

## ABSTRACT

Title of Thesis: Reimagining Housing in Montgomery County,  
Maryland: Bringing Flexibility to Single  
Family Zoning

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Masters of Architecture, 2022

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This thesis proposes to increase options in a single-use residential zone using a “missing middle” typology to support the future of housing in Montgomery County, Maryland. It is a recommendation to adjust the parameters within the zone to allow up to three units per lot. This directly challenges the current zoning restrictions in the R-60 detached single family residential zone. Ultimately, this thesis strives to show flexibility in multiple unit composition within the detached single-family zone that will maintain the scale and form, the “look and feel”, of the single-family neighborhood while providing more housing for present and future county residents.

REIMAGINING HOUSING IN MONTGOMERY COUNTY,  
MARYLAND: BRINGING FLEXIBILITY TO  
SINGLE FAMILY ZONING

by

Kathleen Walsh Gilday

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# Historic Timeline | The Single Family Home

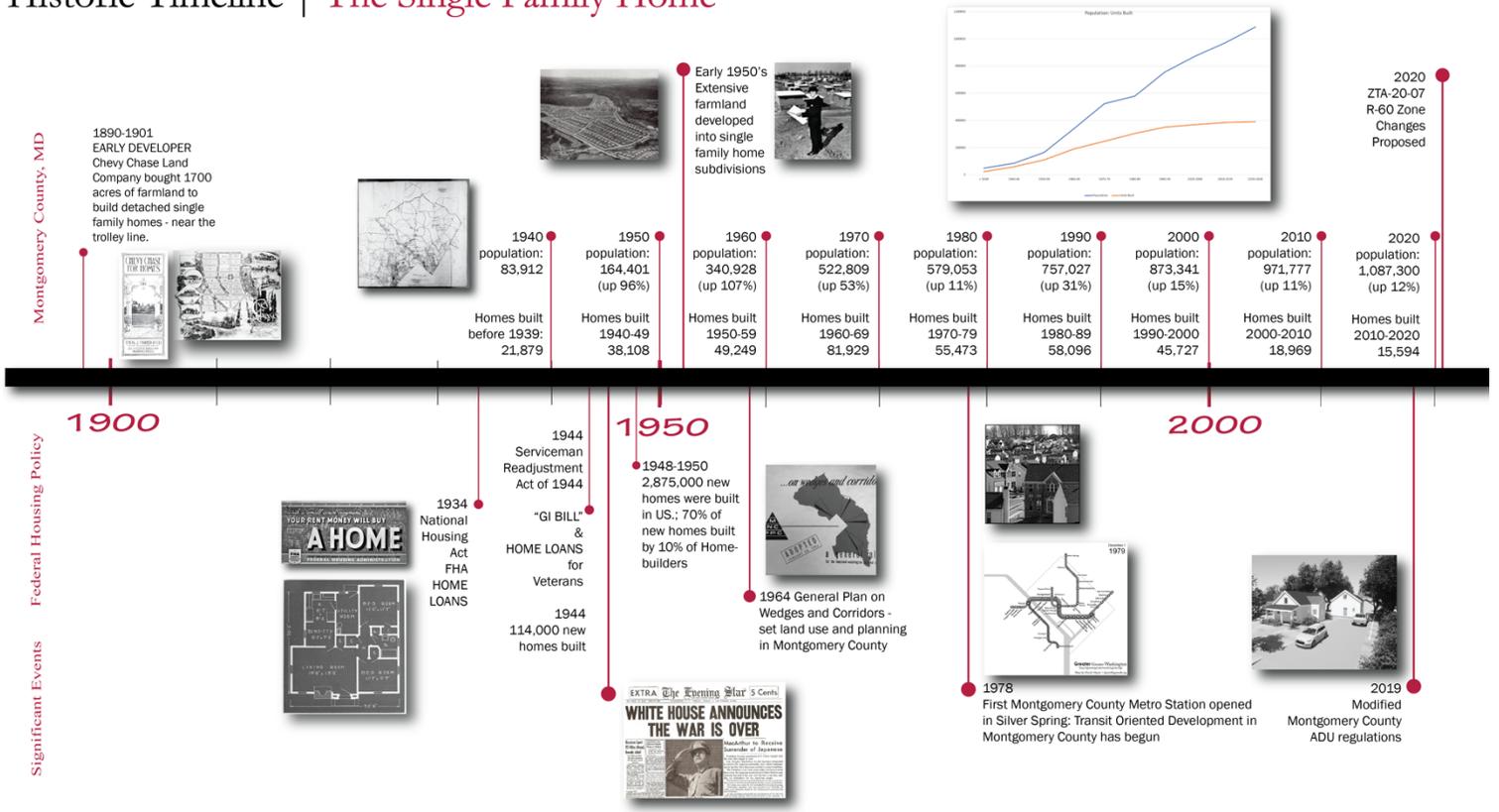


Figure 1: Timeline of the Single-Family Home. Source: Author

# Chapter 1: Understanding Montgomery County, Maryland

## 1.1 Introduction

Montgomery County, Maryland, is located directly north of the nation's capital, Washington, DC. It is the most populous county in the state of Maryland. In the 2020 census, the population was 1,062,061<sup>1</sup>.



Figure 2 Map of Maryland

## 1.2 Historic Context

Established in 1776, Montgomery County finalized its current boundaries in 1791 after 36 square miles of the county was ceded for the new capital city, District of Columbia<sup>2</sup> The loss of land included the port town of Georgetown, which was the terminus for the first farm road in the county extending down from Frederick, Maryland. Towns were established on this route as way stations for the farmers transporting goods to the port. In 1817, this route became the first paved road in the

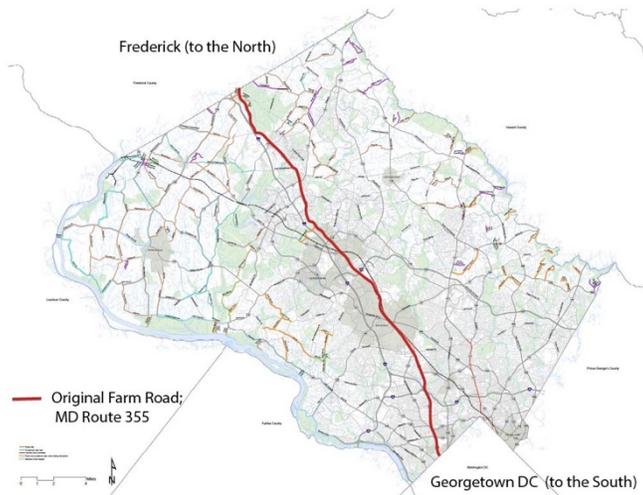


Figure 3 Montgomery County Map with colonial farm road

<sup>1</sup>United States Census Bureau, 2020; [www.census.gov/quickfacts/montgomerycountymaryland](http://www.census.gov/quickfacts/montgomerycountymaryland)

<sup>2</sup> MacMaster, R. K., & Hiebert, R. E. (2013). *A grateful remembrance: The story of Montgomery County, Maryland*. Montgomery County Historical Society

county and was renamed the Washington- Rockville Turnpike. It is known today as Maryland Route 355 and on various lengths of the road it is known as Wisconsin Avenue, Rockville Pike, or Frederick Road. It continues to be a major north-south corridor in the county and the thoroughfare continues through the District of Columbia to Georgetown. There were small and large towns that developed along Route 355. This would be the same corridor as today's western branch of the Washington DC Metrorail's Red Line. Towns began to develop around the train stations following the construction of the Baltimore & Ohio Railroad's Metropolitan Line that connected Frederick to Washington in 1873. The first train towns in Montgomery County extended from Silver Spring to Rockville. This corridor partially coincides with today's eastern branch of the Washington DC Metrorail's Red Line. Transit related development has been a primary catalyst to growth in Montgomery County since its inception.

### 1.3 Land Mass

The total mass of the county is 324,422 acres (506.9 mi<sup>2</sup>)<sup>3</sup> with land mass at 315,590 acres and water at 8,832 acres. The density is 3.4 residents per acre\*. The smallest residential lot size in the county is 6000 SF in the R-60 residential zone, though there are smaller lots which were developed before the current zoning minimums were established. At 6000 SF, the dwelling unit per acre is 7.26\*\*. Therefore, the average occupancy in this county is 0.47 residents per dwelling\*\*\*.

\*(1062061residents/315590acre=3.4 residents/acres)

\*\* $(43560\text{sf}/\text{acre}/1\text{ dwelling}/6000\text{sf}=7.26\text{ dwellings}/\text{acre}$

\*\*\* $(3.4\text{ residents}/\text{acre}/7.26\text{dwellings}/\text{acre}=0.47\text{ residents per dwelling})$

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<sup>3</sup> Montgomery County Planning Board. 2021. [montgomeryplanning.org/planning/housing/residential-development-capacityanalysis/](http://montgomeryplanning.org/planning/housing/residential-development-capacityanalysis/).

By 2030, there will be an estimated 10,000 housing unit deficit in the county<sup>4</sup>. There is capacity for increased density within the county, even in the smallest sized residential zone.

### 1.4 Population

Outside of the agriculture and the stone quarry industries, Montgomery County has acted, mainly, as a “bedroom community” for government workers with its close proximity to Washington DC. The population of the county has increased with the size of the federal work force. In 1940, with a population of 83,912 there were 21,879 homes in the county. The population doubled between 1940 and 1950, then doubled between 1950 and 1960. By 1960, there were 340,948 residents and 109,236 homes built in the county. With a 53% population increase in the 1960’s, a housing boom brought 81,929 homes to the county.

Today’s population is double the population of 1960. With this rapid growth, undeveloped land is scarce. Today, 85% of the land mass in Montgomery County is either constrained by preservation or constrained by land use zoning. “With only 15 percent of land available for

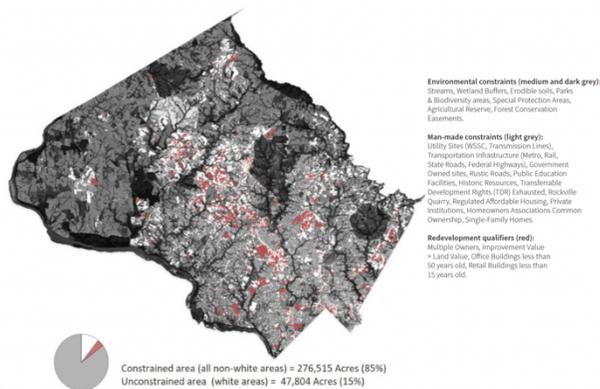


Figure 2: Land available to accommodate growth

development or redevelopment in Montgomery County, MD, the county needs to consider options to meet the needs of a growing population.”<sup>5</sup>

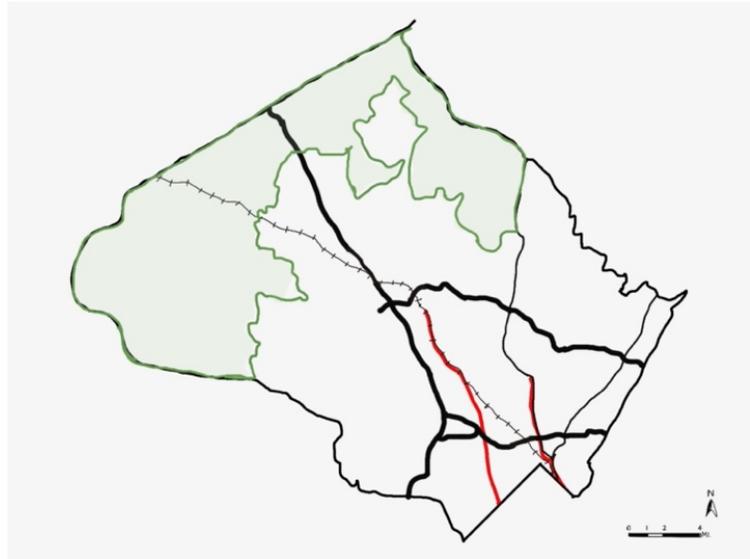
Figure 4 Montgomery County Land Constraint Map

Source: [montgomeryplanning.org](http://montgomeryplanning.org)

<sup>4</sup> Metropolitan Washington Council of Governments, <https://www.mwcog.org/newsroom/2019/09/11/officials-set-regional-housing-targets-call-for-collaboration-to-address-production-and-affordability-challenges/>

<sup>5</sup> Montgomery County Planning Board, <https://montgomeryplanning.org/blog-design/2019/01/man-made-and-environmental-constraints-on-development-in-montgomery-county/>

The existing built residential environment requires flexibility for increasing housing units since the residential zones cover 90% of the land mass in the county. The residential zones include the Agricultural Reserve. The solution may require a variety of actions such as splitting existing housing stock into units, adapting existing stock with additions or replacing existing housing stock with new high-rise housing on the small amount of land remaining.



*Figure 5 Montgomery County Map with Ag Reserve and Transit corridors. Source: Author*

### 1.5 History of Housing in the County

The earliest detached single family home development began in 1890 was the purchase of 1700 acres of farmland by the Chevy Chase Land Company in the Chevy Chase area<sup>6</sup>. These homes had access to transit at the time. The Rock Creek Trolley line extended from the district approximately two miles into Montgomery County on Connecticut Avenue.

According to the Chevy Chase Historic district documents, the neighborhoods developed in **sections** until the 1930s along this rail line. A sampling of the lot sizes show an average 7500 SF lot in the earliest sections. In addition to the development of Chevy Chase, over the

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<sup>6</sup> .chch hx

course of the next 20 years, 90% of the farm land in Bethesda was purchased for development as well.

In 1934, during the Great Depression, the federal government passed the National Housing Act which included the FHA Loan program to facilitate home building and home buying. Prior to this, a home buyer could only get a mortgage extending five to ten years with a 30-50% down-payment. With the FHA Loan, a home buyer could now get a twenty-to-thirty-year mortgage loan for as little as 10% down.<sup>7</sup> FHA loans *avored single family homes over multifamily units*, so the majority of dwellings built were detached single family homes.

After World War II, the federal government passed the GI Bill, 1944 Serviceman's Readjustment Act. This included VA Home loans for returning veterans offering \$4000 in mortgage for 25-year home loan. Nearly 2.4 million veterans used these loans;<sup>8</sup> Housing boomed in the post-war decade. Builders normally building five homes a year were now building five times that number.

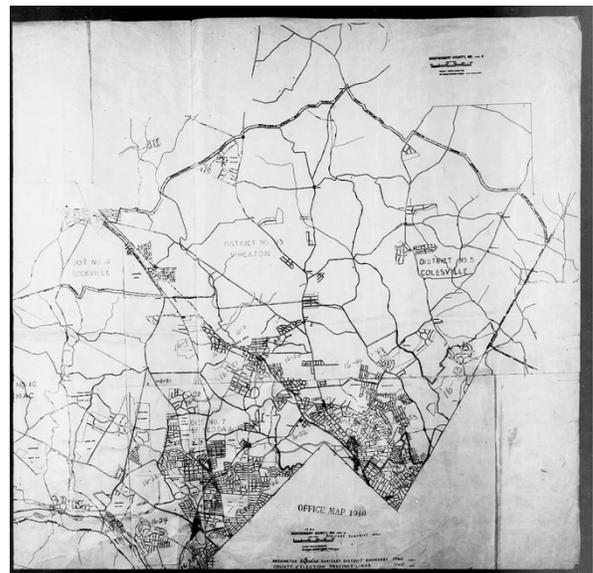


Figure 6: 1940's southern Montgomery County map.  
Source: 1940 census map; public domain

<sup>7</sup> National Housing Act of 1934; <https://catalog.archives.gov/id/299842>

<sup>8</sup> GI Bill of Rights; <https://www.britannica.com/topic/GI-Bill-of-Rights>

In Montgomery County, more homes were built between 1940-1950 (38,108 homes) than had existed before 1940 (21,879 homes). By 1970, half of the current housing stock of the County had been built and, currently, it is over 50 years old. As of 1990, 90% of the housing stock had been built and it is over 30 years old. Older homes in need of remodeling or replacement may be in a position to adapt to include additional units to address the county's housing deficit, if allowed.

Today's population is growing faster than the number of newly built units. In 2020, according to an estimate by the Council of Governments for the Metro DC area, there will be an 85,000-unit deficit in the metro DC area by 2030<sup>9</sup>. Ten thousand units of the shortfall are in Montgomery County.

Without housing for all income levels and household situations, the county will lose its next generation of residents to another area that can accommodate them. From those young adults looking for starter homes to those life-long residents looking to downsize in the same community where they have established roots, it is of vital importance to have a variety of housing options for the success of the county. The future strength of the county - economically and socially - depends on housing its young "coming-of-age" residents and life-long residents as well as the new arrivals to the county.

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<sup>9</sup> Metropolitan Washington Council of Governments, <https://www.mwcog.org/newsroom/2019/09/11/officials-set-regional-housing-targets-call-for-collaboration-to-address-production-and-affordability-challenges/>

### 1.6 Zoning in the Montgomery County

Federally established land use zoning practices were active in Montgomery County starting in the 1920s. Under the leadership of Herbert Hoover, who in the 1920's acted as the Secretary of Commerce, the Commerce department created a zoning plan with a goal of “protecting homeowners from commercial and industrial intrusions.” Initially this was meant to protect homeowners from the unpleasantness of garbage, bad smells, and industrial waste while

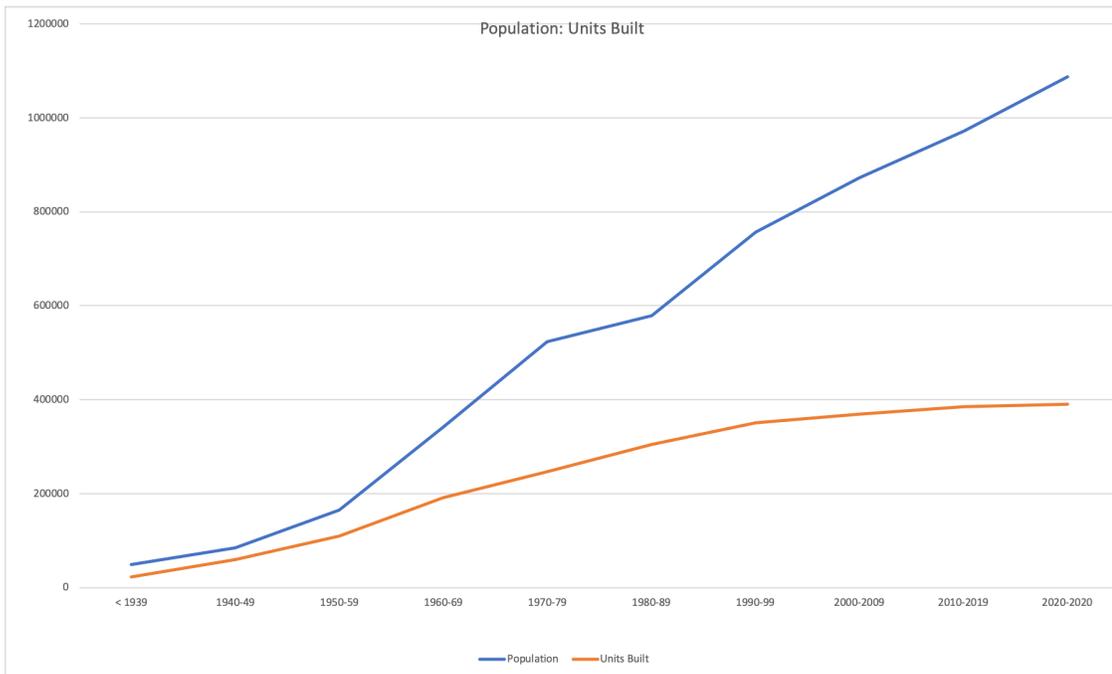


Figure 7: Line graph comparing population growth to housing units built per decade. Source: Author

exposing more Americans to parks and green space. Unbeknownst to Hoover, suburban sprawl would separate all mixed uses by miles creating the car-dependent society of today.

The 1964 General Plan on Wedges and Corridors (approved for use in 1969)<sup>10</sup> is the basis for the land-use zoning currently in effect in the county, though 49% of the housing stock was

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<sup>10</sup> Board, Montgomery County Planning. 2021.

already built by 1969. Montgomery County has eleven single-family residential zones defining land use which covers 90% of the county land mass. ( ) The zones' lot minimum range from 0.14 acres to 5 acres in rural areas. Almost 3/4 of the county has lots sizes zoned for approximately 1 acre (40,000 SF) or more. Each have regulations covering the number of dwellings, number of units, number and size of accessory buildings, dwelling height, maximum lot coverage, and setbacks. R-60 is 6% of the county land mass and has the smallest minimum lot size of 6000 SF. This zone will be featured in this thesis exploration.

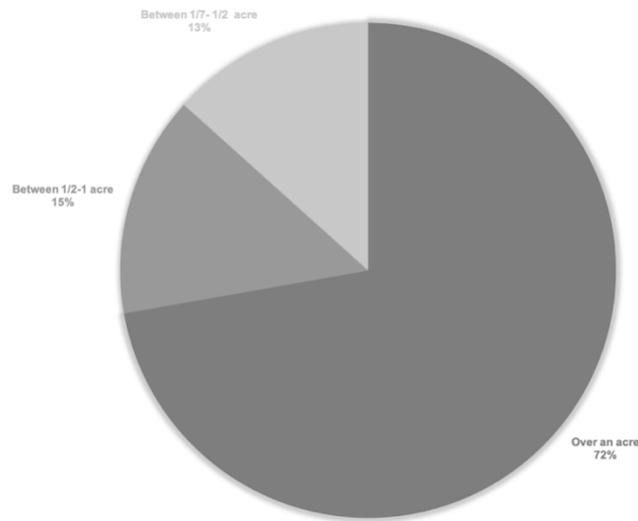


Figure 8 Pie Chart of Montgomery County land Use Source: Author

1.7 Housing Stock in Montgomery County

By 2020, the Montgomery County had a total of 390,365 housing units ranging from detached single-family homes to high rise apartment buildings with over 50 units each<sup>11</sup>. Approximately 47%, or 182,936 housing units, are detached single family homes on individual lots. The multi-unit, low density housing, called “missing middle housing”, in the county, ranging between 2 to 4 units, is 19% of the housing stock, primarily of the townhouse type (17%) requiring multiple lots. It also includes duplexes (1%), and triplexes/quadplexes (1%). Missing middle housing applied to the current detached single family home stock is the key to increased density on a single lot with a similar scale and form as a detached single-family dwelling. They blend in with their single-family neighbors, except in some cases, where there are two front doors.

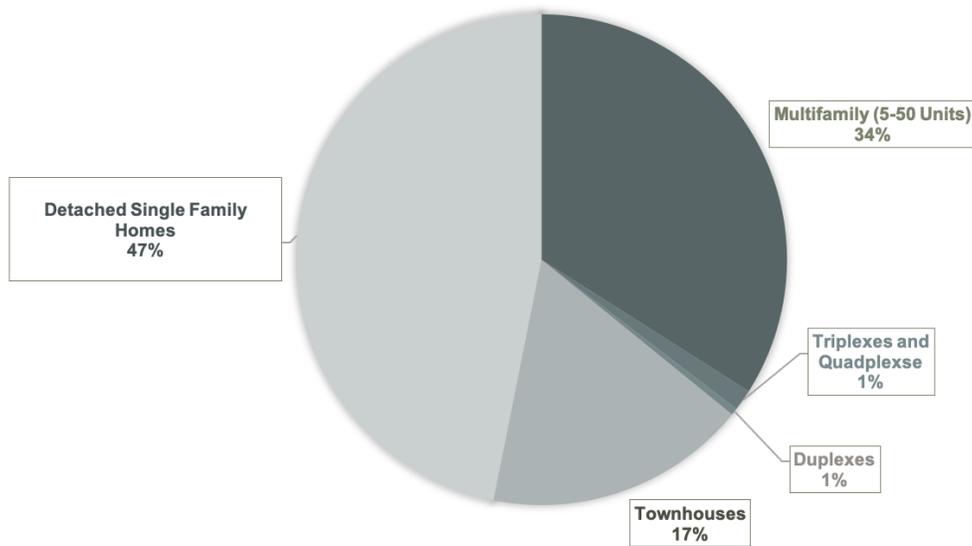


Figure 9 Pie Chart Montgomery County Housing Types. Source: Author

<sup>11</sup> Montgomery County Planning Board. 2021. [montgomeryplanning.org/development/zoning](http://montgomeryplanning.org/development/zoning)

1.8 Existing Housing Initiative: ADUs – Accessory Dwelling Units

Montgomery County updated their ADU policy, *Zoning Text Amendment 19-01*, effective December 31, 2019. This allows an ADU to be built as an independent unit within the walls of an existing home, as an addition to an existing home, or as an independent structure on the property. “An ADU is not permitted in a townhouse, condo, duplex, or mobile home...”

( ) An ADU as a unit must include permanent facilities for “living, sleeping, eating, cooking, and sanitation”. Within the guidelines, this updated policy allows for two units on a property with regulations regarding placement on the property, setbacks, height, width, and the footprint of the structure. Prior to the change in ADU regulation, only 411 ADUs were built in the county – less than 1% of eligible properties built ADUs. Since 2020, the increase in additional housing units built as ADUs has yet to be impactful. ADUs are a type of missing middle housing which can be added to a lot as attached or detached units.<sup>12</sup>

1.9 Proposed Housing Initiative: ZTA 20-06 – Concerning R-60 Zone

There is a Zoning Text Amendment currently under review before the Montgomery County Council – ZTA 20-06 – Concerning R-60 Zone – Use and Standards. ( ) This would be an amendment to the Montgomery County Zoning Ordinance to allow “missing middle” housing in the R-60 zone under certain conditions while amending the density, parking standards, and infill development in the zone. This would affect the R-60 zoned property within a mile of a Metrorail Station. This amendment would allow duplexes, triplexes, quadplexes, and townhouses on a single lot in the R-60 zone near a Metrorail Station. This amendment has not yet been approved.<sup>13</sup>

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<sup>12</sup> Zoning Text Amendment 19-01; montgomerycountymd.gov

<sup>13</sup> Zoning Text Amendment 20-06; montgomerycountymd.gov

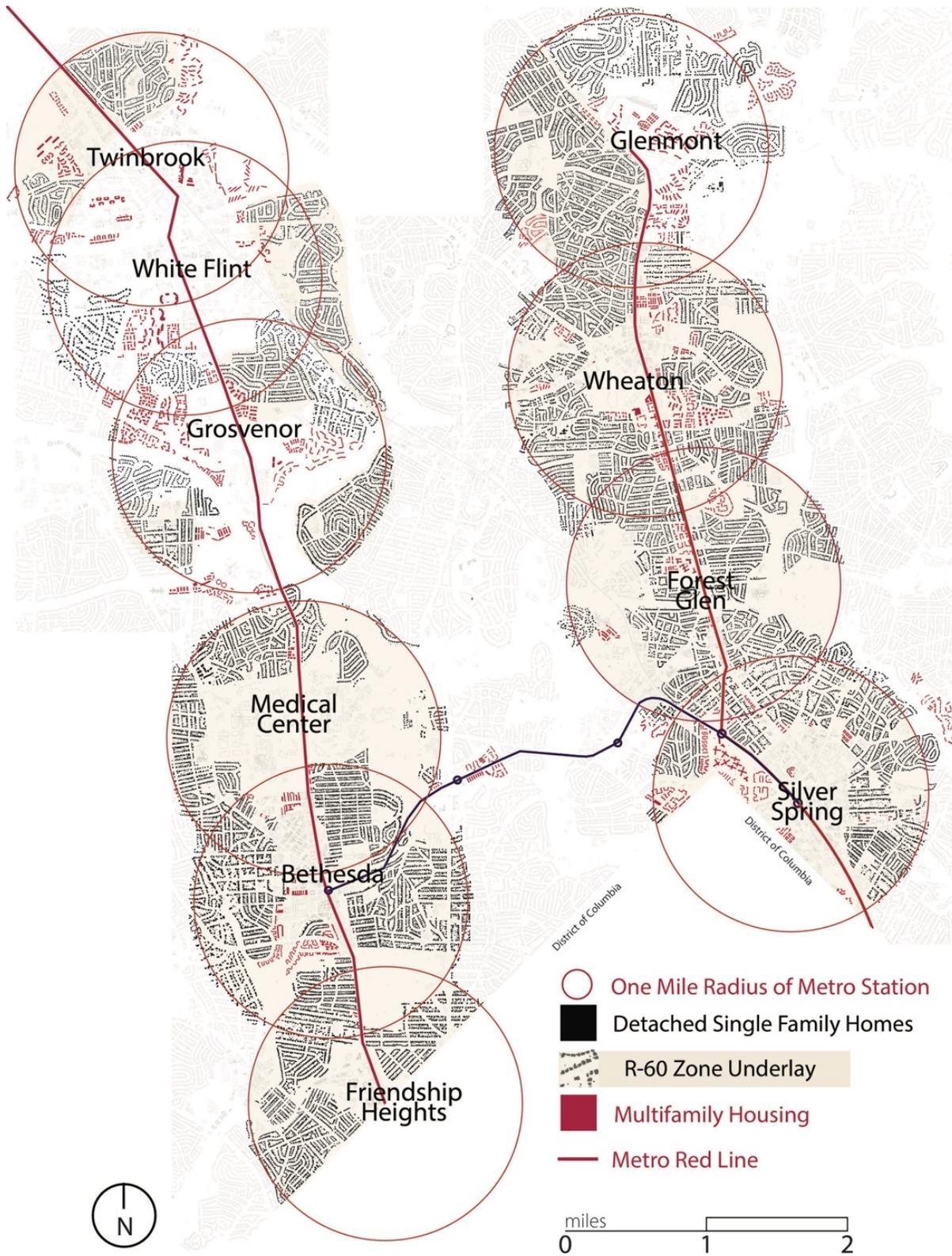


Figure 10 Diagram of One Radii of Metro with R-60 Overlay. Source: Author

1.10 Proposed Housing Initiative: Thrive 2050

Thrive 2050 is “the update to Montgomery County’s General Plan, its long-range policy framework for guiding future land use and growth for the next 30 years.”<sup>14</sup>It responds to housing issues as well as demographic, social, economic, and environmental concerns within the county. The housing plan, among a number of other initiatives, proposes to allow more diverse housing types within detached single-family neighborhoods, such as duplexes and triplexes. These would benefit neighborhoods close to high-quality transit stations, such as Washington DC’s Metrorail. This comprehensive plan update has not yet been approved.

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<sup>14</sup> <https://montgomeryplanning.org/planning/master-plan-list/general-plans/thrive-montgomery-2050>

## Chapter 2: Understanding Missing Middle Housing

### 2.1 Introduction

“Missing Middle Housing” was a phrase coined by Daniel Parolek of Opticos Design in 2010 to describe “a range of multiunit or clustered housing types, compatible in scale to single family homes”<sup>15</sup>. This entails building typologies that provide a range of housing options that exists between single family detached homes and multi-unit apartment buildings.



Figure 11 Missing Middle Typology graphic Source: [www.missingmiddle.com](http://www.missingmiddle.com)

The types of dwellings include the duplex, the triplex, and the quadplex on single lots and the courtyard apartment, the cottage court, the townhouse, the multiplex, and the live-work on double lots. The number of units range between two and nineteen, though for the purpose

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<sup>15</sup> Parolek, Daniel, and Arthur C. Nelson. *Missing Middle Housing Thinking Big and Building Small to Respond to Today's Housing Crisis*. Washington, D.C: Island Press, 2020.

of this thesis, the emphasis will be on housing between two and four units occupying one lot.



Shown idealized R-60 @ 6000SF, maximum lot coverage

Figure 12 Missing Middle examples with Images

Missing middle housing typically has the scale, the form, and a building type similar to single-family housing. They can be situated next to single family homes and appear consistent in scale and form. The smaller missing middle housing which mimics single family styles most closely are the two-unit duplex, the three-unit triplex, and the four-unit quadplex. They fit into a detached single family home footprint and have a similar width, depth, and height. The distinguishing feature

may be multiple mailboxes or gas meters or additional parking spaces or multiple front doors. Otherwise, the housing adds to the uniformity of the street and block. This type of missing middle housing could be regulated under residential codes since the construction type, structure size, and building use are similar to the construction of a detached single-family dwelling.

Also, the addition of Accessory Dwelling Unit, known as an ADU, on a detached single-family home lot, is included in this exploration. An ADU is subjected to the similar, restrictive zoning as the detached single -family house. The question of whether an ADU can be added to the property of a duplex, triplex or even a quadplex property remains to be explored.

A very popular type of housing is the townhome. This is not “missing” in the county, though it falls under the “missing middle” typology. Townhomes are currently allowed in Montgomery County and they have their own zoning regulations. Townhomes are usually built as multiples and require more land than a single lot has to offer, so the is subject is outside of the scope of this thesis.

## 2.2 Historic Trends

“Missing Middle”, as a sector of housing, was prevalent before the 1940 and is seen in many designated historic districts throughout the United States. It is also very popular, especially in the residential areas of towns and cities where density is required but the scale of the house is needed as well. The building type fits on the scale of the block and the blocks make the neighborhood. In several jurisdictions across the U.S., a mix of detached dwellings and semi-detached to fully attached townhomes satisfied the housing needed in most neighborhoods, especially in urban areas. Some had small yards, some had stoops that met the sidewalk, and some had porches. It is a type of housing that could be designed as luxury or utilitarian, depending on exterior finishes, and interior furnishings and finishes. The unit could adjust in size for various economic levels. Most of these, now, are historic blocks

adjacent to a commercial corridor offering retail, dining, and food options for the neighborhood within walking distance.

Historically, a single block of *attached* housing with similarly proportioned and detailed facades could contain several individual family townhomes alongside several sixplexes. Differing levels of income and family-size could inhabit the same block. A single block of *detached* single-family housing could contain several detached single-family houses alongside missing middle options such as duplexes, triplexes, or quadplexes in keeping with the single-family aesthetic.

After World War II, the creation of extensive car dependent, detached single family home



Family of four holding hands while standing in a line with their backs to the camera, facing a ranch-style house in a suburban development in 1965. A sale sign is posted in the front yard of the house. | Getty Images

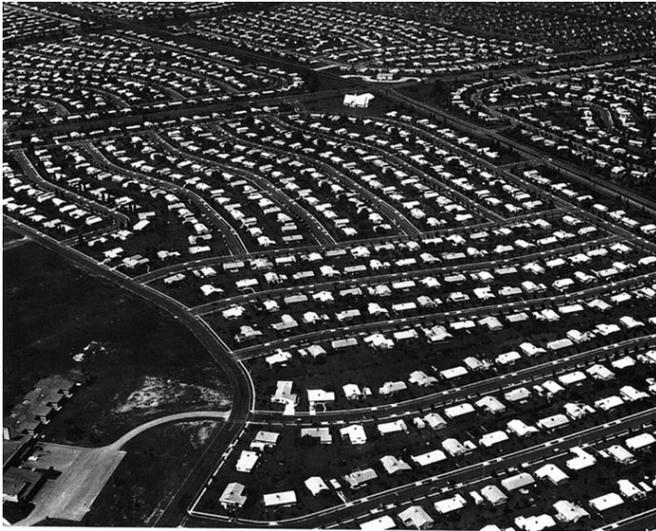
Figure 13 Advertisement for the American dream Source: Getty Images

suburbs perpetuated a dream for Americans – to own a home with a yard. The nuclear family was the ideal with a mother, a father, a boy and a girl, and a dog or a cat. This dream was supported by available mortgages and plentiful housing stock.

By the 1950s, this “dream” was idealized in the Dick and Jane reader series taught in 80% of public elementary schools in the United States. It perpetuated the idea that suburban living was the best way to live after World War II. The demand for detached single-family housing was at an all-time high. Land was

plentiful. The automobile was relatively new and desired by all families in the suburbs. Gas prices were low. Traffic concerns hadn't reached a critical level. Climate change and environmental issues had not yet surfaced.

Between 1948-1950, millions of new homes were built in the United States. Sprawling



*Figure 14 Image of Levittown PA Source: Getty Images*

suburban development became the norm.

Almost 70% of new homes built during this period were built by 10% of the home builders culminating in rows and rows of identical houses arranged in isolated, car dependent neighborhoods such as the "Levittowns" in Long Island, New Jersey, and Pennsylvania.

Missing middle type housing was not pursued at this time; FHA Loan favored single family home loans over missing middle housing loans.

The trend of sprawling neighborhoods built as “developments” was occurring in Montgomery

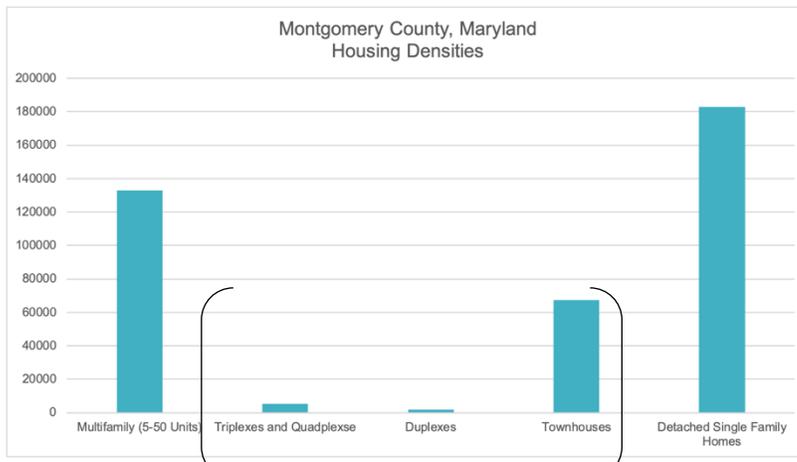


Figure 15 Montgomery County's own missing middle. Source: Author

County as well. Single-family homes were built by the thousands. Eventually the county experienced the “missing middle” in their own housing stock. Some pre-war neighborhoods in

Montgomery County bordering Washington, DC were built before WW2. They are home to the few duplexes and triplexes in Montgomery County.

Currently, the housing stock is 47% single-family homes. There may be an opportunity for homeowners to split their homes in two to create additional housing. Homeowners could benefit from the rental payments while new tenants could benefit from the neighborhood location and ambiance.

### 2.3 Current Trends of Missing Middle Typology

In the state of Maryland, many counties adjacent to Montgomery County allow duplexes and triplexes to be built in their residential zones, like Prince Georges, Carroll, and Howard Counties, while Montgomery County prohibits this housing. For example, Prince George’s County created a new residential townhome zone which will allow duplexes and triplexes, as well as townhomes. Around the United States, there are many jurisdictions challenging the wisdom of single-use zoning in residential zones to allow multiple units on previous single-use lots. For example, in September 2021, the governor of California approved a

State Senate Bill to eliminate statewide single -family zones requiring municipalities to approve two units per lot and up to four units on sizeable lots, with Lot-Splitting if qualified.<sup>16</sup> The point is that housing diversity is advantageous to communities, especially if the form and scale are maintained at the street.

2.4 Focus on the Typology

A duplex is a single dwelling split into two units. It can be split with a party wall between the two units. The units can be mirror images, or “twins”, or they can be uneven in size serving different sized households. This arrangement of units is known as a “side-by-side duplex. They can be side-by-side facing the street or one unit can face the street and the other unit can be further back on the property, still connected to the front unit. Another

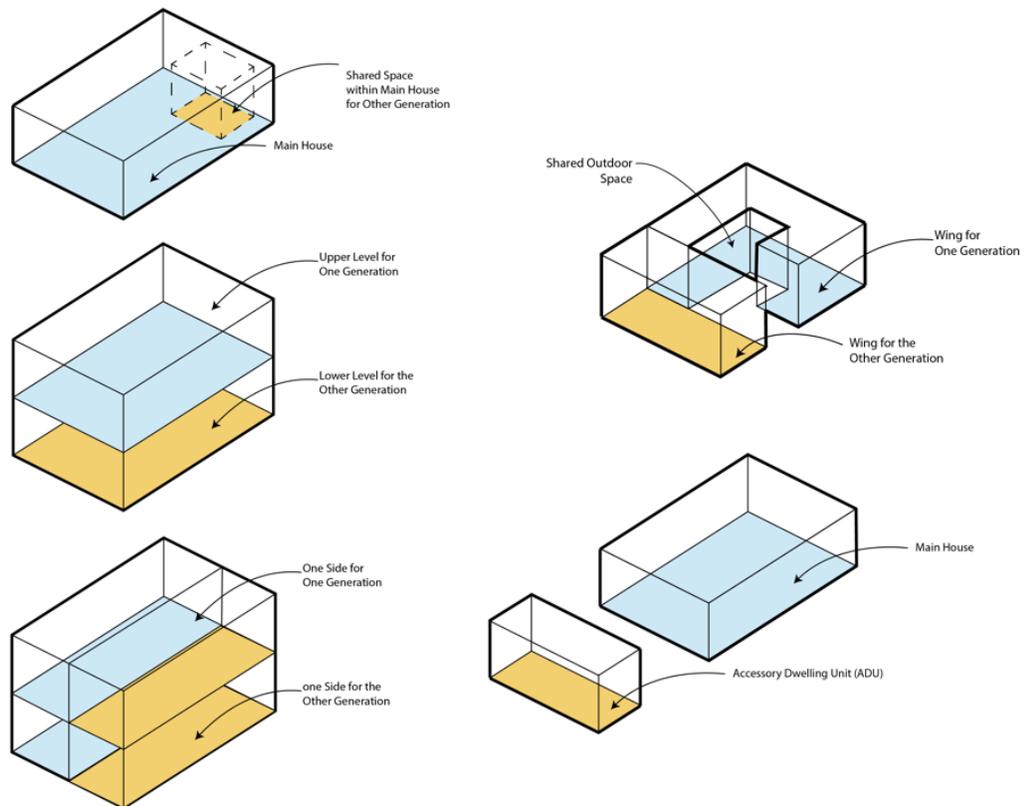


Figure 16 Diagram of splitting a single family home into units. Source: Author

<sup>16</sup> Holland & Knight, <https://www.hklaw.com/en/insights/publications/2021/09/ca-gov-signs-landmark-duplex-and-lot-split-legislation-into-law>

arrangement is a “stacked” duplex with one unit on each floor. These units tend to be close in square footage. The second level unit may have private access to the attic level, if available. Alternatively, the attic may become a third unit in the dwelling. This is called a triplex.

Alternative configurations of the duplex and triplex challenge the current zoning regulations: a side-by-side duplex, a side-by-side duplex with a detached ADU, a stacked duplex, a stacked duplex with a detached ADU, a side-by-side triplex, a stacked triplex, and a stacked triplex with a detached ADU. The side-by-side configurations can be one-story, one and half stories, two stories, or three stories. Each could have a basement. Each could have a garage. Each violates the current zoning in Montgomery County.

## Chapter 3: Site

### 3.1 Site Becomes Standard R-60 Lot

There is a new zoning text amendment before the Montgomery County Council, which, if passed, would allow for the missing middle housing typology within a one-mile radius of a Metrorail Station. Initially several home sites were identified within these radii. The site conditions determined the possible interventions that would be applied – whether there would be an intervention within a structure, as an addition to an existing structure, as a new build adjacent to the existing, or as an independent structure on the lot. It is important to evaluate the units as a part of the street scape in several locations. The neighborhood contexts were evaluated for their lot sizes, existing structures, and their walk-scores. The walkability of the site is of ultimate importance with local amenities such as grocery stores, restaurants, and other services within ¼ mile accessible by sidewalk, while transit could be up to one mile away.

As the thesis exploration progressed, a generic, minimal R-60 lot at 6000SF became the “site”, rather than an actual R-60 lot from Montgomery County. It is assumed that the location would have the walkable amenities mentioned above as well as close proximity to high quality transit.

## Chapter 4: Design Intention

The design intention is to create several (currently prohibited) missing middle type dwellings within the boundaries of a residential lot in Montgomery County. This exploration will show how the missing middle typology fits into a detached single-family street and neighborhood. It will show that flexibility is needed in the zone regulations to gently and seamlessly increase the density of a residential zone to support the future of housing.

### 4.1 Standard R-60 Lot

The variety of residential zones were evaluated and the R-60 zone was selected for its minimal square footage size respective to the other zones. The R-60 zone is 6% of the land mass of the county. It has been experiencing much new building on its periphery in Bethesda and Silver Spring. The zone has many lots located within a mile of the Metrorail for walkability and proximity of transit. It is in a prime position for change.

A dwelling will fit on a Montgomery County R-60 lot with minimum lot square footage, within the current setbacks and the maximum coverage percentage. In elevation, the height restrictions will be followed. Additionally, there will be challenges to the constraints of the R-60 lot and the current ADU regulations.

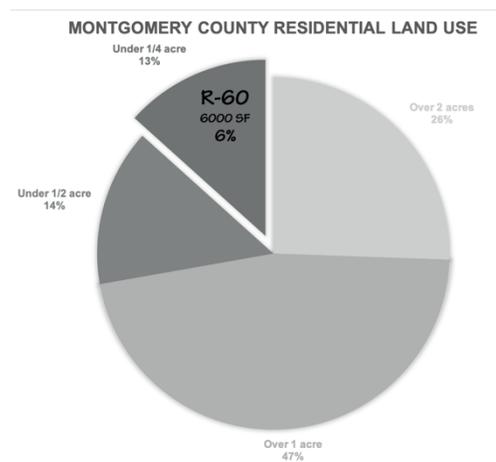


Figure 17 Pie chart showing R-60. Source: Author

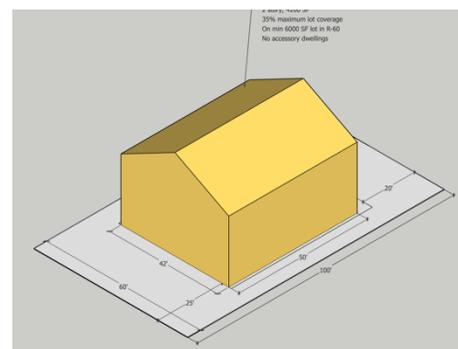


Figure 18 Maximum massing model on R-60 Lot source: Author

## R-60 Minimum Lot 60' X 100'

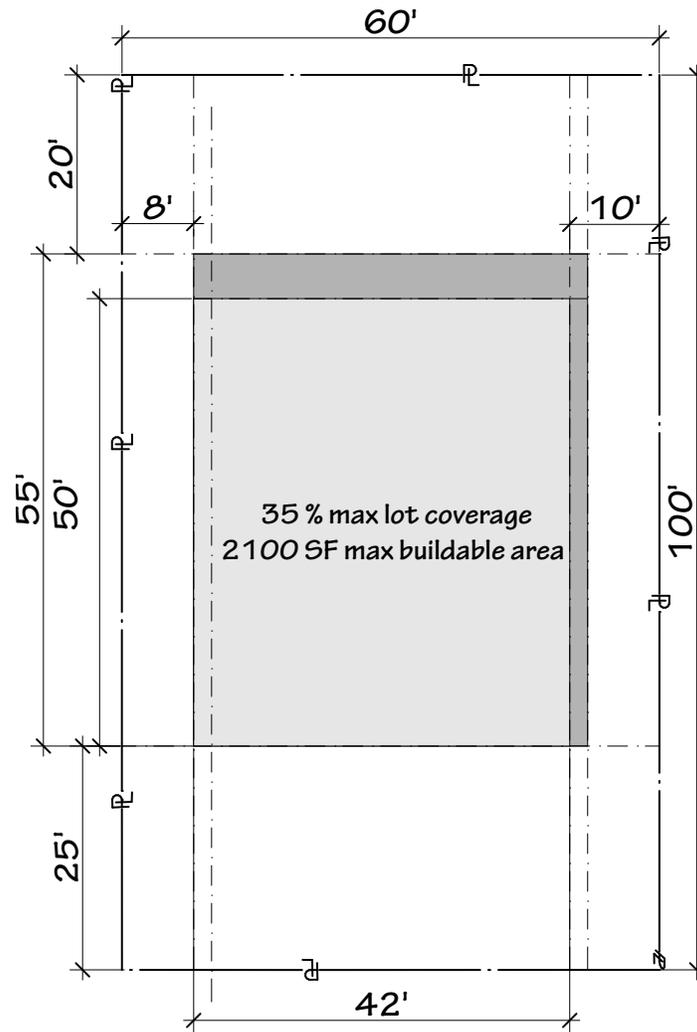


Figure 19 Diagram of R-60 Lot with Dimensions. Source: Author

The minimum lot size is 6000sf, with a minimum front building line of 60'. (The minimum front lot line is 25' for a pie shaped lot, but for this thesis it will be a rectangular shaped lot with no change in grade.) The dwelling design is to be placed in the buildable area at least 25ft from the front property line. Most houses on a sampling of streets have a consistent

front edge producing similarly sized front yards. An optional 9ft open porch is permitted in the front or rear set back. A 3ft open porch is allowed in the side setbacks. Each side setback is 8ft though the sum of the setbacks is 18ft. There is a 55ft x 44ft area determined to be for the home's placement. Out of this 2420sf area, 2100sf may be used for the footprint of the home. The home may be up to 30ft high with a flat roof or up to 35ft with a gable roof. The restrictions assume the forms of the buildings anticipated on a lot.

The first challenge is to design a 2100sf footprint missing middle dwelling that follows the setbacks and height restrictions. A three level 2100sf home would yield a 6300sf home, split into multiple units, which could easily accommodate a total of 6 bedrooms and 2 baths on the second level and a variety of spaces on the first level. The attic and basement could accommodate optional spaces or additional units. Homes with a gable roof will have a reduced square footage on the attic level, but dormers may be used to access the extra head height to reacquire the square footage.

The second challenge is to observe the streetscape and to design a home to fit on the street seamlessly in style, form, and scale while adding units to the street. Many streets in the county host a consistent style of home (i.e. colonial, cape, farmhouse, mid-century modern, etc.) Others have eclectic streetscapes with numerous teardowns and rebuilds inconsistent with the original style of the street, both in form and scale. This thesis intends its designs to blend into the existing streetscape. The home may be constructed out of modern material palettes of sustainable materials or out of traditional palette of materials used on a street. Many homeowners combat changes in zoning because it may damage their streetscape and

cause a loss in value of their most appreciated asset. Lessening their fear through camouflage may be one tactic to gently increase the density on a street in the county.

#### 4.2 Dwelling Design

The dwelling design is primarily the duplex, with the triplex and quadplex as additions to the duplex designs. All designs are to be replacements for an existing older home on a lot.

A duplex is a single dwelling split into two units. The units are separated by a party wall between the two units which acts as a solid bearing wall for each unit. All party walls are constructed for sound attenuation. The units can be mirror images, or “twins”, or they can be uneven in size serving different sized households. This arrangement of units is known as a “side-by-side duplex. They are typically side-by-side facing the street. With either two doors or one door that opens into a vestibule that serves both units. On an existing home, a center hall design is conducive to adaptation to the “twin” side-by-side duplex.

A second side-by-side arrangement of units is known as one unit fronting the street and the other unit is stepped back but still connected to the front unit. A small footprint (less than or equal to half of the 2100sf max coverage) could host a stepped back second unit oriented to the driveway side of the lot. The new unit would be connected as a duplex. A separate but equal unit could be built but it would be considered an ADU.

Another arrangement is a “stacked” duplex with one unit on each floor. These units tend to nearly the same square footage. The second level unit may have private access to the attic

level, if available. An existing home with a far left or far right front door with vertical circulation on the wall edge and a hallway between the stair and a wall are prime candidates for conversion to a stacked duplex or triplex. This arrangement maybe re-converted to a single family home as well.

Alternatively, the attic may become a third unit in the dwelling with the vertical circulation connecting the three units. This is called a triplex. If a basement unit is adding then it would be a quadplex. (At this point, parking restrictions come into the play at one car per unit. If the lot is within  $\frac{1}{4}$  mile of transit, then  $\frac{1}{2}$  car per unit is required.)

Alternative configurations of the duplex and the triplex *challenge* the current zoning regulations: a side-by-side duplex, a side-by-side duplex with a detached ADU, a stacked duplex, a stacked duplex with a detached ADU, a side-by-side triplex, a stacked triplex, a stacked triplex with a detached ADU, a stacked quadplex, or a house with both attached and detached ADUs on the lot. The side-by-side configurations can be one-story, one and half stories, two stories, or three stories. Each could have a basement. Each could have an attic. Each could have a garage if the building allowance has not been used. Each of these scenarios violates the current zoning regulations in Montgomery County and are illegal to build in the R-60 zone.

## Chapter 5: Design Approach

### 5.1 Design Principles

This thesis will use small scale home design as the basis for its units. The design principles used in this thesis consider the streetscape for the exterior facade and front landscaping and the occupant household for the interior and outdoor spaces.

### 5.2 Program

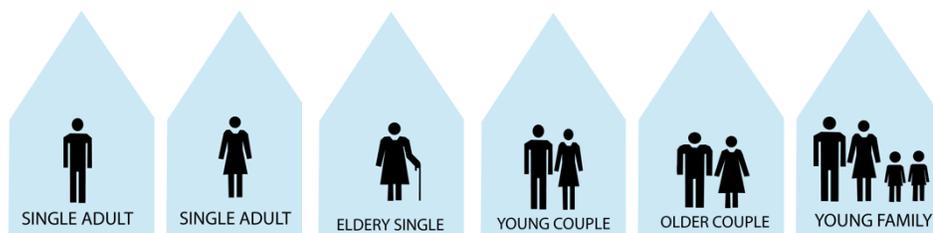
The formal program of each dwelling design includes: an entry foyer, a living room, dining space, full kitchen, office, first floor bathroom, a first level bedroom (if possible), access to outside, and access to light and air on three sides. Placement of the private spaces on the first level are varied, but they are separated from more public, noisier areas of the kitchen, dining, and living room. Some units are one level due to the needs and desires of older residents. Some units have a graduated entry stair to aid accessibility for older residents. Rear and sometimes front spaces are partitioned per unit for a side-by-side duplex while the yard becomes either communal or the domain of the first-floor resident in a stacked duplex. Second floor units in a stacked duplex may not have direct access to the ground level but have either a Juliet balcony or an occupiable balcony. Mechanical units (i.e. furnace and hot water heater) would be located on the basement level, and possibly secondarily in an attic space if the house requires the extra heating/cooling.

### 5.3 Occupant Households

There are predictable households that would occupy a missing middle type of home, since they typically have a smaller unit size than a detached single-family home. Each of these

households have been considered for one or more units during the design process. The householders are as follows: a single adult, an elderly single adult, a young couple, an older couple, a young family, and a multigenerational family consisting of two or more adult generations sharing a lot.

Possible Household occupants:



Possible Multigenerational combinations:

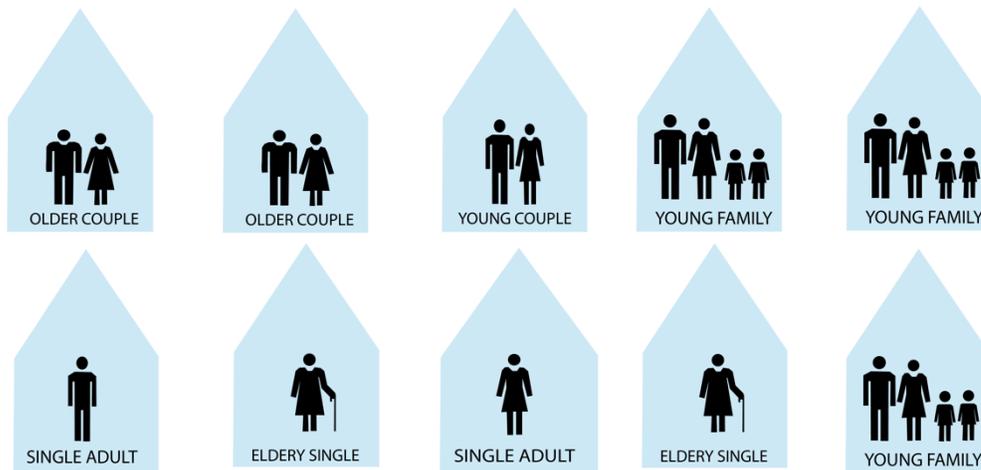


Figure 20 Household Occupant Icons source: Author

The above household configurations are a starting point. Of course, a single parent family, a family with older children, or a household of adult roommates, for example, could choose a duplex as well.

*5.4 Specific Program 1: One Story Side-by-Side Duplex: Stepped Back*

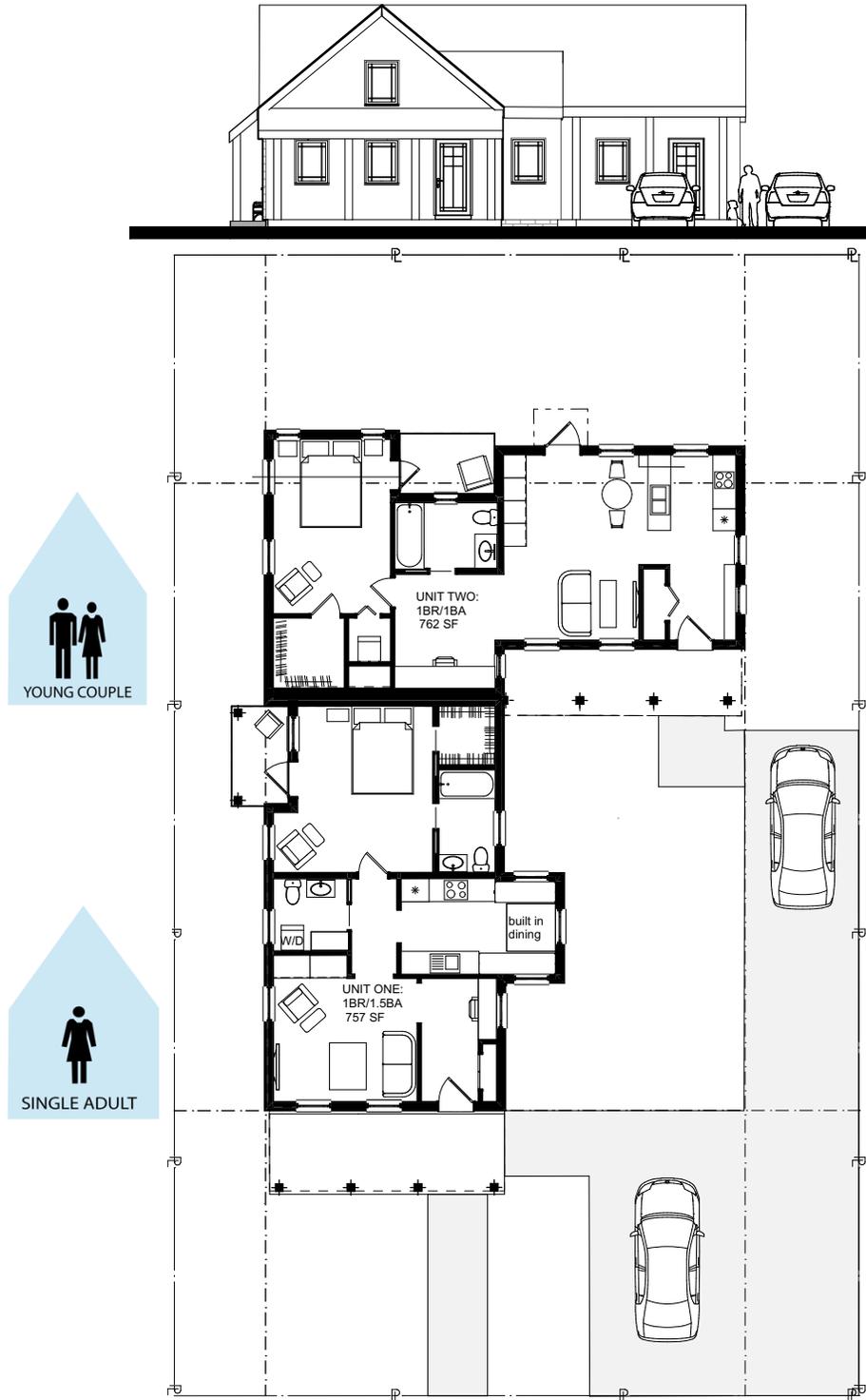


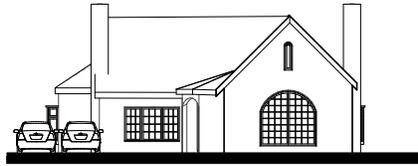
Figure 21 One Story - Side-by-side Duplex Source: Author



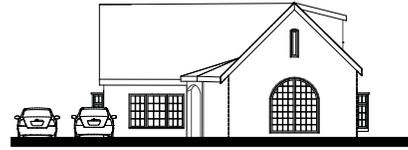
*Figure 22 Rendering of one-story side-by-side duplex. source: Author*

This duplex totals approximately 1500sf of interior space with 180sf of exterior porch space for each unit. Each have a small yard adjacent to the porches. Each front door is visible from the street. The rear unit extends into the setback, so technically it could follow the ADU setbacks of 12'. This is a small footprint duplex, with a one-story profile, which is in keeping with one-story neighborhoods in R-60.

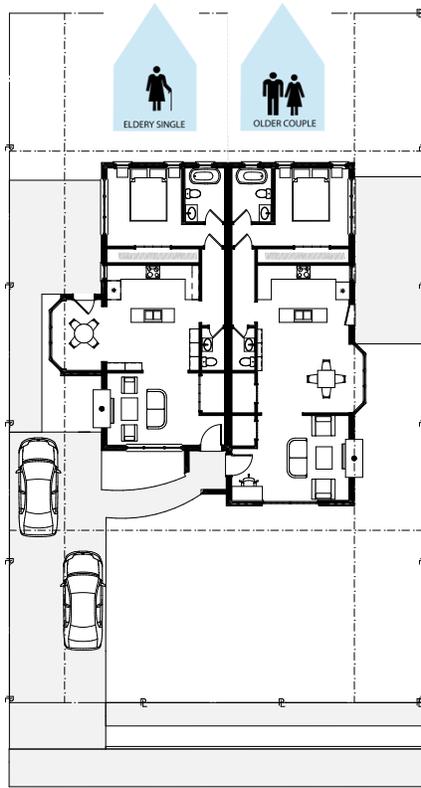
*5.5 Specific Program 2: One Story Side-by-Side Duplex: Unequal Sizes*



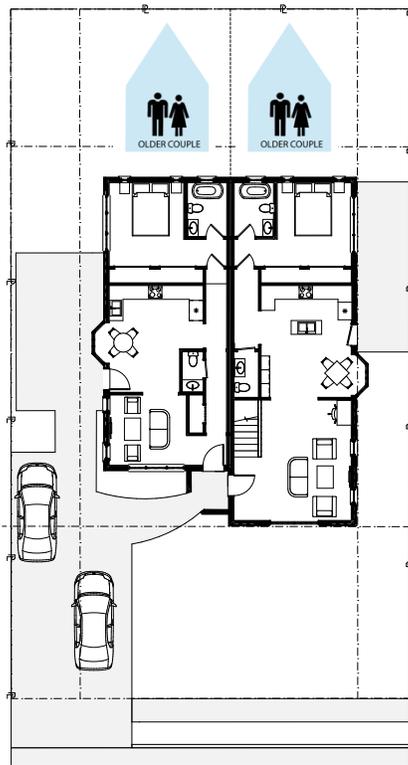
1 SIDE BY SIDE - SINGLE STORY - DUPLEX  
SCALE 1/8" = 1'-0"



1 ONE AND A HALF STORY DUPLEX  
SCALE 1/8" = 1'-0"



2 FIRST FLOOR PLAN  
SCALE 1/8" = 1'-0"



2 FIRST FLOOR PLAN  
SCALE 1/8" = 1'-0"

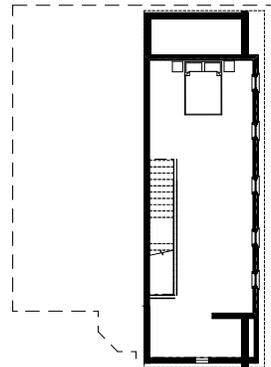


Figure 23 Side-by-side duplex #2. Source: Author



Figure 24: Rendering of side-by-side duplex #2. Source: Author

This duplex is a one story, side-by-side duplex with non-identical units. The left side gable unit has the option of a dormer with makes the unit 1.5 stories. Set among trees and flowering landscaping, this duplex could fit undetected onto a streetscape in the Woodside neighborhood of Silver Spring, Maryland. Within a mile of the Metro, Woodside is also in walking distance to the highly anticipated Purpleline light rail transit train stop at 16<sup>th</sup> Street.



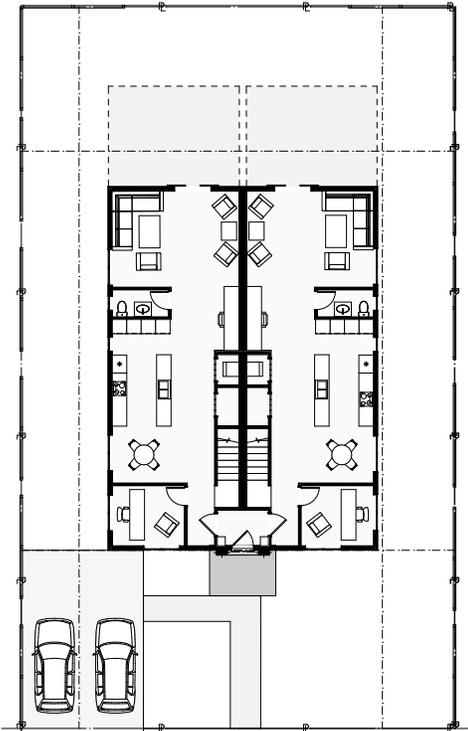
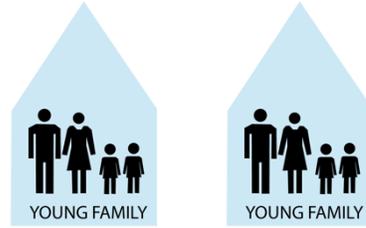
Figure 25 Streetscape rendering of side-by-side duplex on a Silver Spring neighborhood street.

Source: Author

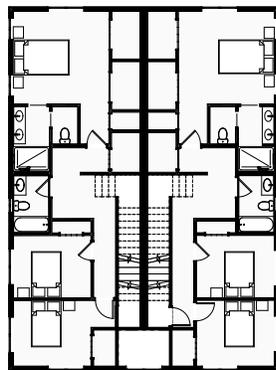
5.6 Specific Program 3: Two Story Side-by-Side Duplex: Twins



1 TWO STORY SIDE BY SIDE DUPLEX  
SCALE: 1/8" = 1'-0"



2 FIRST FLOOR PLAN  
SCALE: 1/8" = 1'-0"



3 SECOND FLOOR PLAN  
SCALE: 1/8" = 1'-0"



Figure 24 Side by Side Duplex: Equal Sized Units. Source: Author



*Figure 25 Duplex rendering on street in Chevy Chase. Source: Author*

This duplex is a two story, side-by-side duplex with identical units, otherwise known as “twins”. It is a footprint of 1820SF, with 2 stories split in two, which makes each unit 1820SF. There are each 3BR/2.5BR and a first-floor office. It has one central entrance foyer which lead to the individual unit front doors. Set among other colonial style homes, this duplex could fit unnoticed onto a streetscape in the Friendship Heights neighborhood of Chevy Chase. Within a half mile of the Metro and a commercial corridor, this duplex could easily house two families.

5.7 Specific Program 4: Two Story Side-by-Side Duplex: Mid-Century Modern

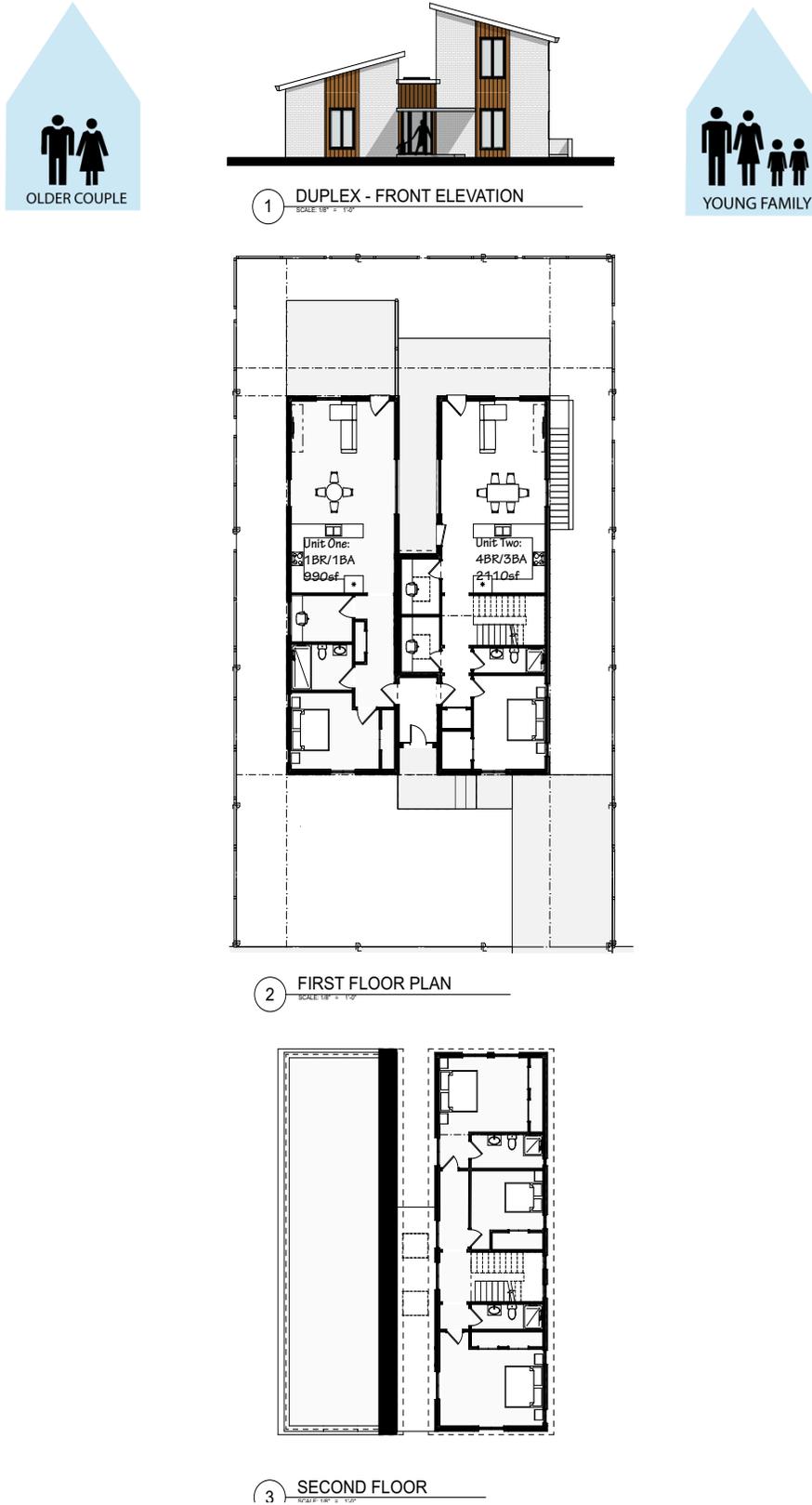


Figure 26 Side-by-Side Mid Century Modern Duplex



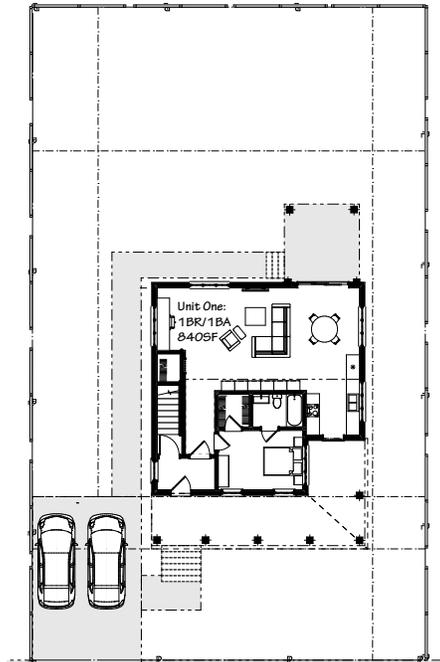
Figure 27 Rendering of Mid Century Modern Duplex. Source: Author

This duplex is a two story, side-by-side duplex with unequal units. Unit One is a 990SF, 1BR/1BA, unit with vaulted ceilings and access to a rear yard. Unit Two is 2110,4BR/3BA, unit on two levels. It has two desk areas with skylights and a bedroom on the main level. The unit has a basement accessed from inside and outside the home. It has a large private rear yard. The entrance is a shared foyer. In the rear, Unit Two has access to the patio through a side door. This “slit” seen in the floor plans physically separates the noisy parts of the house for privacy and comfort of the residents. Set among other mid-century modern homes and other eclectic designs, this duplex could fit onto a streetscape in Bethesda, Maryland. Within a half mile of the Metro and a commercial corridor, this duplex could house a young family and a set of grandparents as neighbors.

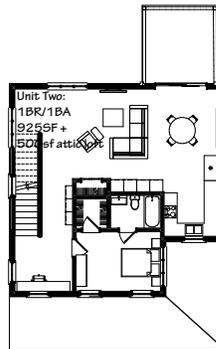
5.8 Specific Program 5: Stacked Duplex



1 TWO STORY STACKED DUPLEX  
SCALE: 1/8" = 1'-0"



2 FIRST FLOOR PLAN  
SCALE: 1/8" = 1'-0"



3 SECOND FLOOR PLAN  
SCALE: 1/8" = 1'-0"

Figure 28 Stacked Duplex. Source: Author



*Figure 29 Rendering of Stacked Duplex. Source: Author*

This duplex is a two story, stacked duplex. Both levels have 1BR/1BA units. The lower level is 840SF with access both the front and rear yards via covered porches. The second level is of approximately 925sf. The second level unit has a rear porch off the dining area. It also has exclusive access to the 500SF attic loft space. The footprint of the dwelling is 950sf, so there is room in the rear yard for an ADU.

5.9 Specific Program 6: Triplex

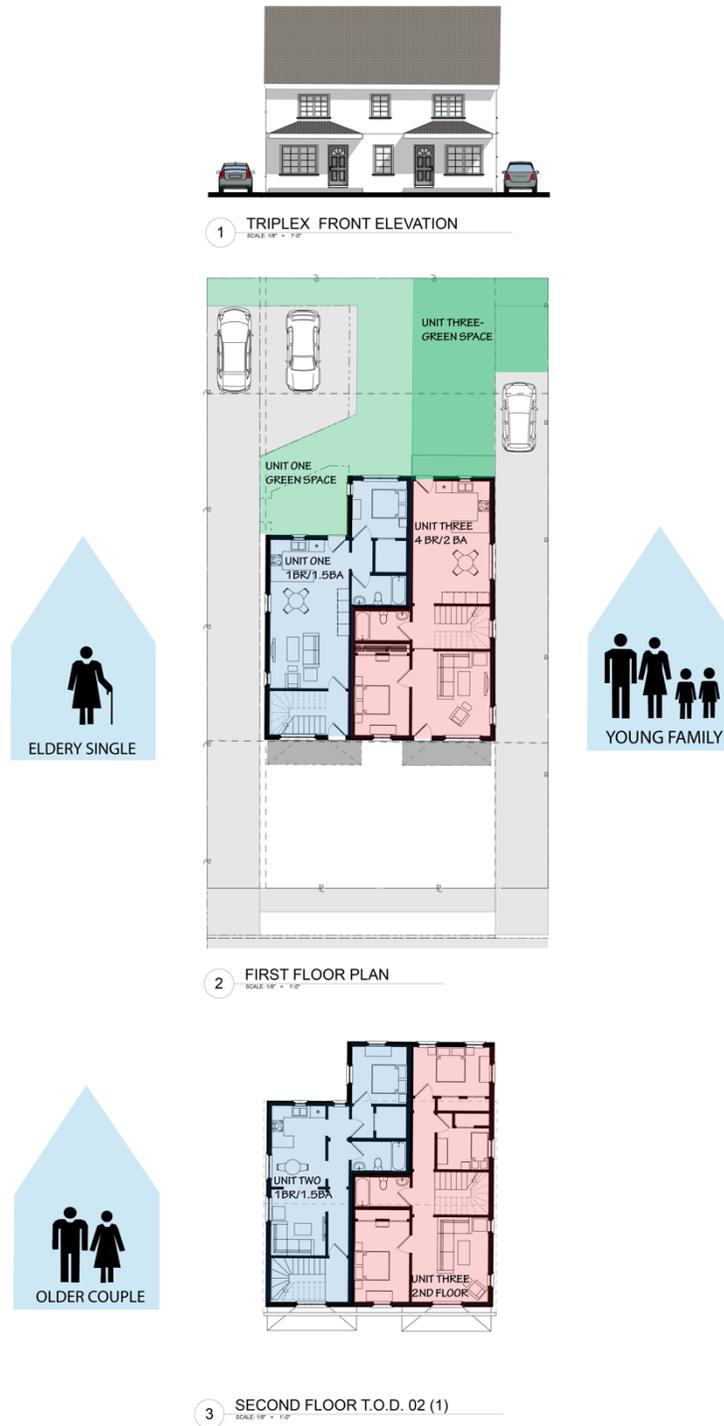


Figure 30 Triplex. Source: Author



*Figure 31 Rendering of Triplex*

This triplex resembles a two story, side-by-side duplex. Unit One is a 610sf, 1BR/1BA, first floor unit with a rear covered porch and access to the rear yard. Unit Two is on the second level above unit one with access to a balcony. It is also a 1BR/1BA that is 610sf. Unit Three is a 1720sf, 4 BR/2BA, unit on two levels. It has a bedroom and full bath on the lower level and access to the backyard. There is a bonus family room on the second level. This dwelling could house a combination of the occupant households with an opportunity for a four generation household.

The footprint of this dwelling is 1500sf. There is room for an optional 600sf ADU in the rear yard. This triplex has a double curb cut for two driveways with two spaces to the left for the smaller units, and one to the right for the two-story unit. There is room to create a fourth parking space.

5.10 Specific Program Expanded: Home with Two ADUs

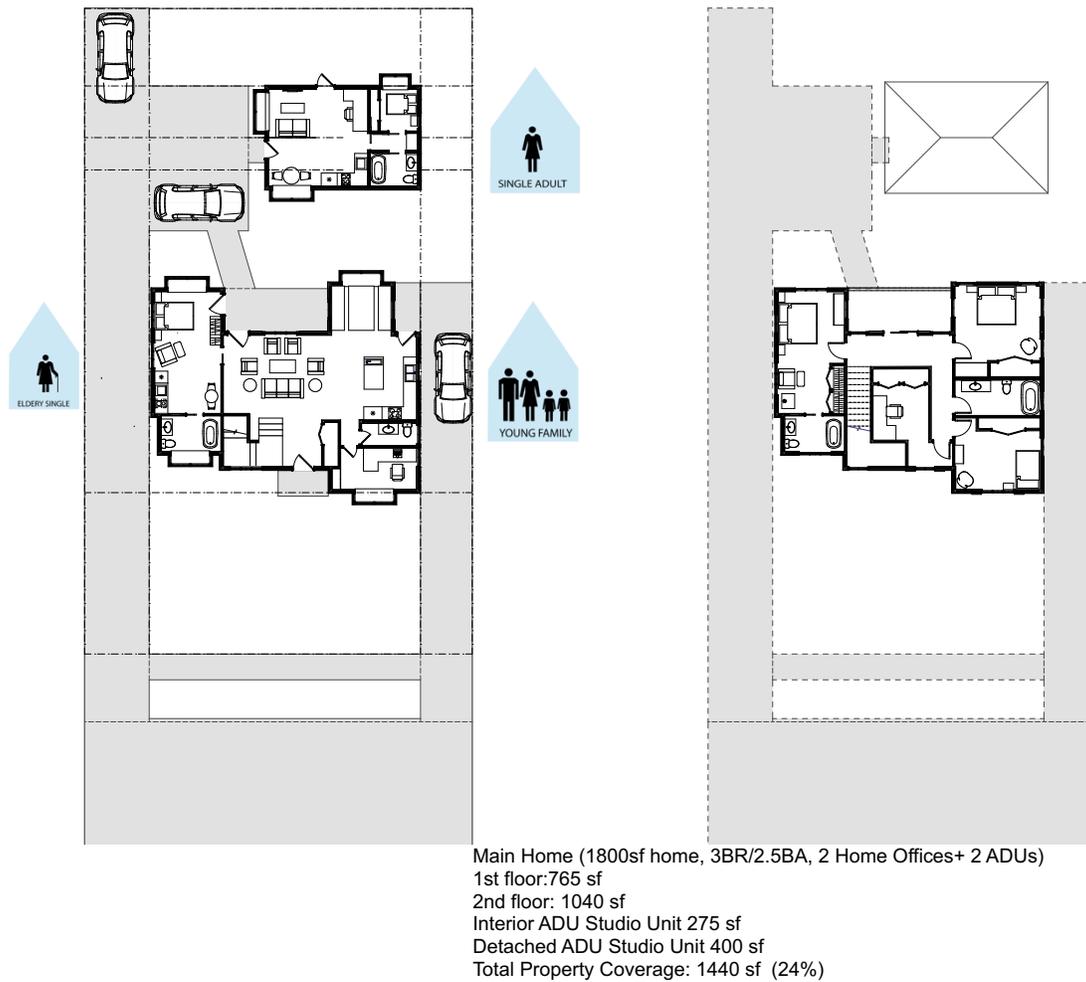


Figure 32 Floor Plans of Home with 2 ADUs. Source: Author

The main home is an 1800sf home with 3BR/2.5BA plus two home offices. The home has two ADUs could work for a multigenerational household.

The first ADU is more dependent, 275sf studio style ADU attached to the main home appropriate for an aging parent or could be reserved for short or long-term guests. It has a private entrance but also connects to the interior of the house.

The second ADU is a 400sf independent, detached ADU in the rear yard. Behind this unit, in the 12' setback, is private outdoor space. This unit is for a single adult tenant.

This design is contra to the current 2019 ADU amendment. The ADU in the main residence is legal, but an additional ADU in the rear yard is against regulations. The total property coverage of all structures is 1440sf, which is 24% coverage of the backyard.

This “triplex” has a double curb cut for two driveways with two spaces to the left for the smaller units, and one to the right for the two-story unit. If desired, a two story ADU could be built. There are four parking spaces on the property.

## Conclusion:

This thesis exploration sought to show how a gentle increase in density could be accomplished through the application of a missing middle typology in the R-60 residential zone in Montgomery County. The inclusion of duplexes and triplexes in the zone could integrate seamlessly with existing neighborhood fabric. This could be accomplished through adaptation of current housing stock or with replacement of aging homes. The R-60 zoning regulations need more flexibility to allow this slight increase in density, while maintaining the tree canopy and streetscape. It would be most effective when the increased density is in proximity to transit and in walking distance to a commercial corridor. Additionally, the inclusion of ADUs as a missing middle building types could allow for multiple ADUs on a property, while maintaining the coverage requirements. This strategy will serve Montgomery County's future while we address the housing deficit. Overall, careful attention to the scale and form of the zoning change will maintain the neighborhood ambiance which makes Montgomery County a sought-after place to live.

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