

**NC STATE** Design

# Affordable and Resilient Housing

Duffyfield Community | New Bern, NC







# Affordable and Resilient Housing Duffyfield Community | New Bern, NC

Thomas Barrie, FAIA

The School of Architecture | NC State University College of Design

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# NC STATE Design

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*Affordable and Resilient Housing, Duffyfield Community | New Bern, NC*  
Thomas Barrie, FAIA, DPACSA

Project research assistant, Gayatri Ganesh (M.Arch 2023)  
Design and production by Adam Noel (MGD 2023)

Cover image by Clayton Johnson

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# Acknowledgements

Thomas Barrie FAIA

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# Introduction



# Introduction

## ***Project Description, Process, and Goals***

The lack of affordable housing is a national problem. It is particularly acute in underserved communities that have suffered from disinvestment, structural inequality, and environmental impacts due to climate change. The Duffyfield neighborhood in New Bern, NC has a rich history as a vibrant and resilient African American community that has withstood racial, economic, and land use discrimination. More recently it has suffered years of periodic flooding, disinvestment, and population and housing loss.

*The Affordable and Resilient Housing, Duffyfield Community, New Bern, NC* project focused on the design of affordable and resilient housing prototypes for the Duffyfield project area. During Spring Semester 2022 eleven students in an advanced architectural design studio produced scholarly and design research aimed at solutions to the housing problems faced by the Duffyfield community. Students designed a range of housing types, options,

and models that will allow existing residents to stay in their community and attract others to move there. In particular, the project focused on the design of single family housing, but also included “missing middle” housing of duplexes, townhomes and accessory dwelling units.

The research included affordable and resilient housing precedents, equitable, sustainable, and resilient design and development practices, leading-edge construction materials, methods, and delivery systems, and emerging concepts of meaningful placemaking. The project research assistant also researched and documented pertinent demographic, historical, environmental, housing and transportation contexts, current planning documents, zoning and building codes, building and site inventories, and other areas germane to the project. Substantive community development studies produced by the City of New Bern, including the *Greater Five Points Transformation Plan* (2016) and *Redevelopment Plan* (2020), informed the project research and

design. Videos of the research outcomes can be viewed on the project pages of the Affordable Housing and Sustainable Communities Initiative website.

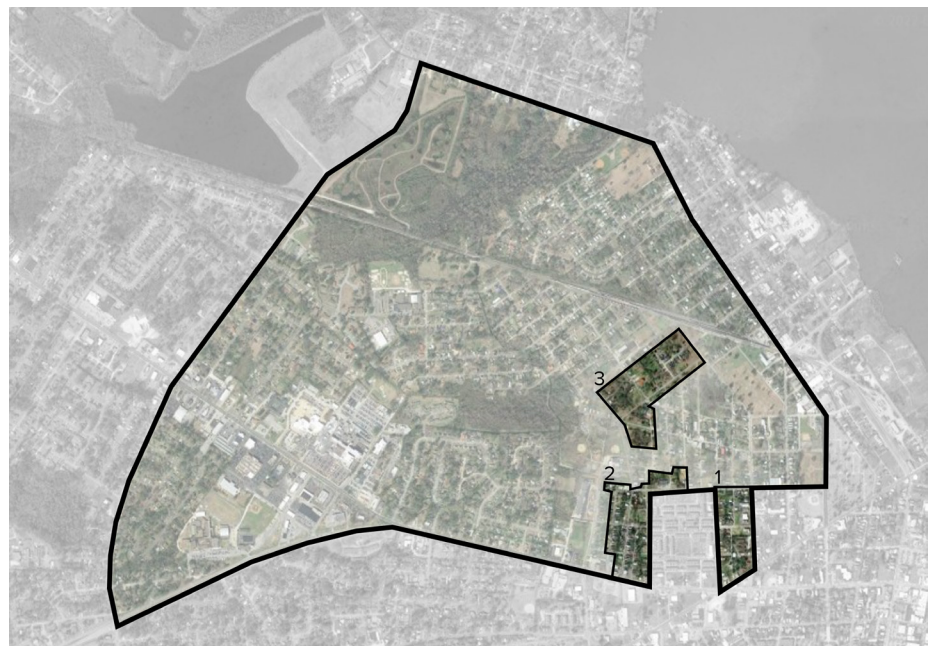
Demonstration projects on scattered sites in three Focus Areas identified by the Redevelopment Plan addressed site-responsive, accessible, affordable, sustainable, and resilient housing, including construction materials, assembly, and delivery systems and strategies for flood-prone areas. Additionally, each project included local placemaking that included streetscapes, sidewalks, on-street parking, lighting and, in some cases, community parks and greenspaces.

The project process included design workshops with visiting experts and presentations to city partners and housing and resiliency experts. It did not include community engagement, which had been successfully accomplished in the *Greater*

*Five Points Transformation Plan*. Instead, the resources and best practices, design guidelines, and housing prototypes included in this report serve as a playbook for future community engagement and participation.

The overall goals are to provide:

- best practices, strategies, and housing prototypes that will productively inform the city of New Bern's goals of revitalizing the physical community of Duffyfield;
- a playbook for grant and funding applications, hiring professionals, requests for proposals (RFPs), and housing developers, and;
- research and design resources for the community so that they can participate in shaping its future in an informed and empowered manner.



Project Boundaries and Focus Areas

# Definitions of Terms Used

In this report the following terms are used:

- **Duffyfield** refers to the area inside the Affordable and Resilient Housing Duffyfield Community, New Bern, NC project boundaries.
- **Redevelopment Area** is used for the Greater Five Points Redevelopment Area as defined by the Redevelopment Commission.
- **Greater Five Points** is the historically Black community addressed by the Greater Five Points Transformation Plan.
- **Greater Duffyfield** refers to the neighborhoods of Dryborough, Walt Bellamy, Trent Court, and Craven Terrace.
- **Affordable Housing** describes housing designed and subsidized to be affordable for the economic demographics of Duffyfield.<sup>1</sup>
- **Resilient Housing** describes housing designed to withstand severe weather events, including flooding, with minimal damage.
- **Placemaking** is used for streetscapes and public amenities that define the character of specific areas.

# **The Duffield Community**

# The Duffyfield Community<sup>2</sup>

## ***Historical and Demographic Contexts***

Built environments reflect histories often as eloquently as historical texts. Greater Five Points is a historical artifact of the struggles, successes, tragedies, and repression experienced by the communities that shaped it over time. Today it comprises over three-thousand residents and is almost 90% Black. The city of New Bern is well-known as the second oldest city in North Carolina and an early capital. What is less well known is the rich history of its Black culture and citizens. After the end of the Civil War formerly enslaved people flocked to New Bern and Greater Five Points became a major Black community in the segregated city.<sup>3</sup> As New Bern's Black population grew, Greater Five Points blossomed with many distinguished business, professional, and religious figures.

Ever since it was founded, New Bern has had a significant Black population, beginning with the enslaved people who worked in the cotton and tobacco industries. Prior to emancipation, it had at times a high percentage of freed enslaved people,

and until the 1930s was a majority Black city. Antebellum New Bern was also distinguished as a sanctuary for Black artisans and progressive laws regarding mixed-race marriage and Black rights.<sup>4</sup> New Bern fell to the Union early in the Civil War and became a haven for enslaved people, some who served in the war efforts and in time became political and economic leaders. Abraham Galloway, who was born into slavery in Wilmington, was a community leader and activist, led Black efforts in the war, and later became a North Carolina Senator.<sup>5</sup>

However, its history is also one of repression and disenfranchisement of its Black citizens. Jim Crow laws following the Civil War and a 1900 amendment to the North Carolina constitution repressed Black communities and disenfranchised Black voters. Laws, discrimination, and racial terror created the segregated built geographies of the South, of which Greater Five Points is heir. Other factors also contributed to the Greater Five Points, and Duffyfield, of today. The 1922 Great Fire of New Bern devastated the city and disproportionately affected Greater Five



Points. This was compounded by laws that prohibited the reconstruction of homes and other discriminatory laws, which, along with Black citizens migrating to northern cities, precipitated a significant loss of population. By the 1940s, New Bern was a majority white city.

The amount of vacant land in Duffyfield dates from this time. Surviving houses, churches, and community spaces, reflect the determination and autonomy of the community. Some were built during and after World War II when the community flourished during an economically supportive time. However, the economic and civic successes of the 1940s and 50s were short-lived. The widening of Broad Street in the early 1950s physically isolated Duffyfield and the continuing white terror of the Jim Crow era marginalized it. Protests, including a sit in at a New Bern restaurant in 1960, and federal laws, brought this era to an end. However, schools in New Bern were not fully integrated until the 1970s, despite being outlawed years earlier. These, and other impacts, contributed to the economic disparity of Duffyfield and its loss of population, housing, and economic opportunities.

Today, Duffyfield, and Greater Five Points, are majority Black communities that continue to be impacted by high crime rates, inadequate public transit, lack of infrastructure, narrow, poorly maintained roads, very few sidewalks, street trees and lighting, below average home values, substandard housing, many vacant lots, and health and education disparities. Damage from hurricanes, especially Florence, have compounded the challenges of rebuilding its physical community. Leander R. Morgan, the first Black mayor of New Bern (first elected 1977) described the condition of Duffyfield in the 1960s as a, “number of dirt streets..., about five miles, roughly, of dirt streets. There were certain ‘thoroughfares,’ but

once you turned off of those streets it was dirt. Very few brick homes, more wood-type homes, and a number of vacant lots,” an observation that could be made today.<sup>6</sup>

Too little remains of the housing that distinguished Duffyfield’s periods of vibrancy. One must rely on historical records to learn about the housing types that created its most distinguishing characteristics. Post-Civil War Greater Five Points was poor and isolated, like many segregated Black communities in North Carolina, and remained so for generations. Early 20<sup>th</sup> century houses were described by one scholar as, “one or two rooms crowded close together of groups of eight to ten. They were probably of substandard construction and represented living conditions no better than slave quarters.”<sup>7</sup>

Pre- and post-fire housing was typically a tightly clustered variety interspersed with local businesses, community buildings, and churches. According to a historical study of Duffyfield’s housing, few pre-twentieth century houses remain.<sup>8</sup> In the late 19<sup>th</sup> century, 1 ½-story cottages and I-houses were found throughout the community. Early 20<sup>th</sup> century housing included 1 and 2-story front-gable houses, and 1 and 2 story bungalows and four squares,<sup>9</sup> some that can be found today. There are also shotgun houses and a variety of mid- to late-twentieth examples, including ranches.

Sadly, most of the built heritage of Duffyfield has been lost, either from the Great Fire or neglect and demolition, though the community it represented remains. The Redevelopment Plan notes that 47% of lots in the Redevelopment Area are vacant. It states that the city has been successful in removing substandard and abandoned housing, but “by removing one problem, the city has created another” of many vacant lots.<sup>10</sup>



Examples of Front Gable Houses



Bungalow



A row of Shotgun Houses



Four Square



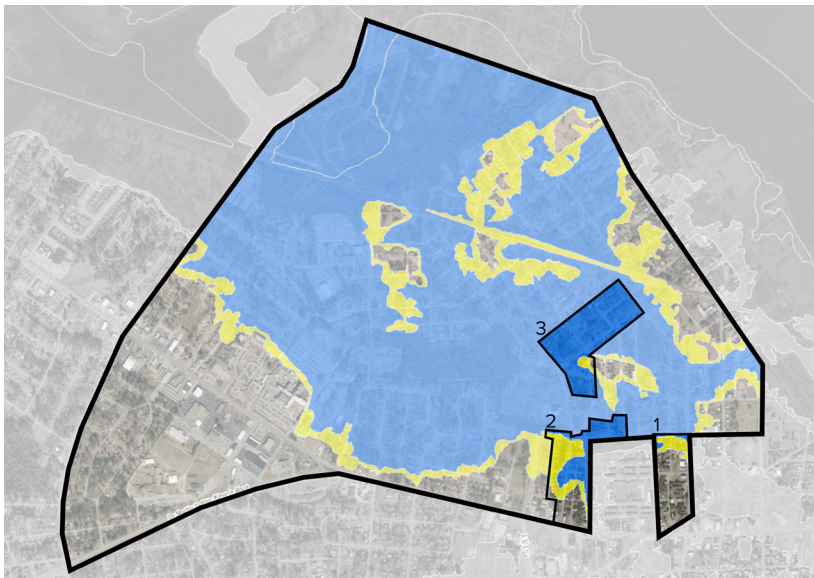
Ranch



### ***Environmental and Economic Conditions***

Further exacerbating the conditions of Duffyfield are repeating deleterious impacts of hurricanes. Most of the storm damage in eastern North Carolina has been flooding, which will worsen as climate change brings sea level rises and more frequent and severe storms. Craven County is one

of the most at risk of flooding of counties statewide and 50% of Greater Five Points lies within the 100- or 500-year floodplain.<sup>11</sup> Duffyfield is particularly prone to flooding, a legacy of segregated Black communities being located in low-lying areas. The flood zone map of Duffyfield documents the high percentage of the community at high risk of flooding during major weather events.



Duffyfield 100- and 500-Year Flood Map



Duffyfield street after Hurricane Florence (Times Union September 16, 2018)

Hurricanes Fran and Bertha in 1996 and Irene in 2011, and more recently hurricanes Isabel, Matthew, and Florence, resulted in severe and lasting damage. Of these, the Category 4 Florence inflicted the most damage county wide. Storms such as Florence also have lasting economic impacts. Property values in the redevelopment area are valued at less than 2/3rds of the average citywide.<sup>12</sup> This is advantageous for the city's acquisition program, but also unjustly reduces property owners' wealth and their ability to move to non-flood-prone areas.

Over 1/3 of the residents in the redevelopment area live at or below the poverty line. For homeowners, the cost of repairing severely damaged houses often exceeded the value of the house itself.<sup>13</sup> For renters, which are most of the residents, it meant long delays in restoring their units, if they were restored at all, further burdening a vulnerable population that was already housing cost burdened. Housing costs for homeowners and renters are also impacted by requirements for flood insurance that can be high in flood prone areas.

**Research**



# Research

## ***Precedents and Best Practices***

Students identified, researched, analyzed, and documented pertinent precedents and best practices appropriate to the project's program and goals. These are not the only examples, and some may not be directly applicable to Duffyfield, but were chosen to illustrate particular design strategies, context responses, or economic models. Additional examples are presented in the research videos.

## Single Family Houses

### Cedar Bay

Cedar Bay is a community of single family homes in Manteo, NC designed by Tightlines Designs, a Raleigh-based architecture

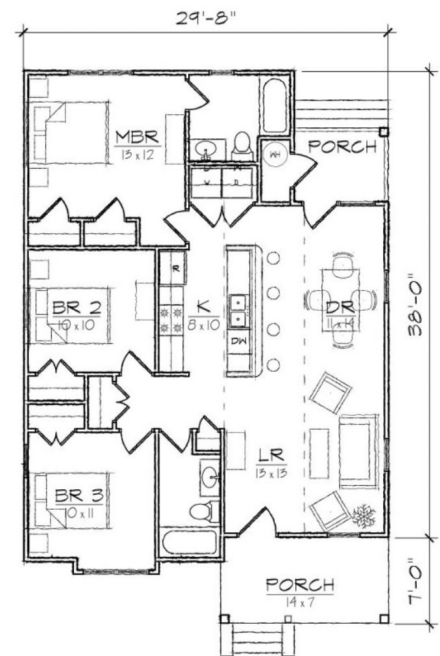
firm that has a robust catalog of house plans. For this project, stock plans were modified to satisfy the maximum flood level requirements of this coastal city. The results were skillful design solutions to the necessity, in some cases, of raising the floor level significantly above ground level.



Cedar Bay Single Family House (Tightlines Designs)



Cedar Bay Single Family House (Tightlines Designs)



Cedar Bay House Plan (Tightlines Designs)



## UrbanBuild 12

This design build project led by Byron Mouton of Tulane University was a 2-bedroom infill house scaled to fit in with adjacent existing houses on Toledano Street in Central City New Orleans. A mechanical

core organizes the plan and northern light from clerestories provide natural lighting to bedrooms and living spaces. A retractable screen provides privacy for the front porch and living areas, if necessary.



UrbanBuild 12, New Orleans



UrbanBuild 12, New Orleans, view of kitchen and clerestories



UrbanBuild 12, New Orleans, Plan

## Rural Studio 20K houses

The Rural Studio is an off-campus, design build program of Auburn University that was founded by Samuel Mockbee and D.K. Ruth in 1993 and has primarily served the residents of Hale County, Alabama. Recent projects have focused on prototypes of

owner-occupied, single family homes that are affordable, healthy, safe, durable, energy efficient, and beautiful. The so-called 20K house project, begun in 2004, focusses on modest dwellings designed and built to replace substandard housing that is prevalent in the county.



Rural Studio 20K House, Dave's Home, 2009



Rural Studio 20K House, Ree's Home, 2018



## East College Park Project, Raleigh, NC

East College Park is a historically Black community next to Saint Augustine College, a historically black university (HBU), in Raleigh, NC. After years of disinvestment and increasing blight, Raleigh's Housing and Neighborhoods Department began buying and assembling properties. Construction started in 2017 on what will eventually be

98 single family homes, 51 townhouses, streetscape upgrades and community parks. An RFP process resulted in 5 qualified developers who were responsible for all aspects of the homes' design and construction. 60% of the units will be sold to income-restricted households at or below the HUD 80% AMI. They are required to live in the home and there is a 10-year deed restriction to keep them affordable.



East College Park, Raleigh, NC



East College Park, house and accessory dwelling unit



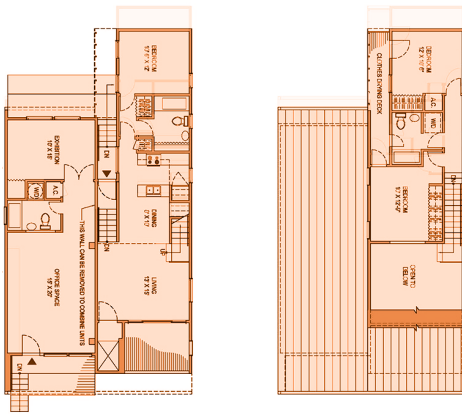
## Duplexes

### UrbanBuild 05

This project by UrbanBuild was part of the Make it Right Foundation projects to provide innovative housing models for the 9<sup>th</sup> Ward of New Orleans following Hurricane Katrina. It was designed according to leading edge sustainability and energy efficiency models. It is also a duplex that can be combined by removing a wall between the two units. According to the designers, “Its primary, larger unit is raised in anticipation of potential future flood waters, while a smaller unit downstairs, which maintains the home’s connection with the surrounding neighborhood, would have to be repaired if the neighborhood ever flooded again.”<sup>14</sup>



UrbanBuild 5, New Orleans



UrbanBuild 5, New Orleans, plan



UrbanBuild 5, interior

## ***Multifamily***

### **OJT Starter Home Initiative**

The ten single family and one two family homes tightly assembled on a site in the Irish Channel neighborhood of New Orleans were developed by the Office of Jonathan Tate (OJT) as part of their Starter Home Initiative. The site, which was zoned large-lot single family, was re-platted using condominium regulations to achieve the density necessary for its affordability strategy. OJT also utilized innovative funding models, including crowdfunding.<sup>15</sup> The scale of the three-story units is mitigated by their gable roofs while also providing a consistent street frontage.



Starter Home, 9<sup>th</sup> Street, New Orleans, Office of Jonathan Tate (photograph by Will Crocker)



Starter Home, 9<sup>th</sup> Street, New Orleans, Office of Jonathan Tate (photograph by Will Crocker)



## Woodstock Gardens, Portland, Oregon

Three single family homes, each with an accessory dwelling unit, were developed by Kristy Larkin in the Woodstock Gardens neighborhood of Portland, Oregon. The project, completed in 2013, was designed by Studio Cropp of Portland. Each unit was sold separately using the condominium ownership model.



Woodstock Gardens, concept drawing



Woodstock Gardens, accessory dwelling unit

## ***Cottage Courts***

### **Third Street Cottages, Langley, Washington**

This cluster of small cottage homes was built in a single family neighborhood of Langley, Washington after the town amended their building code to allow for “Cottage Housing Development.” This was a response to the need for more affordable, diverse, and

dense housing that would not upset the character of this small city on Whidbey Island north of Seattle. The code limits the size of units to 975 square feet and requires a shared internal courtyard and screened off-street parking. Ross Chapin Architects designed 8 detached cottages that were not more than 850 square feet, a shared garden, commons building, and toolshed. Each unit was sold as a condominium.



Third Street Cottages, Langley, WA



Third Street Cottages, Langley, WA



## Keys Cottages, Big Pine Key, Florida

The Florida Keys Community Land Trust developed this small cottage community on Big Pine Key after 25% of the housing on the Florida Keys was destroyed by Hurricane Irma in 2017. Community land trusts preserve affordable housing through ownership of the land. In this case, Monroe

County bought the land and leased it to the Florida Keys Community Land Trust with the requirement that all cottages be rented to residents with incomes at or below 80% AMI. Four 750 – 1094 square foot units, designed by Marianne Cusato, were completed in 2018, with five more planned. All are raised twelve feet above grade and designed for 200 mph wind loads.



Keys Cottages, Big Pine Key, FL



Keys Cottages, Big Pine Key, FL

### ***Scattered Site Townhomes***

Erie Ellington Homes, Boston, MA

The Erie Ellington Homes are 20 three and four-family, energy-efficient, context responsive, townhouse apartment buildings on seven scattered sites near public transit. It is in the Dorchester section of Boston that had suffered from disinvestment, blight, and vacant properties for many years. It was developed by the Codman Square

Neighborhood Development Corporation in partnership with the Erie Ellington Brimsley Partnership, a neighborhood association, and completed in 2000. There are a total of 50 units ranging from 707 to 1450 square feet rented at or below 60% AMI. The project was funded by a package of Low Income Housing Tax Credits (LIHTCs) and loans. The development was the result of robust community input and has been a catalyst for new development in the area.



Erie Ellington, Dorchester, MA, townhouse



## ***Resilient and Disaster-Responsive Housing***

### **Katrina Houses**

The Mississippi State Gulf Coast Community Design Studio (GCCDS) is a university-based housing provider created after Hurricane Katrina to serve gulf coast communities in Mississippi. Located in Biloxi, Mississippi, it is an outreach and professional services program of Mississippi State University's

College of Architecture, Art and + Design and directed by David Perkes. Following Katrina, the GCCDS worked with a number of relief, development, and housing non-profits to create over 230 new single family houses on scattered sites. A variety of sources funded the design and construction costs. Each house was designed for a specific client to be, in the words of the studio, "a good fit and end up being long-term housing."<sup>16</sup>



Katrina Cottage, Gulf Coast Community Design Center

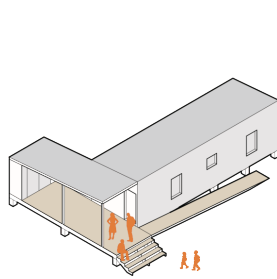


Katrina Cottage, Gulf Coast Community Design Center

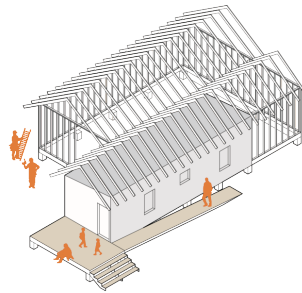
## RAPIDO

The Building Community Workshop (bcWorkshop), a non-profit corporation that engages in architectural design, research, and advocacy, developed a panelized housing prototype to respond to hurricane housing damage and loss. Rapido utilizes a core that can be quickly assembled on a property as temporary housing while a

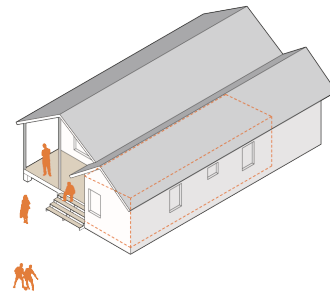
home is being rebuilt, or as permanent homeownership that is built out over time according to custom, pre-designed additions. The program also includes community outreach, case-management, and labor recruitment. Pilot programs have been developed for Houston and the Gulf coast through strategic partnerships, and prototypes constructed.



1| FAMILY LIVES IN THE CORE



2| CORE IS EXPANDED TO FIT FAMILY'S NEEDS



3| FAMILY ENJOYS PERMANENT HOME

RAPIDO, bcWorkshop, concept drawing



RAPIDO, bcWorkshop, completed house



RAPIDO, bcWorkshop, plan



RAPIDO, bcWorkshop, house core



# Design Guidelines

# Design Guidelines

The number of vacant lots, with a significant amount owned by the city or county, and the preponderance of damaged or sub-standard housing, is a significant problem and opportunity. Some vacant parcels are buyouts that can only be repurposed as greenspace, community gardens, or constructed wetlands; others are suitable for new housing built above flood and freeboard levels. The substantial loss of housing is also a loss of neighborhood character that presents challenges regarding how to rebuild in ways that is sympathetic with the built history of the community. The redevelopment of Duffyfield is an interrelated planning, finance, and design challenge that consequently should incorporate a broad range of strategies, many of which are outlined below.

## Context and Character



Houses should respond to historical and existing contexts through scale, form, materials, details, and color, including porches and defined front yards.

Prototypical infill housing at Elm between Darst and West Streets.  
Clayton Johnson

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## Streetscapes



Neighborhood streets should include sidewalks, street trees, and domestic-scaled lighting with houses and porches defining street edges for security and legibility.

Cooke Street, Raleigh, NC. Affordable housing and streetscape designed by David Maurer Architects/Tightlines for a formerly blighted area in Raleigh.

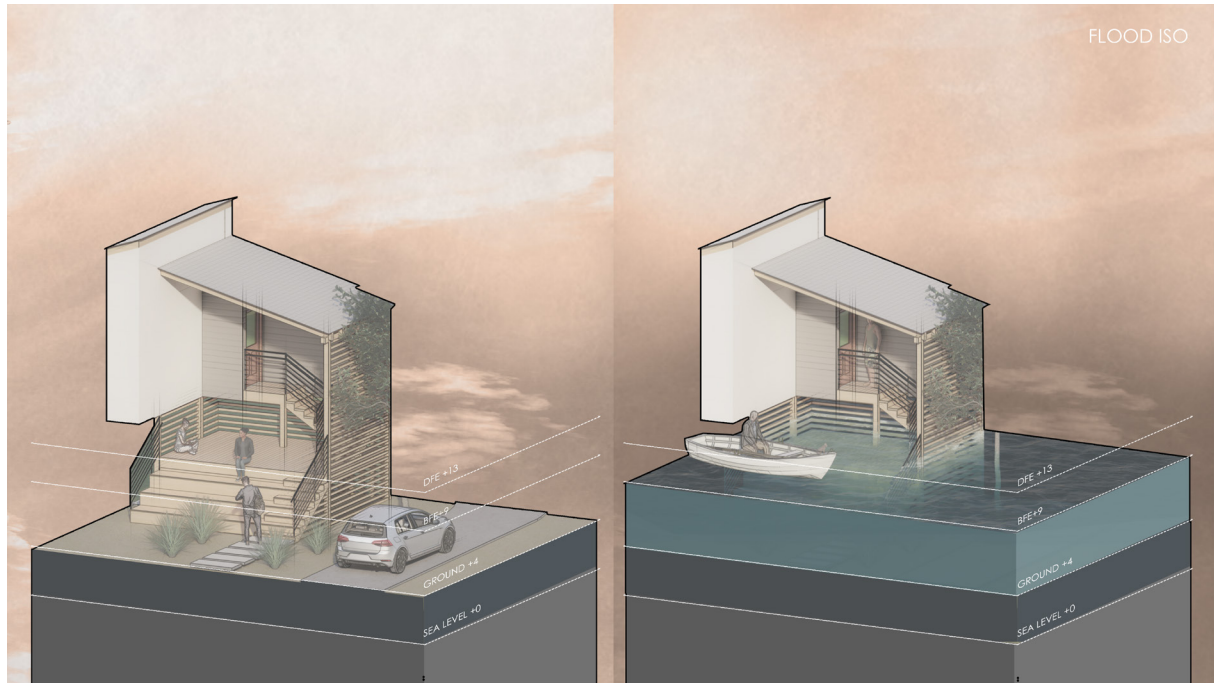


Prototypical streetscape of sidewalks, street trees, lighting, and on-street parking. Gayatri Ganesh

## Building in Hurricane and Flood-prone Areas

Houses should be elevated so that the first finished floor is above the maximum flood and freeboard levels, with accessibility provided through ramps or exterior lifts. Impacts on streetscapes should be mitigated

through tiered landscaping and porches or wet floodproofed, non-living spaces on the ground floor. Houses should also be designed to withstand hurricane-force winds with minimal damage.



Tiered porches designed for elevated housing on scattered sites in Focus Area 3. Harish Palani.

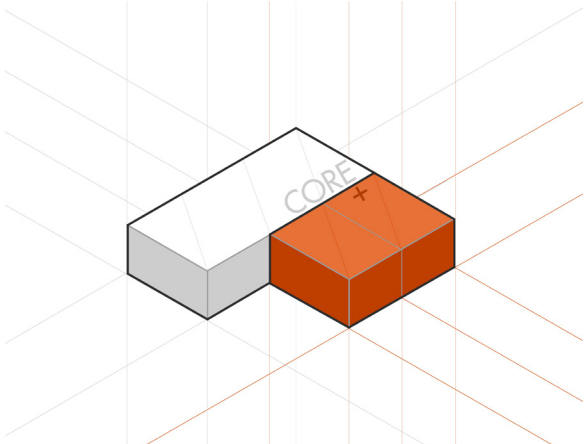


Tiered decks at UB5 by Tulane University UrbanBuild

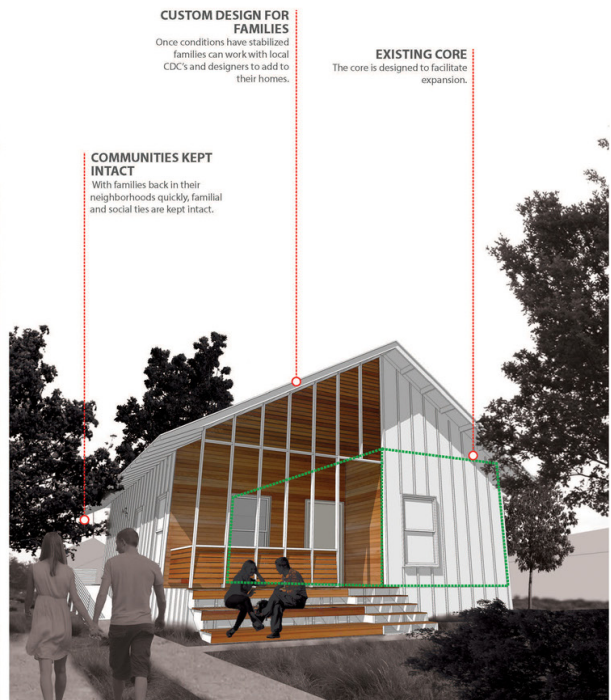
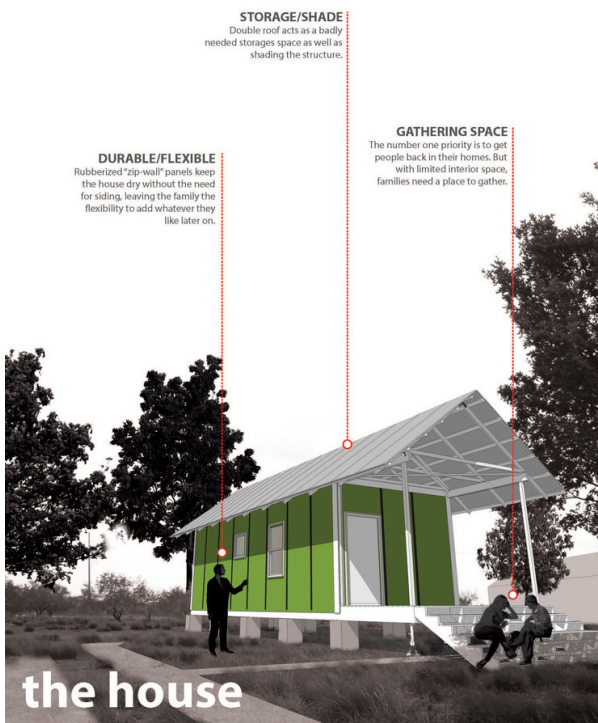


## Disaster Responsive Housing

Rapidly deployed housing allows owners to live on site while their home is being repaired, and can be built out over time.



Disaster responsive housing with a premanufactured core, with additional bedrooms that can be added over time. Gayatri Ganesh



The bcWorkshop RAPIDO features a premanufactured wet core module and flat packed wall, roof, and floor panel systems that can be deployed quickly following a disaster. bcWorkshop

## Site Planning

Clustering housing in compact organizations can maximize land use while also providing community spaces and constructed wetlands and greenspaces, and support public transit.



Townhouses designed for a site at Rose and Biddle Streets include a constructed wetlands and resilient park.  
Golsa Motevalli

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## Affordable Land-use Models

Community land trusts or other land use models where the land is owned by the community, city, county, or non-profit housing developer, can reduce housing costs, and preserve affordable housing.



A cottage court of small duplexes in Focus Area 3 is clustered around a community green and garden space (highlighted). Hima Thaker

## Zoning Reform

Zoning should encourage gentle density through compact development, minimal on-site parking, a variety of housing types and, in appropriate areas, mixed use for home and neighborhood businesses.

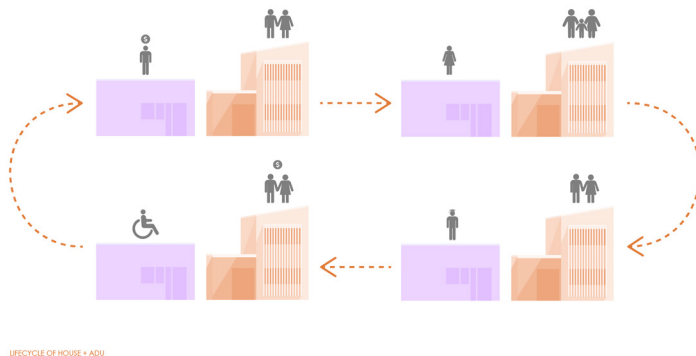


Small duplexes with ground floor live-work spaces are organized around a common courtyard and interior parking area. Meg Maley

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## Affordable Housing Types

New development should include missing middle, multigenerational housing of duplexes, triplexes, quads, cottage courts, and accessory dwelling units to provide equity and rental income opportunities, and with deed restrictions to maintain long-term affordability.



A detached accessory dwelling unit paired with a primary owner-occupied home can provide rental income and adaptable housing as family needs change over time. Brianna Creviston



Housing designed to be built out over time to meet a growing family's needs and resources can be an affordable option. Tenecia Jones



## Space Efficiency

Space efficiency lowers unit costs by reducing square footage while maximizing gracious, light-filled, and naturally ventilated spaces for living.



A square footage efficiently designed home can also feel large and bright. Clayton Johnson

## Privacy and Security

Smaller units in more densely planned clusters are one effective affordability strategy, but must balance the benefits of natural light, ventilation, and access to the outside with visual and acoustic privacy.



A variety of interior courtyards of cottage courts includes levels of private and public spaces. Meg Maley

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## Universal Design

Universal design incorporates design elements that allow physically handicapped residents, or their guests, to use the unit without restrictions.



Accessible accessory dwelling unit. Brianna Creviston

## Resilient Materials

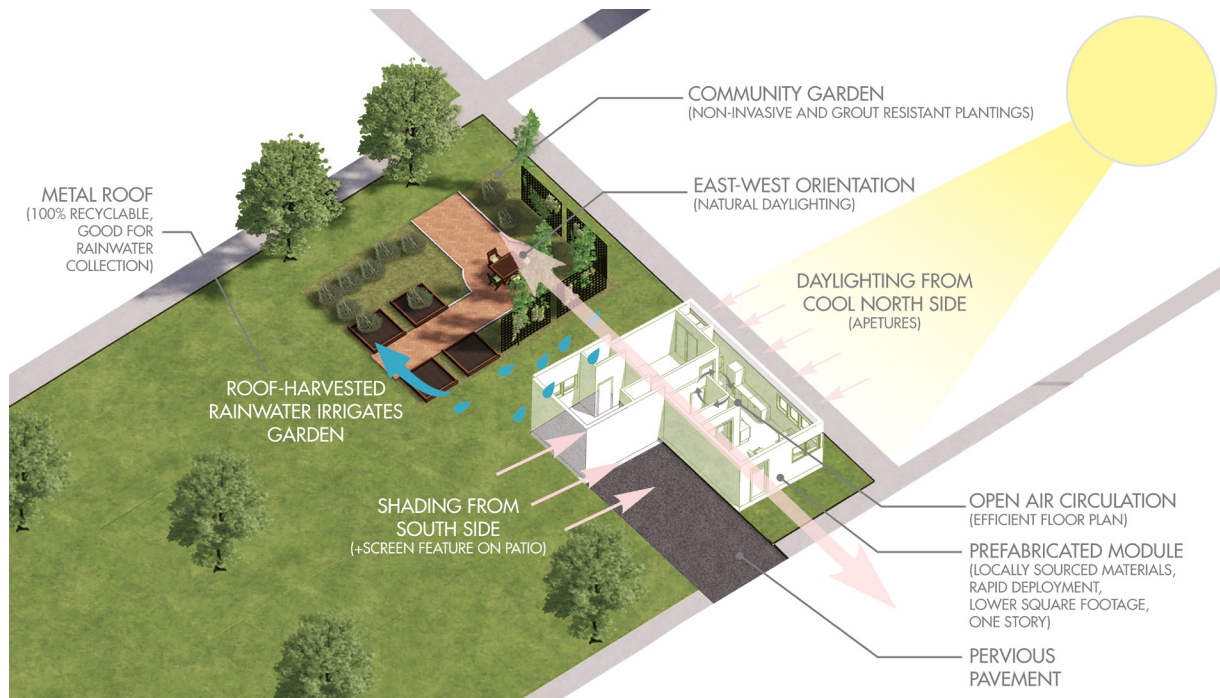
Houses should be constructed with flood and moisture resilient materials.



Prototypical housing models can include a palette of resilient materials from which owners can choose. Brianna Creviston

## Energy and Sustainability

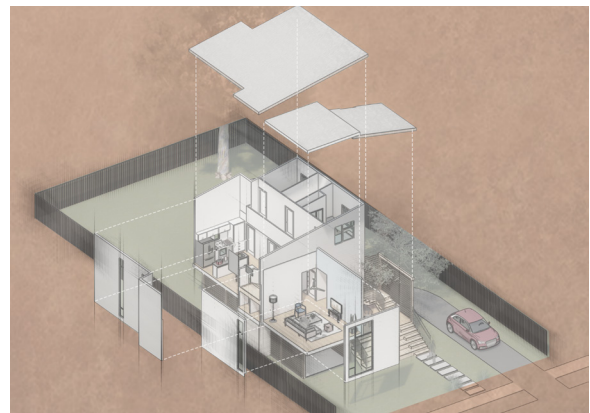
Energy efficient and sustainable design practices should minimize embodied energy of materials, use safe and healthy materials and finishes, and incorporate life-cycle cost-effective passive and active sustainability systems.



Sustainability diagram showing landscape, siting, planning, and material sustainability strategies. Gayatri Ganesh

## Conventional Materials and Assemblies

Affordable and cost-effectively maintained homes should use conventional materials and construction methods that can be easily maintained and repaired.



Isometric showing panelized building systems. Harish Palani



# **Demonstration Projects**



# Demonstration Projects

The Redevelopment Plan includes a 9-point plan to rebuild and revitalize the area over which the Redevelopment Commission has authority, and that includes Duffyfield. According to state law, the commission has the power of eminent domain, condemnation, and land acquisition in blighted areas. Point 4, which is the predominant subject of this study, commits to “improve quality, quantity, and appearance of housing stock.”<sup>17</sup> This is also consistent with Goal D-3 of the Choice Neighborhoods Greater Five Points Transformation Plan of 2016 for the city or developers to build affordable, infill housing for homeownership.

The demonstration projects used lots in the three focus areas identified by the Redevelopment Plan. Many are city owned, consistent with the Redevelopment Plan’s Goal 7, to “utilize city owned property within the redevelopment boundary to create new development opportunities.” For Focus Areas 1 and 2, projects correspond with the redevelopment plan’s goal of a variety of new housing, and in Focus Area

3, “higher density residential mixed use, community, and commercial uses.”<sup>18</sup>

Significant parts of two of the focus areas lie in an AE Flood Zone, which has a Base Flood Elevation of nine feet above sea level. Projects in these areas were designed to exceed this level, including the two-foot Design Flood Elevation, or Freeboard, with some adding an additional 1 to 2 feet as a safety buffer.

Duffyfield is predominantly zoned R-6 and 10. The projects incorporated existing and proposed zoning changes designed to allow for more density and mixed-use. In some cases, demonstration projects suggested what further zoning reform could produce, such as reduced setbacks and off-street parking, and provisions for new housing types.



## ***Single Family Houses***

The redevelopment of communities that have lost significant amounts of housing stock should be done in a manner that is historically and culturally sensitive. This single family prototype has two and three bedroom, roof form, and exterior materials options. The context responsive homes are designed for single, scattered sites or neighborhood infill of multiple, contiguous units in Focus Area 1. There are two units,

both of which utilize the same core, a 1,250 square foot two bedroom, 1 ½ bath and a three bedroom, two bath unit. The sustainability strategy includes a geothermal system shared by multiple houses in a neighborhood infill. The material palette provides a range of resilient materials in various colors and finishes.

Project by **Clayton Johnson**



Street facades, Elm Street



View down Elm Street



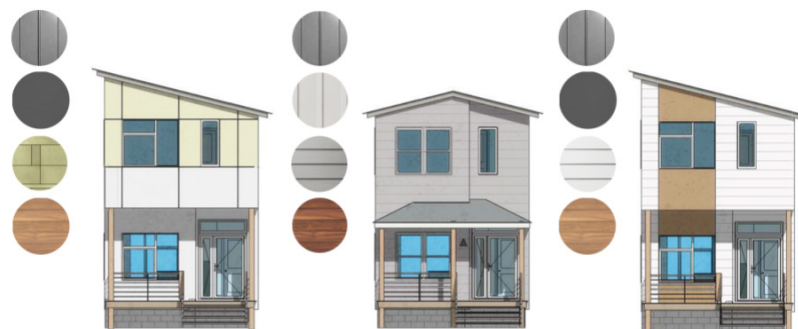
Site plan



Plan of the House Core



Plan of Core +



Material choices





View of kitchen



View of dining room

Homes in flood-prone areas present particular challenges because of the required height of their first floors. These homes are designed for scattered sites in Focus Area 3 and raised to the required level. Tiered porches transition from entry level to the streetscape and carports double

as patios. One story, two bedroom and two story, four bedroom models are proposed. A palette of resilient materials provides color and finish choices.

Project by **Harish Palani**



Prototypical units



Street view





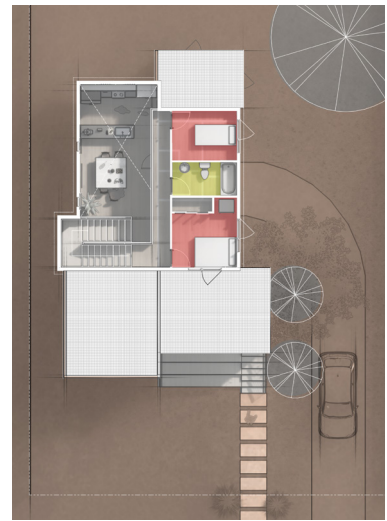
Two-bedroom house



Floor plan of two-bedroom house



Lower-level floor plan of four bedroom house



Upper-level floor plan of four bedroom house



Section, one story model





Entry and porch, one story model



Kitchen and dining room, two story model

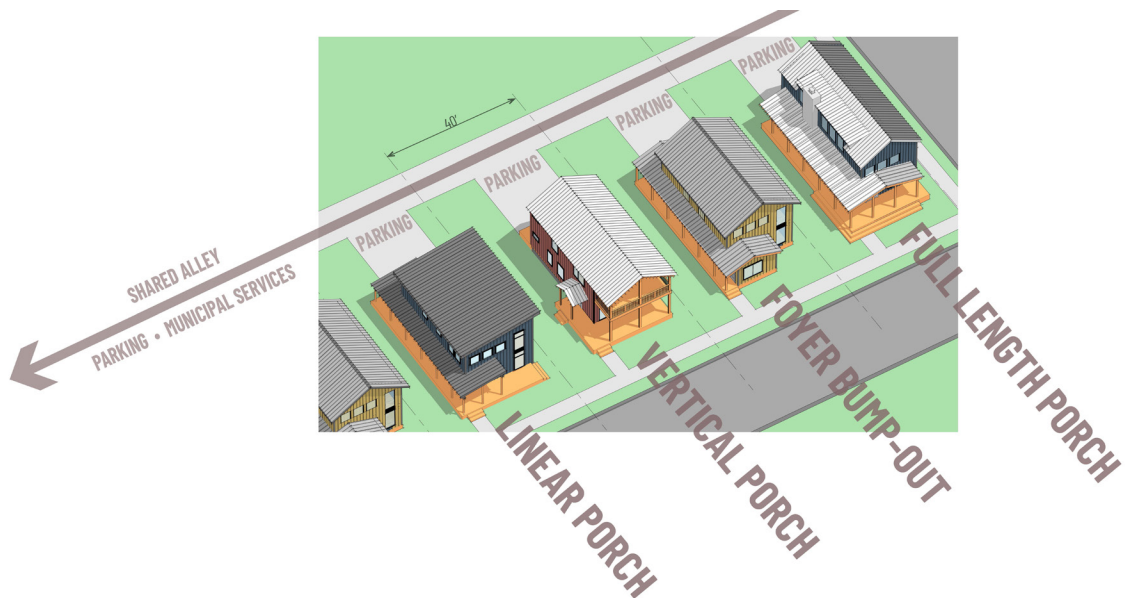
Affordable housing options can be achieved by utilizing construction systems that reduce site preparation and construction time. A pre-engineered and manufactured post and beam construction system distinguishes this project. It is designed as disaster responsive homes that can be quickly and efficiently

constructed. The three bedroom model has a variety of form and finishes options. Demonstration projects are shown for a flood prone area on 1st Avenue in Focus Area 2.

Project by **Mark Storch**



Sites in Focus Area 2



House variations

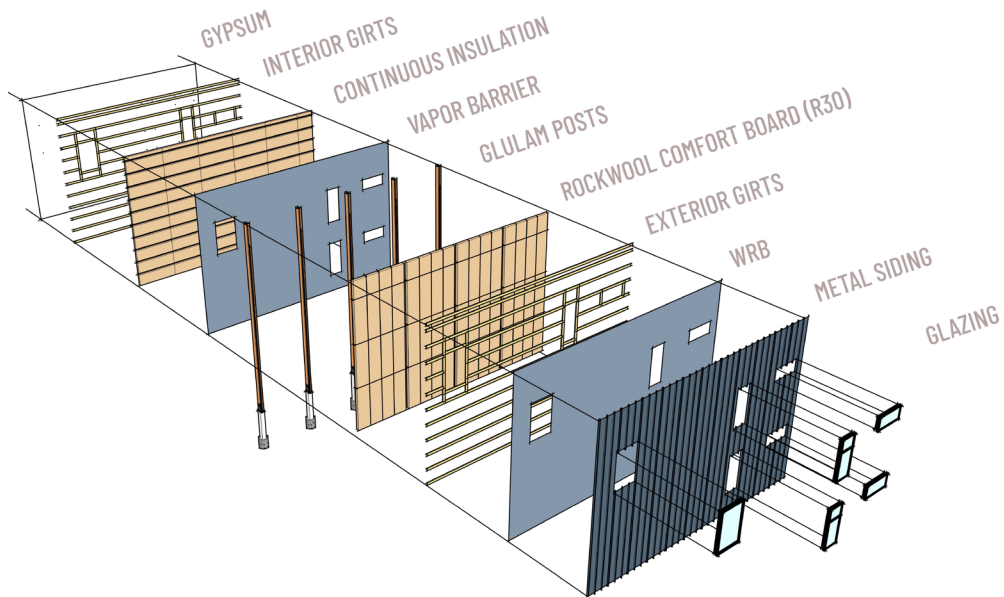




① 1st Floor  
1/8" = 1'-0"

① 2nd Floor  
1/8" = 1'-0"

Floor plans



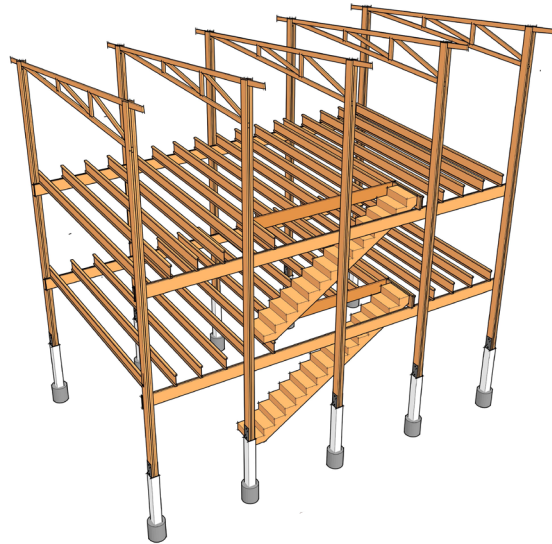
Wall assembly system

# PRIMARY STRUCTURE

## MPC Wood Trusses

Standard Spans: 20' - 60'

Double Shear Connection:  
Designed and Guaranteed by Truss Manufacturer



## Glue Laminated Columns

3-ply 2x6	4-ply 2x6	5-ply 2x6
3-ply 2x8	4-ply 2x8	5-ply 2x8
3-ply 2x10	4-ply 2x10	5-ply 2x10

Height: 12, 14, 16, 18, 20, 22, 24, 26



Truss Saddle



Precast Concrete Base

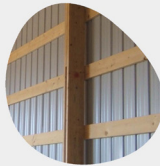
Primary structure

# SECONDARY STRUCTURE

## Girts

2X member attached perpendicular to posts, adds lateral support and transfers loads

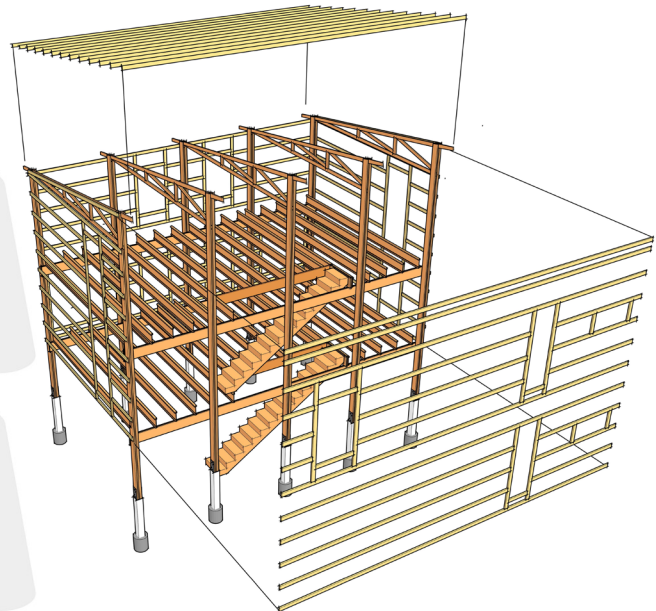
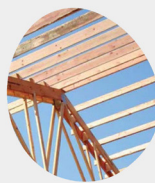
Exterior - Inset - Interior



## Purlins

2X member attached perpendicular to roof trusses, adds lateral support and transfers loads

On Edge - Laid Flat - Recessed



Secondary structure

## ***Incremental and Adaptable***

Homeowners often adapt their homes over time, adding bedrooms or baths, enlarging kitchens, or living areas, and other responses to changing family needs and economic resources. However, rarely are homes designed to do so. This project on Crawford Street in Zone 2

includes a compact, affordable, one-bedroom starter home that can be expanded over time. Units are designed for scattered sites or paired to create spaces shared by two households.

Project by **Tenecia Jones**



Paired units



Phase one floor plan

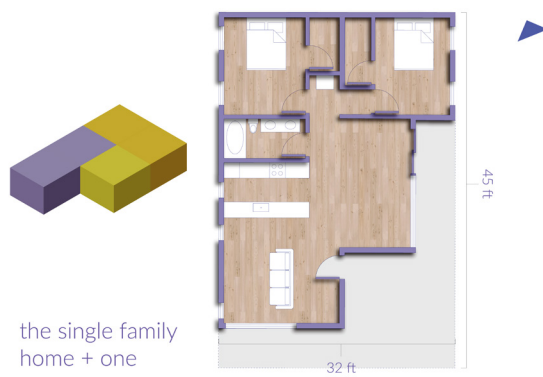


Paired option





View at Elm and Crawford Streets



Phase two floor plan



Kitchen and living room

One of the more distressing situations following the damage of a major storm is the length of time it takes for households to return to homes. In this project, a 480 square foot, one-bedroom, premanufactured core can be quickly deployed to a property. The family can live in the unit while their home is being renovated or, if it is a total loss, add to the

core over time using pre-designed two and three-bedroom expansion options. It is designed to be deployed on scattered sites or grouped to create context-sensitive streetscapes in Focus Areas 1 and 2. A palette of resilient materials creates a variety of units.

Project by **Gayatri Ganesh**



Corner of Hatties and Elm

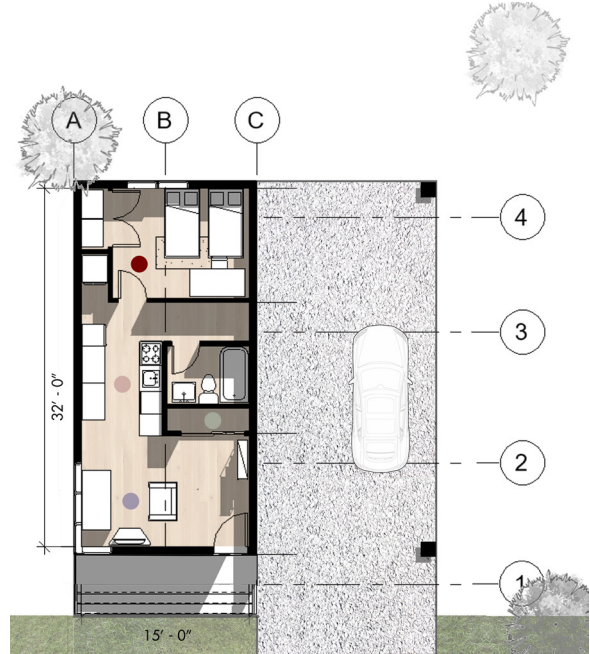


View from street

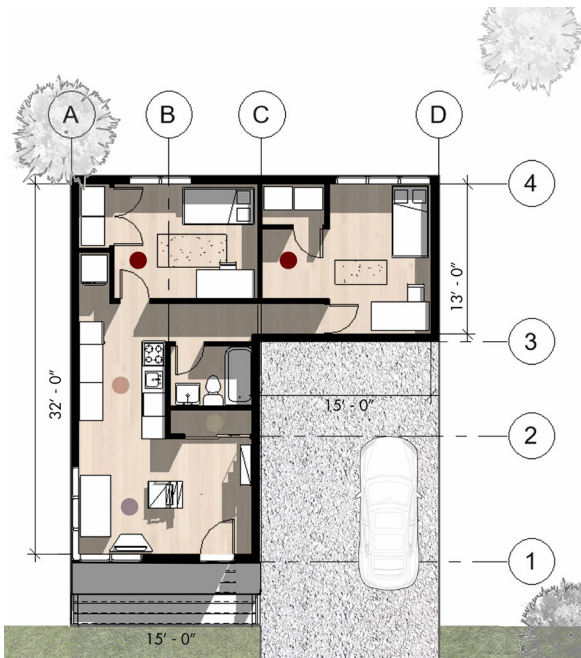




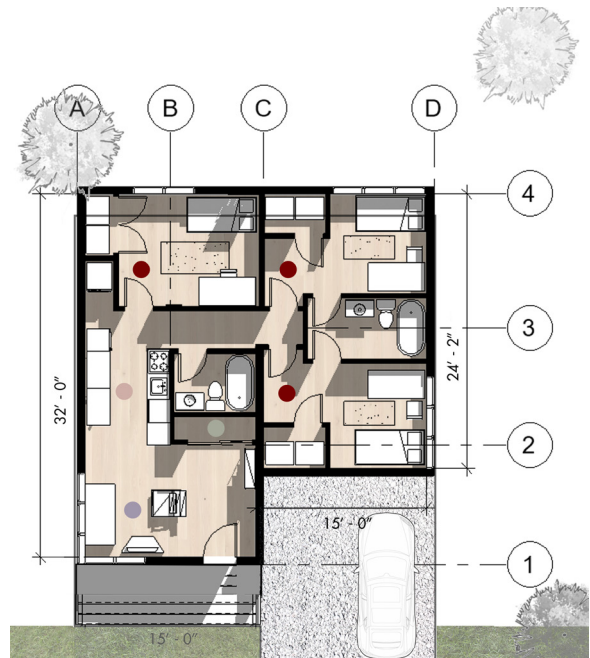
Site plan at Hatties and Elm



Unit core plan



Phase one build out



Phase two build out

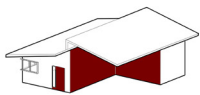


View of kitchen

## MATERIAL PALETTE

### EXTERIOR WALL FINISHES

#### WOOD-STAINED HARDIE BOARD VERTICAL SIDING



MAPLE

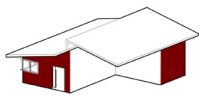


CHERRY



WALNUT

#### COLOR-PRIMED HARDIE BOARD LAP SIDING



SAGE



LAVENDER



PEACH



MUSTARD



AQUA



MONOTONE

### RECOMMENDED COMBOS



WALNUT

+



PEACH



CHERRY

+



AQUA



MAPLE

+



SAGE

Material choices

## Duplexes and Accessory Dwelling Units

When homeowners own two units on their property the second unit can generate income and subsidize mortgage costs. Accessory dwelling units, whether attached or detached, can also provide options for trading up or down, housing a boomerang kid, elderly parent, or caregiver, and other options.

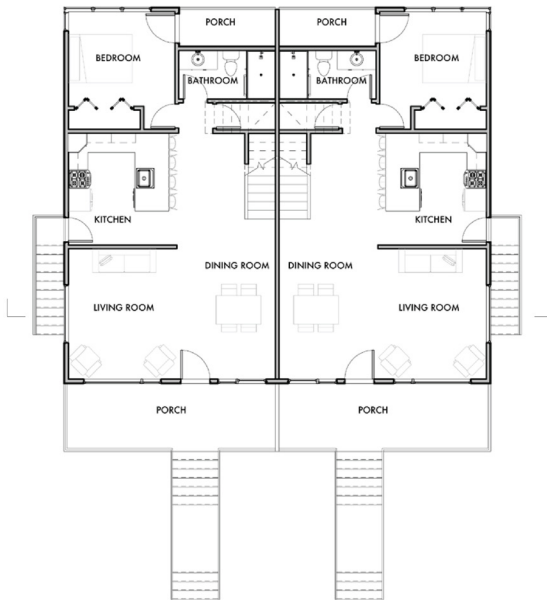
One challenge facing communities with many vacant lots is the loss of streetscapes

and identity. In this project for Focus Area 3, duplexes line the street on both sides, creating a generous streetscape of on-street parking, street trees, lighting, and sidewalks. The terraced site mitigates the negative impact of the required height of the first floor. The entire duplex could be owned by one household, or they could be sold separately as condominiums.

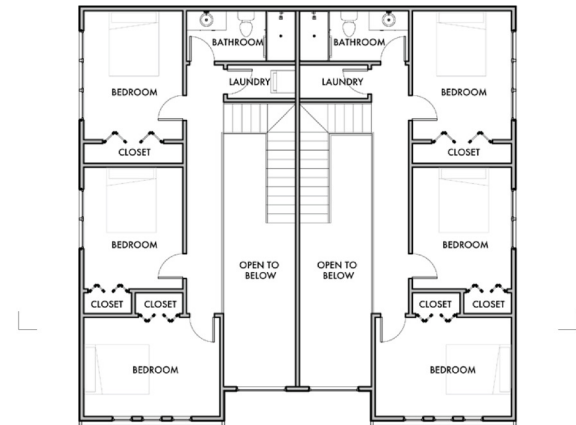
Project by **Erin Kennedy**



View down K Street



Lower-level floor plan



Upper-level floor plan



This project features a small attached ADU and was designed for scattered-site infill. Two models were developed, a contemporary and a more traditional one.

Both are articulated to fit seamlessly into single family neighborhoods.

Project by **Brailey Lee**



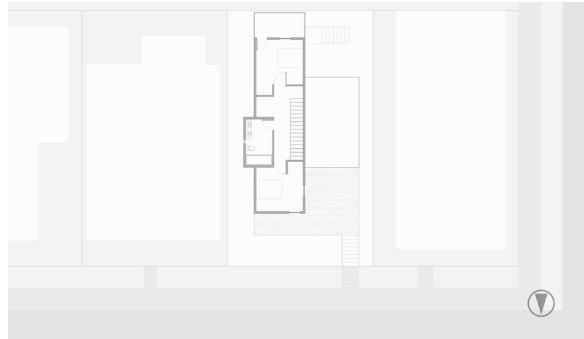
Exterior form version 1, Elm Street between Oak and Darst



Exterior form version 2, Elm Street between Oak and Darst



Lower-level floor plan



Upper-level floor plan



Elm Street facades form version 1

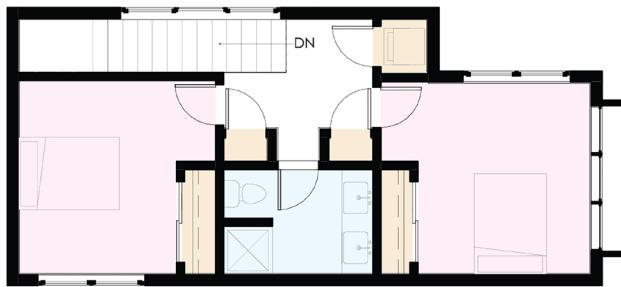


Elm Street facades form version 2

This project proposes a main house with detached accessory dwelling unit in a variety of organizations for a range of sites. Long-term affordability is achieved through efficient floor plans, conventional and resilient construction methods and materials, and the economic potential of a rental unit. It is also designed for aging-in-place with the ADU designed according to universal design standards. The raised models maintain connections to the street

through terraced decks and stairs. The main house is 1,200 square foot 3 bedroom, 2 bath, the ADU 700 square foot 1 bedroom, one bath. Its sustainability strategy includes heat gain reducing orientations, plantings and sun-screening, cross-ventilation, and sustainable appliances, materials, and assemblies.

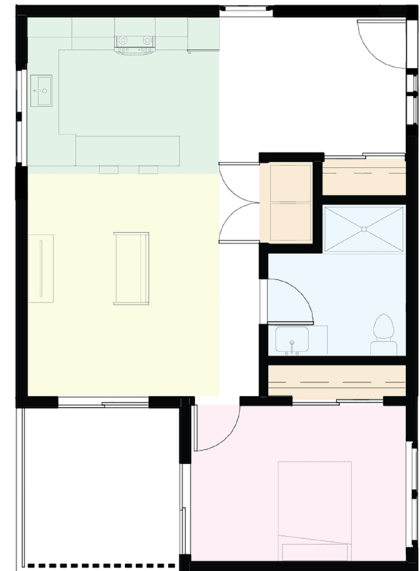
Project by **Brianna Creviston**



LEVEL 2



LEVEL 1

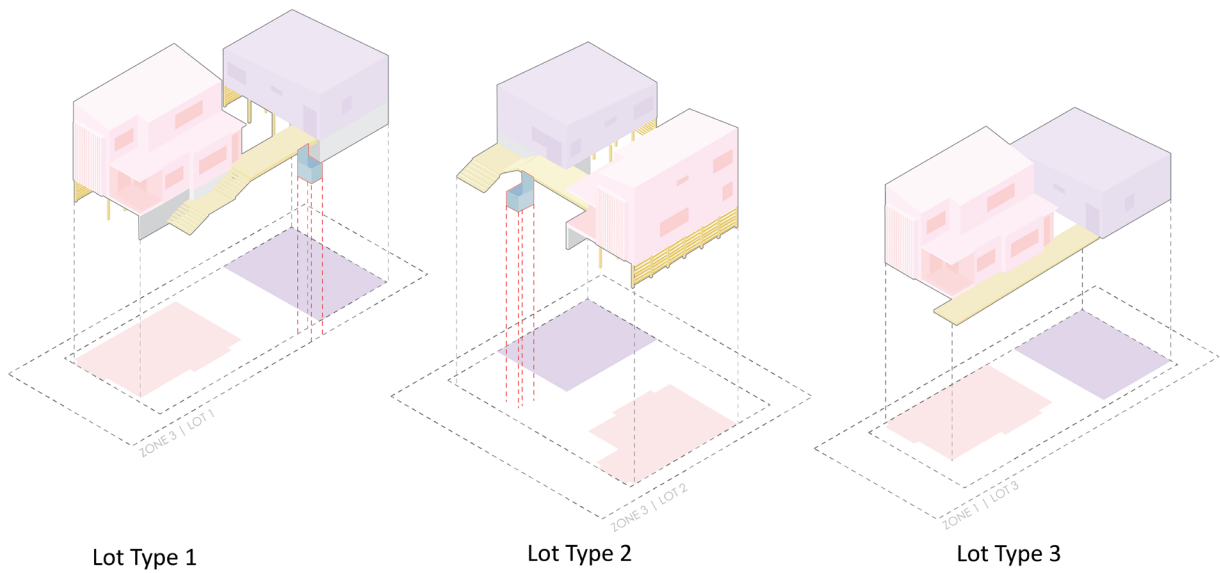


LEVEL 1

Typical plans of house and accessory dwelling unit



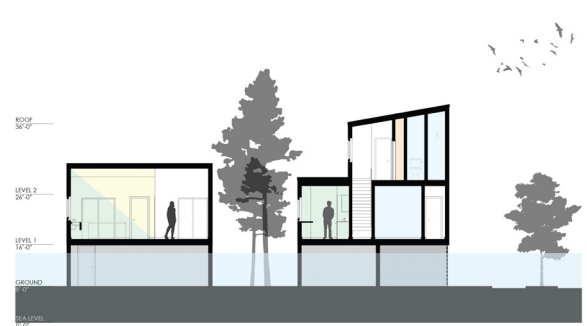
View of Lot Type 2



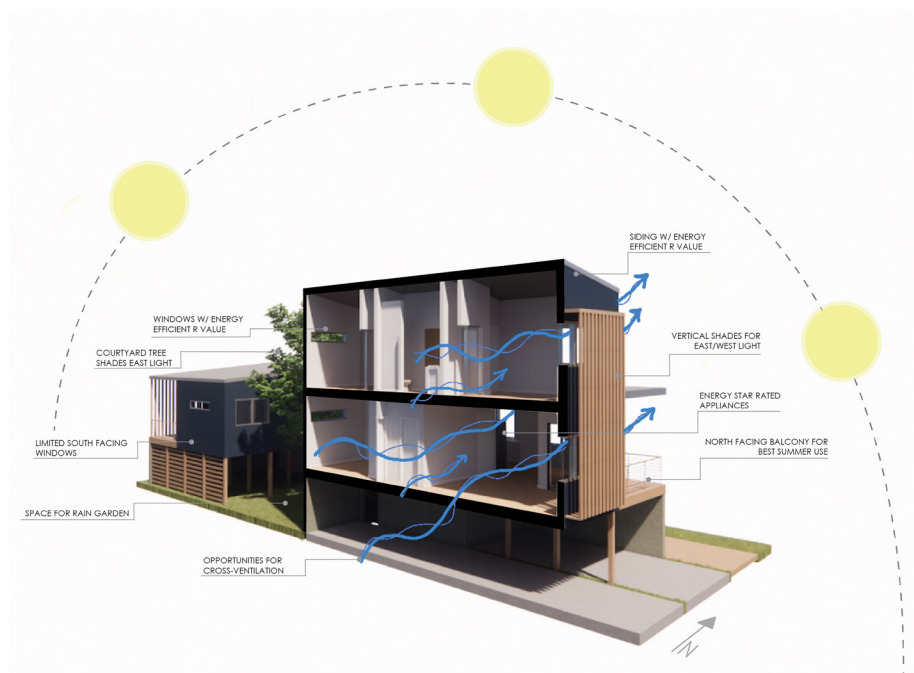
Lot types



View of Lot Type 3



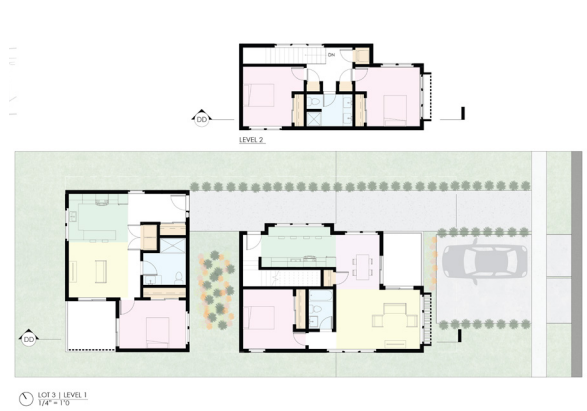
Section showing maximum flood level



Sustainability section



Plans of Lot Type 1



Plan of Lot Type 3





Typical living room



Typical kitchen



## Multifamily

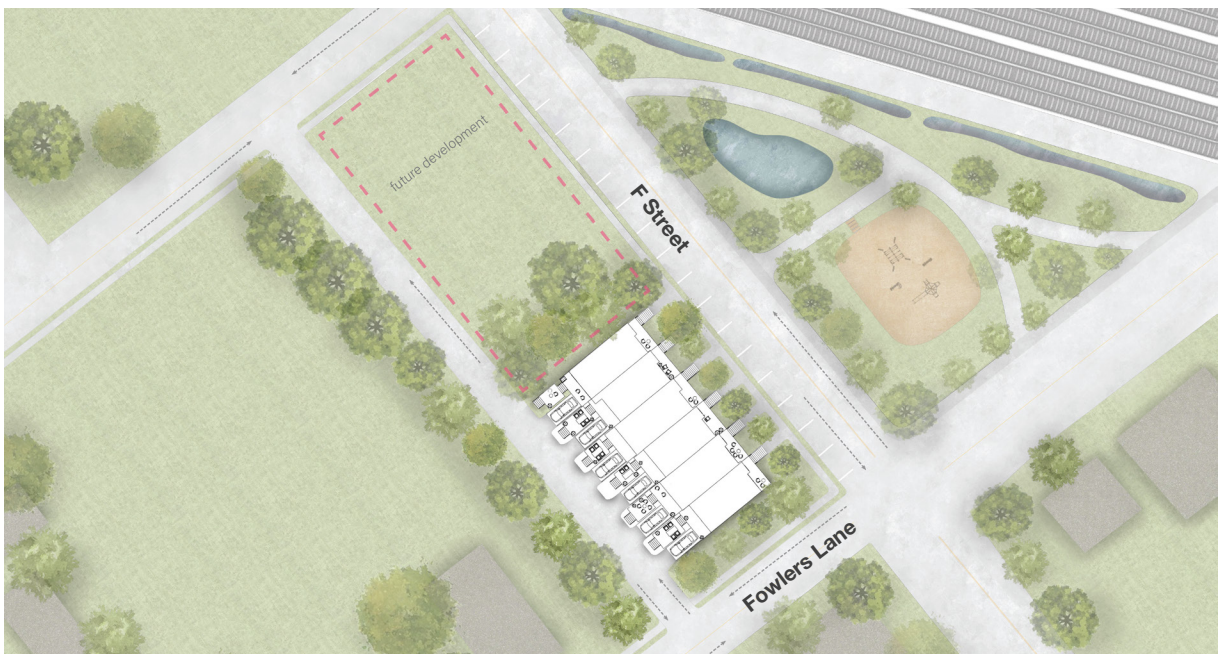
Dense housing creates opportunities for shared public and green spaces. In this project, designed for F Street in Focus Area 3, the relatively small footprint results in a generous public park and constructed wetlands. A variety of unit types serve a diversity of families and provide for aging-

in-place. A front shared deck capitalizes on its required height by providing views of a public park. The efficiently planned units feel spacious because of visual connections to the outside.

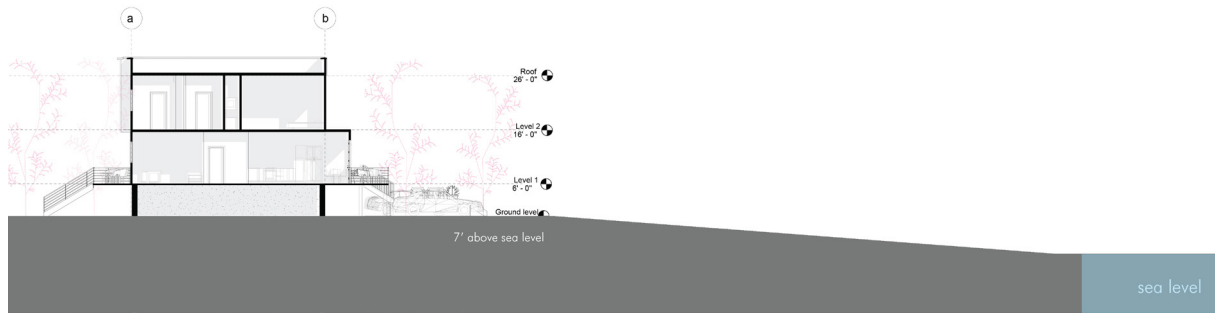
Project by **Golsa Motevalli**



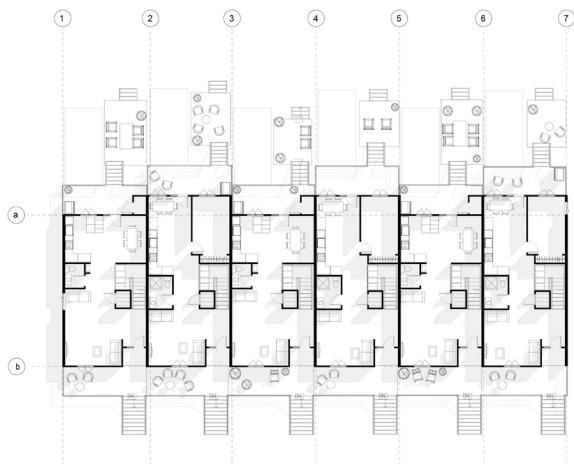
Street view of units



Site plan



Site section



Lower floor plan



Upper floor plan



View of living room



View of kitchen



## Cottage Courts and Community Land Trusts

Cottage courts are smaller units clustered around shared public spaces. They are a site planning model that lends itself easily to affordable ownership models such as community land trusts.

This project for a demonstration site on K Street in Focus Area 3 is designed to provide

a variety of affordable studio, 2 bedroom and 4-bedroom duplex units organized around generous public spaces. Economic opportunities are provided through live-work units whose floodable ground-floor workspaces connect with the street.

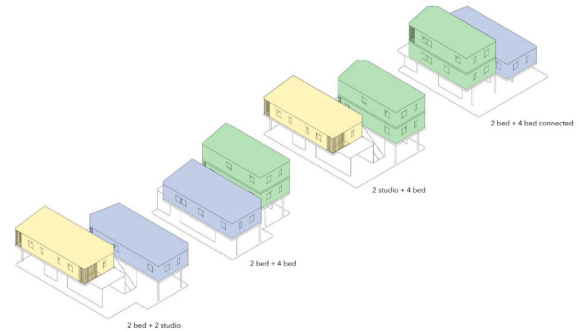
Project by **Meg Maley**



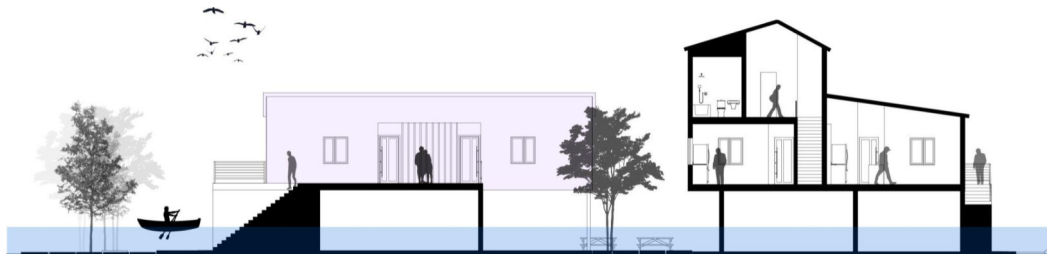
Site plan



View of interior courtyard



Unit types



Section showing maximum flood level

This project, also in Focus Area 3, organizes duplex units around a greenspace with community gardens. Its affordability strategy includes a community land trust where the land is owned by the city or

county and the units sold as duplexes or condominiums.

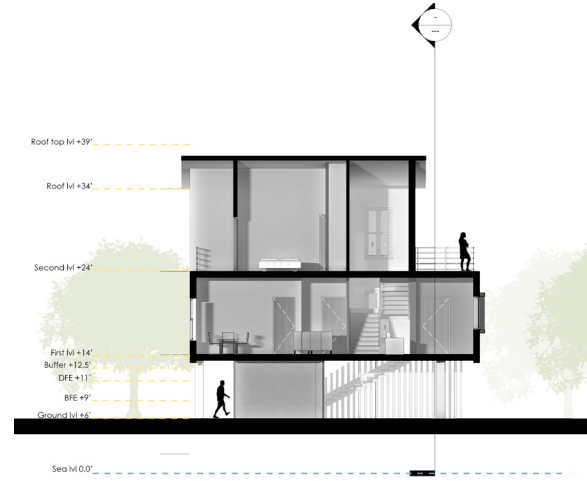
Project by **Hima Thaker**



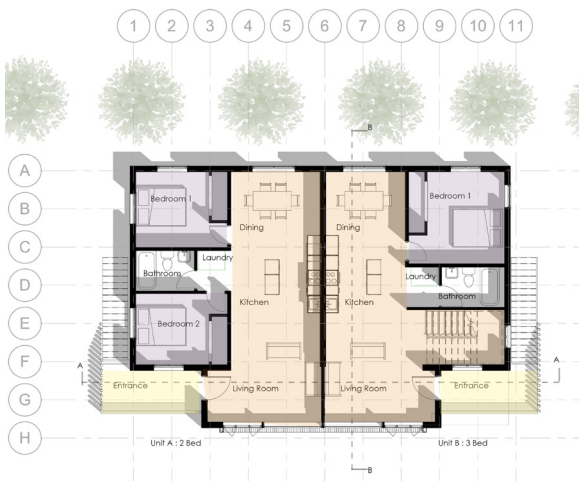
View from corner of Biddle and H Streets



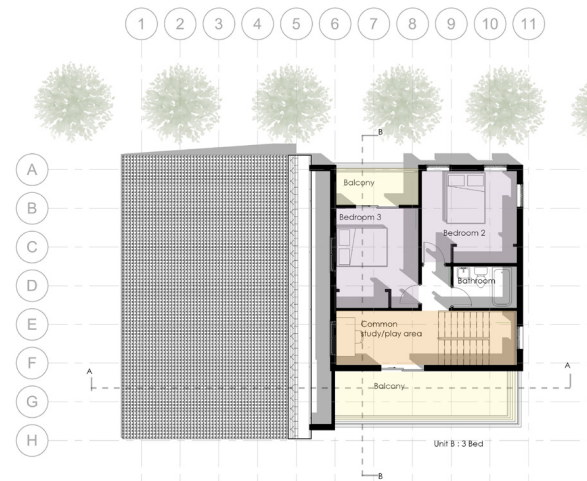
Site plan



Section



Lower level floor plan



Upper level floor plan





View of duplex unit and ground floor space



View from lower level of unit





# **Conclusions and Recommendations**

# Conclusions and Recommendations

The City of New Bern has done significant work in response to the deteriorating conditions of Duffyfield and in anticipation of future impacts by storms. The results include substantive data and analysis, robust community engagement, comprehensive plans, and clear action steps. Significant resources have been used to commission studies and assemble properties. There is clarity about priorities, especially the need for affordable and resilient housing. With this in mind, the following are brief recommendations as the city proceeds with implementation.



## **Recommendations:**

1. Re-engage the Duffyfield community to understand its housing and planning preferences and support its participation in guiding development through the resources and housing options outlined in this report.
2. Produce new and renovated housing that respects, responds to, and preserves the essential characteristics and historical context of the community.
3. Create a physical plan that shows housing types and options, phases of development, infrastructure upgrades, connectivity, public transportation, and flood-mitigating green and community spaces.
4. Explore further zoning reforms to allow for more affordable housing options, neighborhood businesses, and transit supportive density.
5. Provide incentives for affordable housing developments such as expedited review and approval processes, gap funding, reducing impact fees, tax exemptions, land swaps, and other means.
6. Promote equity, ownership, and mixed-use options such as community land trusts, cohousing, rent-to-own units, sweat equity programs, and live-work units.

### **Recommendations Continued:**

7. Create assistance programs such as funding for energy upgrades and building repairs and owner-occupied or multifamily development property tax relief.<sup>19</sup>
8. Develop a program to preserve existing affordable housing. Track affordable housing units and create an “early warning” mechanism to identify properties at risk.
9. Apply financing strategies that leverage city owned properties, utilize Low Income Housing Tax Credits (LIHTCs), incentive program funding such as Historic and Energy Tax Credits, low-interest loans, and other funding sources, and establish private-public partnerships with community banks and non-profit housing developers.
10. Require sustainable and energy efficient materials and systems for all new housing to lower housing costs and support a sustainable future.
11. Plan for success and implement policies and ownership models that preserve affordable units and community stability in a future economically diverse Duffyfield.
12. Make it beautiful. Everyone has a right to live in safe, affordable, resilient housing that supports flourishing lives and communities.

# Appendix



### ***Service Learning Projects and NC State University***

North Carolina State University is North Carolina's largest comprehensive university. Founded in 1887 as a land-grant institution under the Morrill Act of 1862, NC State has a three-part mission: instruction, research, and extension. The latter describes the unique model of land-grant universities that were founded following the Civil War. Congress deeded land to establish new universities that would not only educate students but would serve their citizenry. This unique American model has the goal of accessible education paired with an extensive outreach and service mission.

Like other land-grants, NC State began by serving the agricultural needs of the mostly agrarian state through its schools of agriculture and veterinary medicine. Today all 100 counties continue to be served through the County Extension program. As the state's demographics and industrial profile have changed, however, so have the services provided by NC State. Its broader service mission now includes economic development, re-tooling industry, technology transfer, urban affairs, community services, housing, and urban design. Where in the past a farmer might contact a County Extension Officer to seek answers to a problem, now it is municipal and business leaders who come for the expertise that only a research intensive institution can provide.

Increasingly, NC State is serving more and more cities, small towns, and communities in areas of housing and urban design – most of which is performed in the College of Design's Office of Research, Extension and Engagement. Through a diverse group of initiatives and faculty, issues such as environmental health, spatial justice, universal design, landscape urbanism, community art programs, and Public Interest Design are addressed.

The *Affordable Housing and Sustainable Communities Initiative*, founded by Thomas Barrie FAIA in 2007, focuses on research, community-based demonstration and service-learning projects, and the development and dissemination of a knowledge base in its subject areas. Its *mission* is primarily educational – to provide educational resources for government, non-profit, and community leaders, students and the general public, and innovative and applicable solutions to the housing and urban challenges that North Carolina communities face. Traditional research and applied research through funded projects and service learning studios are potent means to produce substantive, applicable, and measurable outcomes. The education of qualified practitioners and future leaders in the profession remains central to its mission, and therefore the integration of professional education and research is essential.

# Project Team

## **Faculty**

Thomas Barrie FAIA, Director: Affordable Housing and Sustainable Communities Initiative

## **Project Partners**

Frank Lopez, Extension Director, NC Sea Grant & Water Resources Research Institute

Amanda Ohlensehlen, Director of Community and Economic Development, New Bern, NC

Matt Schelly, Interim Director of Development Services, New Bern, NC

Alice Wilson, GIS Manager, New Bern, NC

## ***Visiting Experts***

David Maurer AIA, Principal, Maurer Architecture/Tightlines Designs

Byron Mouton, Director of Urbanbuild, Lacey Senior Professor of Practice, Tulane University

David Perkes, Professor and Director, Mississippi State Gulf Coast Community Design Studio

## ***Project Consultants***

Andy Fox FASLA, PLA, Professor of Landscape Architecture and Environmental Planning, Co-Director: Coastal Dynamics Design Lab

David Hill FAIA, Professor and Chair, School of Architecture, Co-Director: Coastal Dynamics Design Lab

Gavin Smith Ph.D., AICP, Professor of Landscape Architecture and Environmental Planning

## **Research Assistant**

Gayatri Ganesh (M.Arch. 2023)

## Students

Brianna Creviston (M.Arch 2023)  
Gayatri Ganesh (M.Arch 2023)  
Clayton Johnson (M.Arch 2022)  
Tenecia Jones (M.Arch 2023)  
Erin Kennedy (M.Arch 2023)  
Brailey Lee (BEDA 2022)  
Meg Maley (BEDA 2022)  
Golsa Motevalli (M.Arch 2023)  
Harish Palani (M.Arch 2023)  
Mark Storch (M.Arch 2022)  
Hima Thaker (M.Arch 2023)



Back row, left to right: Gayatri Ganesh, Mark Storch, Brailey Lee, Clayton Johnson, Tenecia Jones. Front row, left to right: Erin Kennedy, Harish Palani, Meg Maley, Brianna Creviston, Golsa Motevalli



# Notes

## Introduction

1. See the *Choice Neighborhoods Greater Five Points Transformation Plan*, p. 92 for an expanded definition of affordable housing.

## The Duffyfield Community

2. Chapter Two is based on research and preliminary drafts created by Gayatri Ganesh.
3. See Karen Elizabeth Medlin, "Reclaiming First-Class Citizenship: The African-American Struggle and Mobilization for Political Rights in New Bern, North Carolina (1948-1979)," Master of Arts Thesis, NC State University, 2007, p. 10.
4. Catherine W. Bisher, *Crafting Lives: African American Artisans in New Bern, NC 1770-1900*, Chapel Hill: University of North Carolina Press, 2013
5. Bisher, *Crafting Lives: African American Artisans in New Bern, NC 1770-1900*, pp. 267-68.
6. Peter B. Sandbeck, *The History and Architecture of Long Wharf and Greater Duffyfield, New Bern, NC*: Tyron Palace Commission, 1988, p. 29.
7. Sandbeck, *The History and Architecture of Long Wharf and Greater Duffyfield*, p. 27.
8. Sandbeck, p. 26.
9. Catherine W. Bisher, and Michael T. Southern, *A Guide to the Historic Architecture of Eastern North Carolina*, Chapel; Hill: University of North Carolina Press, 1996, pp. 206-207.
10. City of New Bern Redevelopment Plan, p. 12.

11. *Choice Neighborhoods Greater Five Points Transformation Plan*, 2016, p.24.

12. City of New Bern Redevelopment Plan, p. 6.

13. City of New Bern Redevelopment Plan, p.18.

#### **Research**

14. From the UrbanBuild website. <https://urbanbuild.tulane.edu/06-outcomes/finished-projects/> Last accessed 06.21.2022.

15. See interview with Jonathan Tate in Architect & Developer. <https://architectanddeveloper.com/interview-jonathan-tate-of-ojt/> last accessed 06.21.2022.

16. From the Katrina Houses project description. <http://gccds.org/new-index-1#/biloxi/> last accessed 06.21.2022.

#### **Demonstration Projects**

17. City of New Bern Redevelopment Plan, p. 17. Other goals include: partnering with “existing non-profits, citizen groups, and community advocates working in the redevelopment area to implement the shared goals, objectives, and policies of this plan” (Goal 2), “Mitigate the impact of localized flooding” (Goal 4), and “Create a functional transportation network to enhance health, safety, economic development and access to amenities and services” (Goal 6).

18. City of New Bern Redevelopment Plan, p. 32.

#### **Conclusions and Recommendations**

19. See Goal D-3 of the *Choice Neighborhoods Greater Five Points Transformation Plan*, p.76.