridge has been dwindling – goal to bring 80,000 trees to the city.
- Pervious Materials

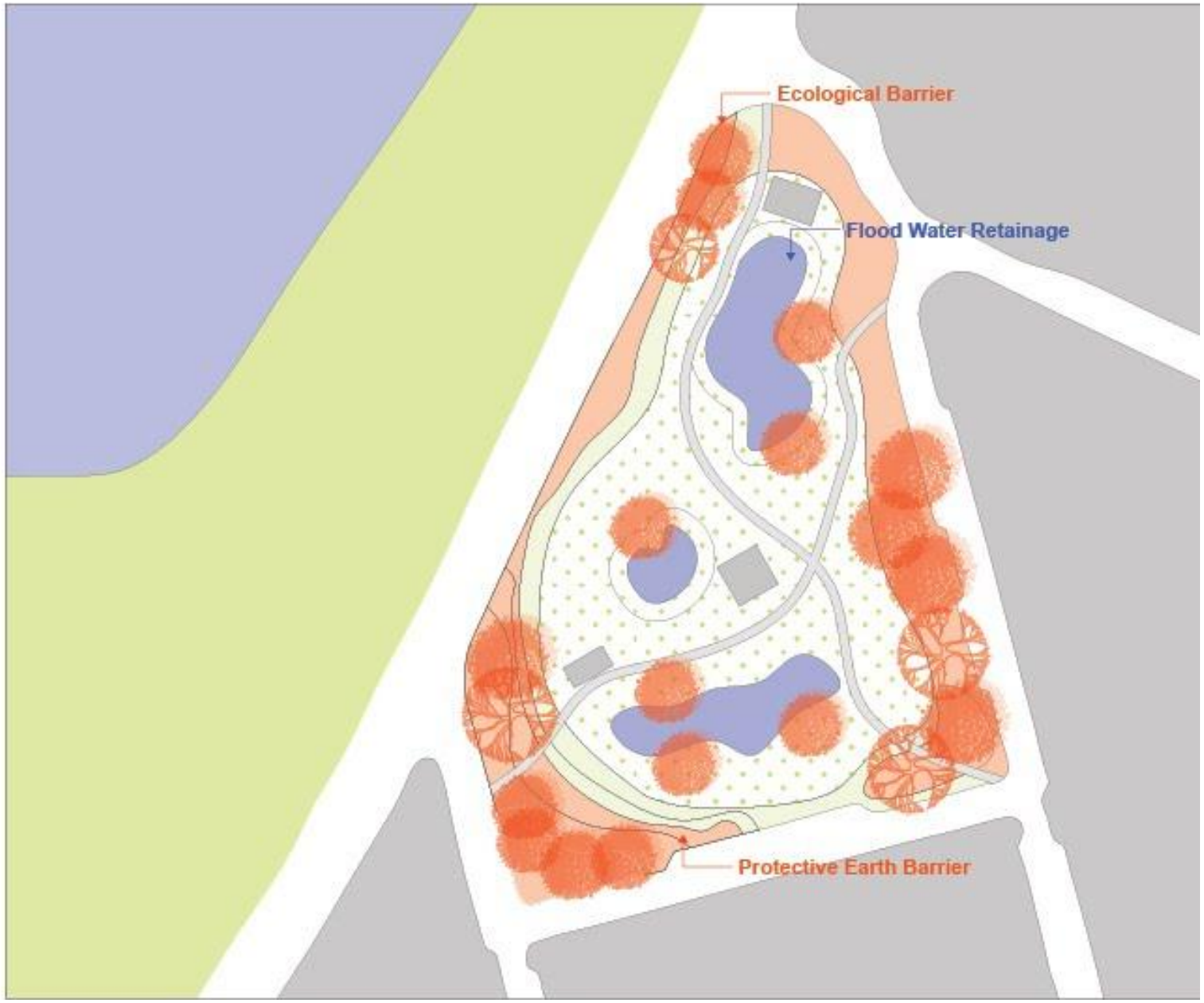
Zoning Changes

- Zoning change from a business to open space
- No parking to be located onsite



Stronger Infrastructure

- Protection of existing residential neighborhoods and existing transportation systems



Social Resiliency

- Open space
- Extension of Fresh Pond
- Gathering place for members of the community

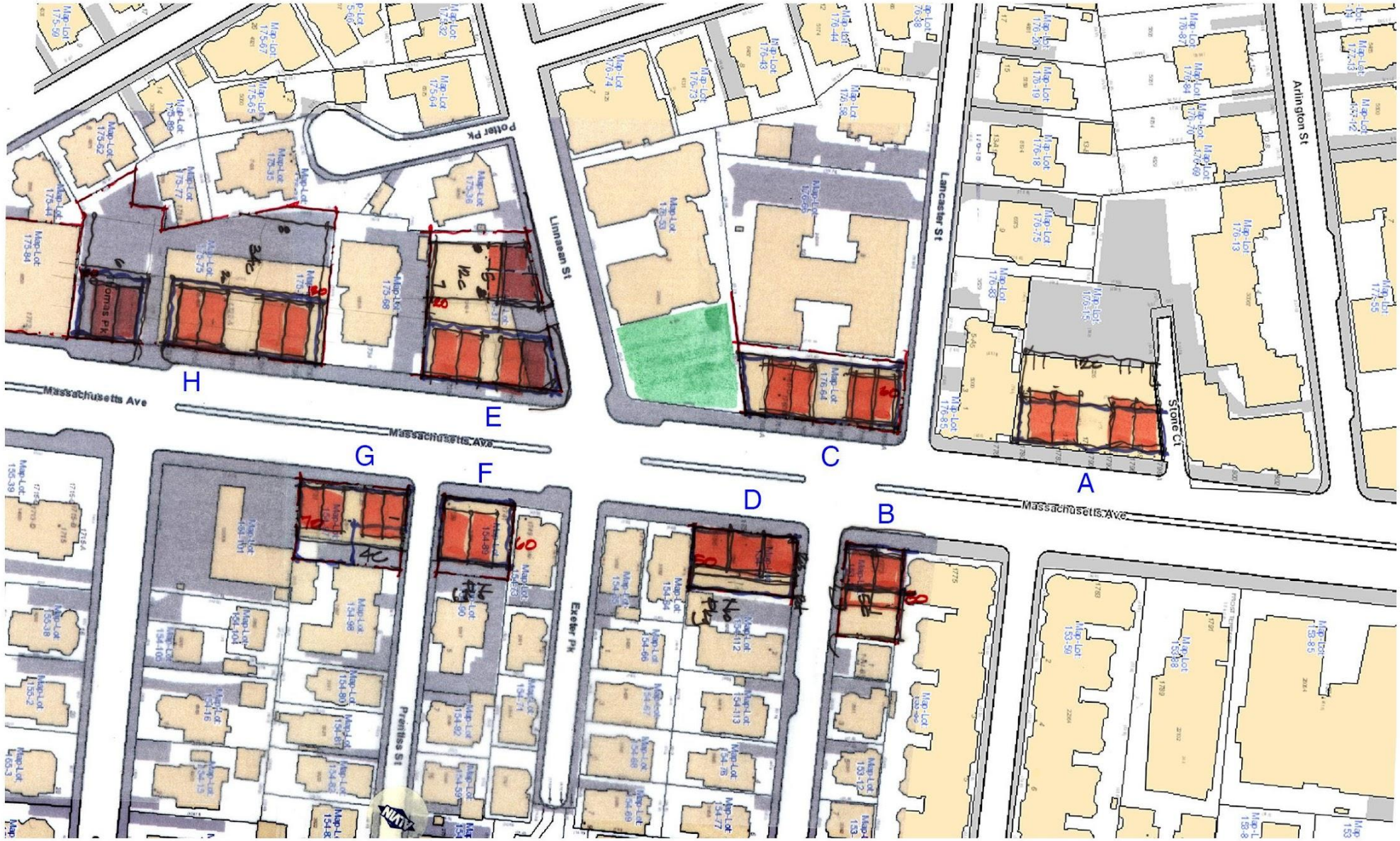
Thank you!

Appendix

04 Aerial View Looking NW - Existing

04 Aerial View Looking NW - Proposed

01 Reference Plan



Executive Summary: The proposed urban design strategy includes increased density within lots currently occupied by single-story retail buildings, along several blocks of Massachusetts Avenue. The strategy povides for two-story, duplex, walk-up residences above a single story of retail or office use. The proposal generally conforms to the existing zoning ordinance, although some of the lots, noted in red below, would require setback or floor area relief. Several of the proposed sites could suport additional density, beyond what is proposed here (see Remaining Floor Area Permitted below). The proposal also provides ample opportunity to enhance sustainability and reliency features within the neighborhood.

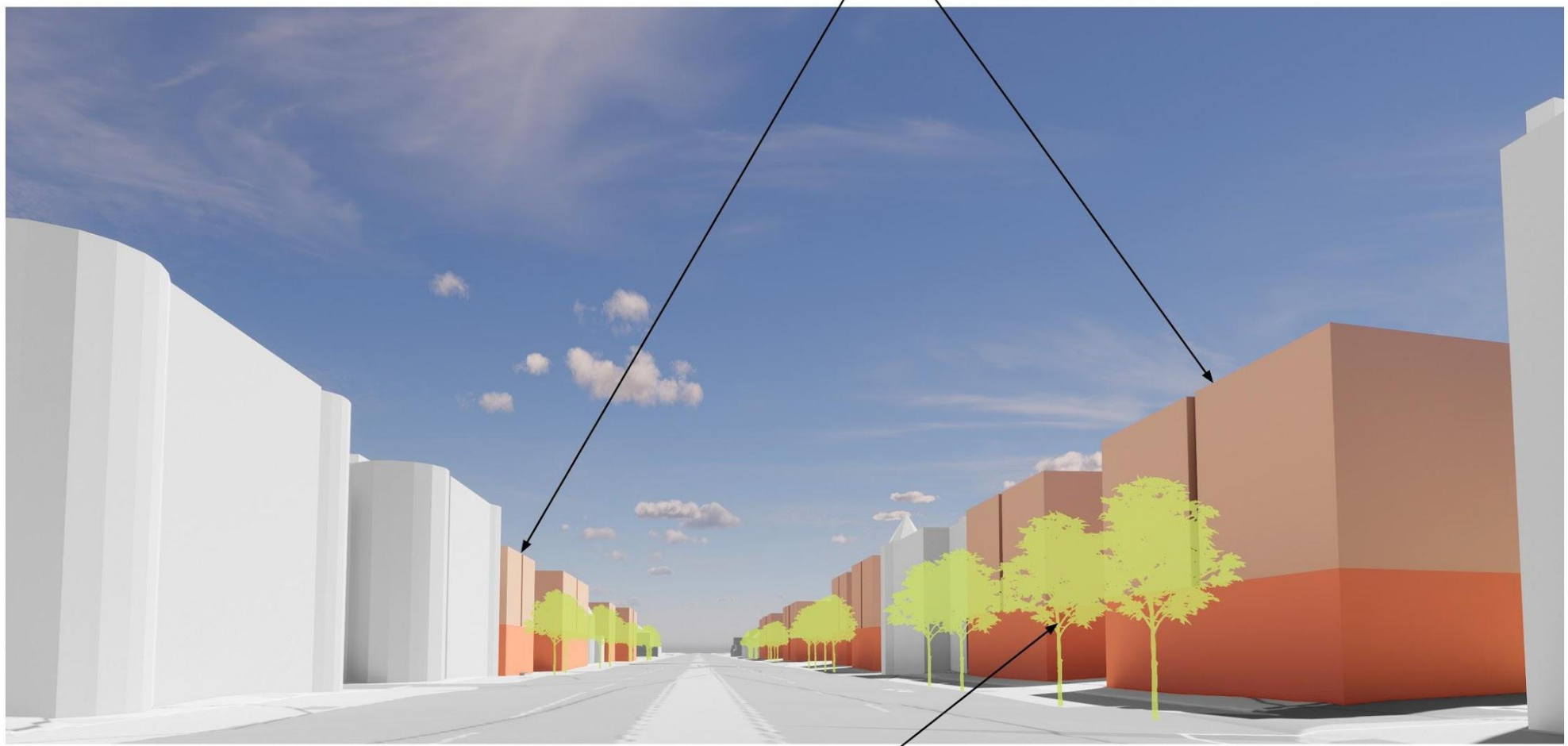
Key	Property	Lot Size	GF- Retail	2F - Residential	3F - Residential	Area	F.A.R.	Gross Floor Area Permitted	Remaining Floor Area Permitted	% Retail	% Residential	Setback Notes
A	1780-1798 Mass Ave*	16,226	3,036	3,965	3,965	10,966	0.68	25,026	14,060	28%	72%	Side Yard abutting 1-5 Linaean requires 10 feet. Minor adjustment to massing may make this feasible. Side window in Level 2 of neighbor
B	1771-1773 Mass Ave*	5,226	1,560	2,310	2,310	6,180	1.18	8,156	1,976	25%	75%	10' side yard setback required at 1775 Mass Ave due to residential/ side windows adjacent. No side yard setback provided
C	1760-1770 Mass Ave	7,467	3,400	3,400	3,400	10,200	1.37	11,201	1,001	33%	67%	Rear Yard Setback 15' provided, approx 25 Feet required
D	1755-1765 Mass Ave	4,664	2,891	2,891	2,891	8,673	1.86	6,996	-1,677	33%	67%	10' side yard setback required at 1753 Mass Ave. Building has upper level side windows. No side yard setback provided
E	1736-1740 Mass Ave*	12,424	4,672	5,172	5,172	15,016	1.21	18,843	3,827	31%	69%	10' side yard setbacks achievable at both sides corner site
F	1739-1741 Mass Ave	3,600	2,050	2,050	2,050	6,150	1.71	5,400	-750	33%	67%	10' side yard setbacks achievable at both sides corner site
G	1731-1737 Mass Ave*	5,847	2,680	3,058	3,058	8,796	1.50	8,896	100	30%	70%	No sideyard setback provided adjacent to gas station parking lot
H	1720-1730 Mass Ave	25,656	6,060	6,060	6,060	18,180	0.71	38,484	20,304	33%	67%	Setbacks achievable

* Includes some residential over surface level parking

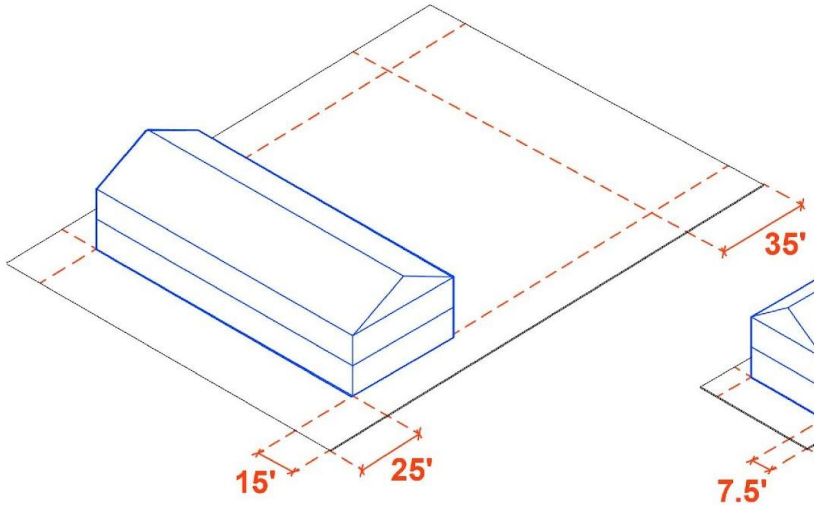
District	Max. Ratio of Floor Area to Lot Area	Minimum Lot Size in Sq. Ft.	Min. Lot Area for Each D.U. in Sq. Ft.	Minimum Lot Width in Feet	Minimum Yard in Feet			Maximum Height in Feet			Min. Ratio of Private Op. Sp. to Lot Area
					Front	Side	Rear				
Bus. A-2	1.0/1.75	none	600	none	5 (m)	10 (i)	20 (j)	45 (k)			none

05 Existing Massing - Looking South

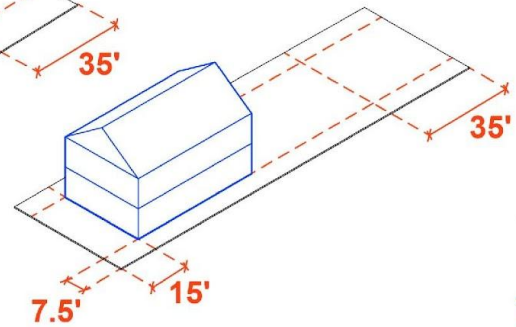
05 Proposed Massing - Looking South



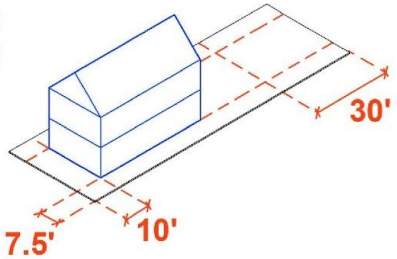
Existing Zoning



Dimensional standards
Max. FAR: 0.5
Max. Height: 35’



Dimensional standards
Max FAR: 0.5
Max. Height: 35’



Dimensional standards
FAR: 0.6
Max. Height: 35’